The following excerpt are pages from the North American Product Technical Guide, Volume 2: Anchor Fastening, Edition 16.

Please refer to the publication in its entirety for complete details on this product including data development, product specifications, general suitability, installation, corrosion and spacing and edge distance guidelines.
US: http://submittals.us.hilti.com/PTGVol2/
CA: http://submittals.us.hilti.com/PTGVol2CA/

To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists between the hours of 7:00am – 6:00pm CST.
US: 877-749-6337 or HNATechnicalServices@hilti.com
CA: 1-800-363-4458, ext. 6 or CATechnicalServices@hilti.com

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3.2.3 HIT-HY 200 Adhesive Anchoring System

HIT-HY 200-A

HIT-HY 200-R

Listings/Approvals

ICC-ES (International Code Council)
ESR-3187

NSF/ANSI Std 61
certification for use in potable water

European Technical Approval
ETA-11/0492, ETA-11/0493
ETA-12/0006, ETA-12/0028
ETA-12/0083, ETA-12/0084

City of Los Angeles
Research Report No. 25964

Independent Code Evaluation

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

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

IBC®/IRC® 2009
(ICC-ES AC308)

IBC®/IRC® 2006
(ICC-ES AC308)

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.

Department of Transportation

Contact Hilti to get a current list of State Departments of Transportation that have added HIT-HY 200 to their qualified product listing.

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 anchor rods (when drilled with hammer-drilled holes). 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 anchor rods in dry conditions with hammer-drilled holes
- ICC-ES approved for cracked concrete and seismic service
- May be installed in diamond cored holes with HIT-Z anchor rod only 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

For material specifications for anchor rods and inserts, please refer to section 3.2.9.

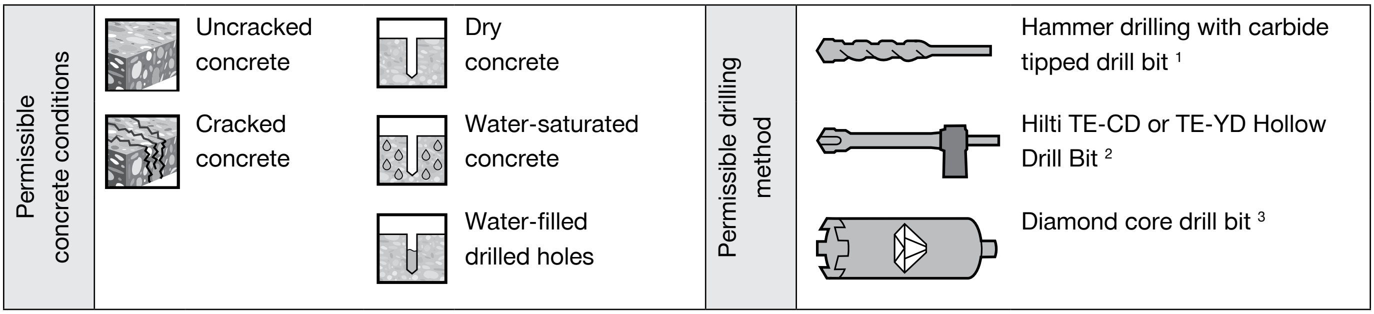
3.2.3.3 Technical data

3.2.3.3.1 ACI 318-14 Chapter 17 design

The load values contained in this section are Hilti Simplified Design Tables. The load tables in this section were developed using the Strength Design parameters and variables of ESR-3187 and the equations within ACI 318-14 Chapter 17. 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.

HIT-HY 200 adhesive with HIT-Z and HIT-Z-R anchor rods

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

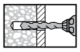
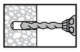


1 Anchor may be installed in a hole drilled with a carbide-tipped bit without cleaning the drilling dust from the hole. Temperature must be 41° F or higher. Drilling dust must be removed from the hole if the temperature is below 41° F. See Manufacturer's Published Installation Instructions (MPII).

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 - Specifications for HIT-Z and HIT-Z-R installed with HIT-HY 200 adhesive

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)
Minimum diameter of fixture hole	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-Z and HIT-Z-R specfications

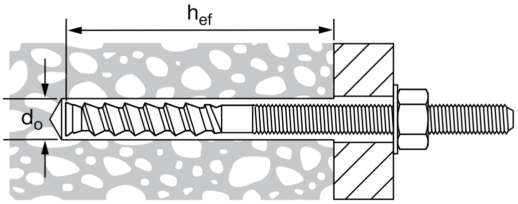
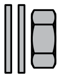


Figure 3 -
Installation with (2) washers



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		HIT-Z Length Code
	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)	F
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)	H
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)	J
1/2 x 4-1/2	4-1/2	(114)	2-1/2	(63)	5/16	(8)	1-11/16	(43)	1	(26)	F
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)	J
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)	M
5/8 x 6	6	(152)	3-5/8	(92)	7/16	(11)	1-15/16	(49)	1-1/8	(28)	I
5/8 x 8	8	(203)	3-5/8	(92)	7/16	(11)	3-15/16	(100)	3-1/8	(79)	M
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)	P
3/4 x 8-1/2	8-1/2	(216)	4	(102)	7/16	(12)	4	(102)	3-1/16	(77)	N
3/4 x 9-3/4	9-3/4	(248)	4	(102)	1-11/16	(44)	4	(102)	3-1/16	(77)	Q

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

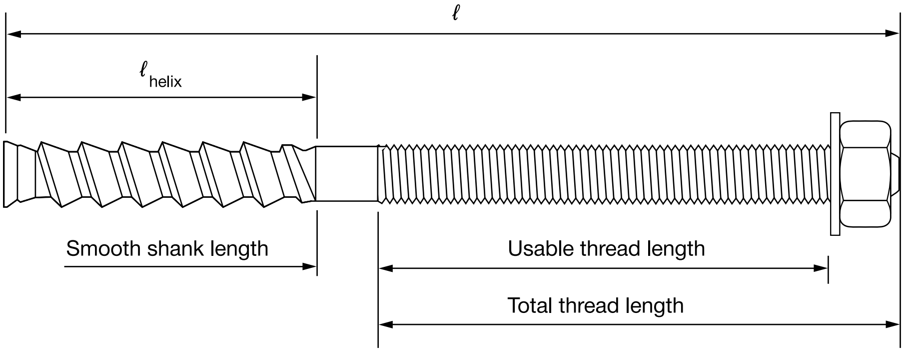


Table 3 - HIT-HY 200 design strength with concrete/pullout failure for HIT-Z(-R) rods in uncracked concrete [1,2,3,4,5,6,7,8,9,10]

Nominal anchor diameter in.	Effective embed. in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 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)	5,170 (23.0)	5,170 (23.0)	5,170 (23.0)	10,415 (46.3)	11,410 (50.8)	13,175 (58.6)	16,135 (71.8)
	4-1/2 (114)	5,170 (23.0)	5,170 (23.0)	5,170 (23.0)	5,170 (23.0)	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)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	16,035 (71.3)	17,570 (78.2)	20,285 (90.2)	24,845 (110.5)
	6 (152)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	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)	13,905 (61.9)	22,415 (99.7)	24,550 (109.2)	28,350 (126.1)	34,720 (154.4)
	7-1/2 (191)	13,905 (61.9)	13,905 (61.9)	13,905 (61.9)	13,905 (61.9)	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)	18,500 (82.3)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	45,645 (203.0)
	8-1/2 (216)	18,500 (82.3)	18,500 (82.3)	18,500 (82.3)	18,500 (82.3)	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				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 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)	5,170 (23.0)	7,380 (32.8)	8,085 (36.0)	9,335 (41.5)	11,430 (50.8)
	4-1/2 (114)	5,170 (23.0)	5,170 (23.0)	5,170 (23.0)	5,170 (23.0)	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)	7,110 (31.6)	11,360 (50.5)	12,445 (55.4)	14,370 (63.9)	17,600 (78.3)
	6 (152)	7,110 (31.6)	7,110 (31.6)	7,110 (31.6)	7,110 (31.6)	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)	13,905 (61.9)	13,905 (61.9)	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)	18,155 (80.8)	29,490 (131.2)	32,305 (143.7)	37,300 (165.9)	45,685 (203.2)

1 Section 3.1.8 for explanation on development of load values.
2 See Section 3.1.8.6 to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 10 - 17 as necessary to the above values. 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 = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 1.0.
For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.90.
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 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension only by the following reduction factors:
3/8-in diameter - $\alpha_{N,seis}$ = 0.705
1/2-in to 3/4-in diameter - $\alpha_{N,seis}$ = 0.75
See Section 3.1.8.7 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 318-14 Chapter 17 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)	Seismic Shear[5] $\phi V_{sa,eq}$ lb (kN)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic Shear[5] $\phi V_{sa,eq}$ lb (kN)
3/8	4,750 (21.1)	1,930 (8.6)	1,930 (8.6)	4,750 (21.1)	2,630 (11.7)	2,630 (11.7)
1/2	8,695 (38.7)	3,530 (15.7)	2,295 (10.2)	8,695 (38.7)	4,815 (21.4)	3,610 (16.1)
5/8	13,850 (61.6)	5,625 (25.0)	3,655 (16.3)	13,850 (61.6)	7,670 (34.1)	4,985 (22.2)
3/4	20,455 (91.0)	8,310 (37.0)	5,400 (24.0)	20,455 (91.0)	11,330 (50.4)	7,365 (32.8)

1 See section 3.1.8.6 to convert design strength 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 318-14 Chapter 17.

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 318-14 Chapter 17.

5 Seismic Shear = $\alpha_{V,seis}\ \phi_{Vsa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

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

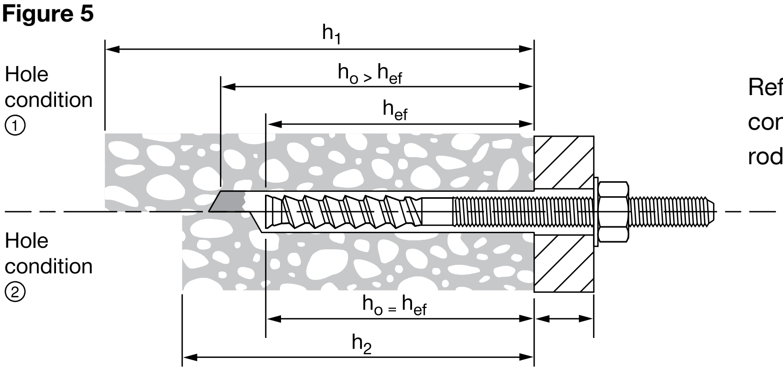
The Hilti HIT-Z and HIT-Z-R anchor rods produce higher expansion forces in the concrete slab when the installation torque is applied. This means that the anchor must be installed with larger edge distances and spacing when compared to standard threaded rod, to minimize the likelihood that the concrete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

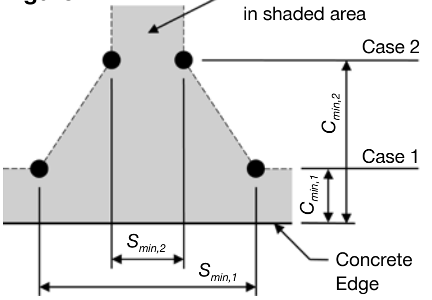


Refer to tables 6 to 9 in this section for the minimum concrete thicknesses associated with the Hilti HIT-Z(-R) rods based on diameter and drilled hole condition.

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.

Figure 6



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

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

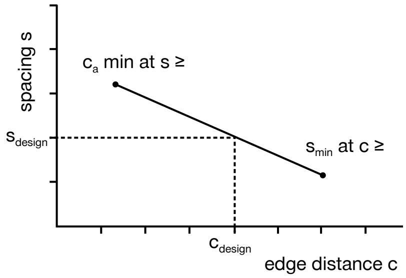


Table 6 - Minimum edge distance, spacing, and concrete thickness for 3/8-in. diameter Hilti HIT-Z and HIT-Z-R rods[1]

Nominal anchor diameter		d	in.	3/8								
Effective embedment		h_{ef}	in.	2-3/8			3-3/8			4-1/2		
			(mm)	(60)			(86)			(114)		
Drilled hole condition		-	-	2 [2]	1 or 2		2 [2]	1 or 2		2 [2]	1 or 2	
Minimum concrete thickness		h	in.	4	4-5/8	5-3/4	4-5/8	5-5/8	6-3/8	5-3/4	6-3/4	7-3/8
			(mm)	(102)	(117)	(146)	(117)	(143)	(162)	(146)	(171)	(187)
Uncracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in.	3-1/8	2-3/4	2-1/4	2-3/4	2-1/4	2	2-1/4	1-7/8	1-7/8
			(mm)	(79)	(70)	(57)	(70)	(57)	(51)	(57)	(48)	(48)
		$s_{min,1}$	in.	9-1/8	7-3/4	6-1/8	7-3/4	6-1/2	5-5/8	6-1/8	5-3/8	4-1/2
			(mm)	(232)	(197)	(156)	(197)	(165)	(143)	(156)	(137)	(114)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in.	5-5/8	4-3/4	3-3/4	4-3/4	3-7/8	3-1/4	3-3/4	3-1/8	2-3/4
			(mm)	(143)	(121)	(95)	(121)	(98)	(83)	(95)	(79)	(70)
		$s_{min,2}$	in.	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8
			(mm)	(48)	(48)	(48)	(48)	(48)	(48)	(48)	(48)	(48)
Cracked concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in.	2-1/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8
			(mm)	(54)	(48)	(48)	(48)	(48)	(48)	(48)	(48)	(48)
		$s_{min,1}$	in.	6-3/8	5-1/2	4-1/4	5-1/2	3-1/2	2-5/8	3-1/4	2	1-7/8
			(mm)	(162)	(140)	(108)	(140)	(89)	(67)	(83)	(51)	(48)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in.	3-5/8	3-1/8	2-3/8	3-1/8	2-1/2	2-1/8	2-3/8	2	1-7/8
			(mm)	(92)	(79)	(60)	(79)	(64)	(54)	(60)	(51)	(48)
		$s_{min,2}$	in.	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8	1-7/8
			(mm)	(48)	(48)	(48)	(48)	(48)	(48)	(48)	(48)	(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.	2-3/4			4-1/2			6		
			(mm)	(70)			(114)			(152)		
Drilled hole condition		-	-	2 [2]	1 or 2		2 [2]	1 or 2		2 [2]	1 or 2	
Minimum concrete thickness		h	in.	4	5	7-1/8	5-3/4	6-3/4	8-1/4	7-1/4	8-1/4	9-3/4
			(mm)	(102)	(127)	(181)	(146)	(171)	(210)	(184)	(210)	(248)
Uncracked Concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in.	5-1/8	4-1/8	2-7/8	3-5/8	3	2-1/2	2-7/8	2-1/2	2-1/2
			(mm)	(130)	(105)	(73)	(92)	(76)	(64)	(73)	(64)	(64)
		$s_{min,1}$	in.	14-7/8	11-7/8	8-5/8	10-1/4	9	7-1/4	8-1/8	7-1/4	5
			(mm)	(378)	(302)	(219)	(260)	(229)	(184)	(206)	(184)	(127)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in.	9-1/4	7-1/4	4-7/8	6-1/4	5-1/4	4-1/8	4-3/4	4-1/8	3-3/8
			(mm)	(235)	(184)	(124)	(159)	(133)	(105)	(121)	(105)	(86)
		$s_{min,2}$	in.	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2
			(mm)	(64)	(64)	(64)	(64)	(64)	(64)	(64)	(64)	(64)
Cracked Concrete	Minimum edge and spacing **Case 1**	$c_{min,1}$	in.	3-5/8	3	2-1/2	2-5/8	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2
			(mm)	(92)	(76)	(64)	(67)	(64)	(64)	(64)	(64)	(64)
		$s_{min,1}$	in.	10-7/8	8-1/2	6	7-3/8	5-1/2	3-1/8	4-1/2	3-1/8	2-1/2
			(mm)	(276)	(216)	(152)	(187)	(140)	(79)	(114)	(79)	(64)
	Minimum edge and spacing **Case 2**	$c_{min,2}$	in.	6-1/2	5	3-1/4	4-1/4	3-1/2	2-3/4	3-1/4	2-3/4	2-1/2
			(mm)	(165)	(127)	(83)	(108)	(89)	(70)	(83)	(70)	(64)
		$s_{min,2}$	in.	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2
			(mm)	(64)	(64)	(64)	(64)	(64)	(64)	(64)	(64)	(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						Concrete thickness factor in shear[4] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
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						Concrete thickness factor in shear[4] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
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 Chapter 17 or CSA A23.3 Annex 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						Concrete thickness factor in shear[4] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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						Concrete thickness factor in shear[4] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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 Chapter 17 or CSA A23.3 Annex 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.

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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						Concrete thickness factor in shear[4] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
Embedment h_{ef}	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	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						Concrete thickness factor in shear[4] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
Embedment h_{ef}	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)
Spacing (s) / Edge Distance (c_a) / Concrete thickness (h), - in. (mm)	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 Chapter 17 or CSA A23.3 Annex 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						Concrete thickness factor in shear[4] f_{HV}		
											⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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						Concrete thickness factor in shear[4] f_{HV}		
											⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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 Chapter 17 or CSA A23.3 Annex 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.

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

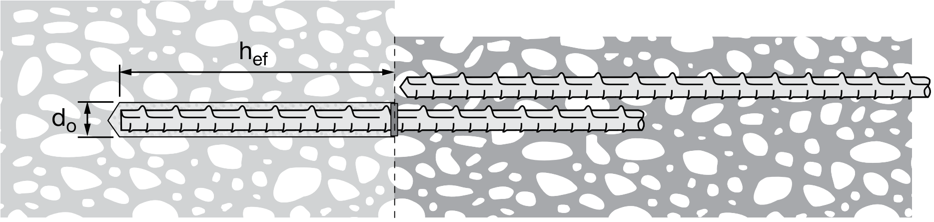

Table 18 - Specifications for rebar installed with HIT-HY 200 adhesive

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
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)							
Minimum edge distance[1]		c_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)	(159)
Minimum anchor spacing		s_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)	(159)

[1] Edge distance of 1-3/4-inch (44mm) is permitted provided the rebar remains un-torqued.

Note: The installation specifications in table 18 above and the data in tables 19 through 37 pertain to the use of Hilti HIT-HY 200 with rebar designed as a post-installed anchor using the provisions of ACI 318-14 Chapter 17. For the use of Hilti HIT-HY 200 with rebar for typical development calculations according to ACI 318-14 Chapter 25 (formerly ACI 318-11 Chapter 12), refer to section 3.1.8.14 for the design method and tables 89 through 93 at the end of this section.

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 [1,2,3,4,5,6,7,8,9]

Rebar size	Effective embedment in. (mm)	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
#3	3-3/8	4,030	4,105	4,225	4,400	8,685	8,845	9,100	9,480
	(86)	(17.9)	(18.3)	(18.8)	(19.6)	(38.6)	(39.3)	(40.5)	(42.2)
	4-1/2	5,375	5,475	5,635	5,865	11,580	11,790	12,135	12,640
	(114)	(23.9)	(24.4)	(25.1)	(26.1)	(51.5)	(52.4)	(54.0)	(56.2)
	7-1/2	8,960	9,125	9,390	9,780	19,295	19,650	20,225	21,065
	(191)	(39.9)	(40.6)	(41.8)	(43.5)	(85.8)	(87.4)	(90.0)	(93.7)
#4	4-1/2	7,170	7,300	7,510	7,825	15,440	15,720	16,180	16,850
	(114)	(31.9)	(32.5)	(33.4)	(34.8)	(68.7)	(69.9)	(72.0)	(75.0)
	6	9,555	9,735	10,015	10,430	20,585	20,960	21,575	22,465
	(152)	(42.5)	(43.3)	(44.5)	(46.4)	(91.6)	(93.2)	(96.0)	(99.9)
	10	15,930	16,220	16,695	17,385	34,305	34,935	35,955	37,445
	(254)	(70.9)	(72.1)	(74.3)	(77.3)	(152.6)	(155.4)	(159.9)	(166.6)
#5	5-5/8	10,405	11,400	11,740	12,225	22,415	24,550	25,280	26,330
	(143)	(46.3)	(50.7)	(52.2)	(54.4)	(99.7)	(109.2)	(112.5)	(117.1)
	7-1/2	14,930	15,205	15,650	16,300	32,160	32,755	33,710	35,105
	(191)	(66.4)	(67.6)	(69.6)	(72.5)	(143.1)	(145.7)	(149.9)	(156.2)
	12-1/2	24,885	25,345	26,085	27,165	53,605	54,590	56,185	58,510
	(318)	(110.7)	(112.7)	(116.0)	(120.8)	(238.4)	(242.8)	(249.9)	(260.3)
#6	6-3/4	13,680	14,985	16,905	17,600	29,460	32,275	36,405	37,915
	(171)	(60.9)	(66.7)	(75.2)	(78.3)	(131.0)	(143.6)	(161.9)	(168.7)
	9	21,060	21,900	22,535	23,470	45,360	47,165	48,540	50,550
	(229)	(93.7)	(97.4)	(100.2)	(104.4)	(201.8)	(209.8)	(215.9)	(224.9)
	15	35,840	36,495	37,560	39,115	77,190	78,610	80,905	84,250
	(381)	(159.4)	(162.3)	(167.1)	(174.0)	(343.4)	(349.7)	(359.9)	(374.8)
#7	7-7/8	17,235	18,885	21,805	23,960	37,125	40,670	46,960	51,605
	(200)	(76.7)	(84.0)	(97.0)	(106.6)	(165.1)	(180.9)	(208.9)	(229.5)
	10-1/2	26,540	29,070	30,675	31,945	57,160	62,615	66,070	68,805
	(267)	(118.1)	(129.3)	(136.4)	(142.1)	(254.3)	(278.5)	(293.9)	(306.1)
	17-1/2	48,780	49,675	51,125	53,240	105,065	106,995	110,120	114,675
	(445)	(217.0)	(221.0)	(227.4)	(236.8)	(467.4)	(475.9)	(489.8)	(510.1)
#8	9	21,060	23,070	26,640	31,295	45,360	49,690	57,375	67,400
	(229)	(93.7)	(102.6)	(118.5)	(139.2)	(201.8)	(221.0)	(255.2)	(299.8)
	12	32,425	35,520	40,065	41,725	69,835	76,500	86,295	89,870
	(305)	(144.2)	(158.0)	(178.2)	(185.6)	(310.6)	(340.3)	(383.9)	(399.8)
	20	63,710	64,885	66,775	69,540	137,225	139,750	143,830	149,780
	(508)	(283.4)	(288.6)	(297.0)	(309.3)	(610.4)	(621.6)	(639.8)	(666.3)
#9	10-1/8	25,130	27,530	31,785	38,930	54,125	59,290	68,465	83,850
	(257)	(111.8)	(122.5)	(141.4)	(173.2)	(240.8)	(263.7)	(304.5)	(373.0)
	13-1/2	38,690	42,380	48,940	52,805	83,330	91,285	105,405	113,740
	(343)	(172.1)	(188.5)	(217.7)	(234.9)	(370.7)	(406.1)	(468.9)	(505.9)
	22-1/2	80,635	82,120	84,515	88,010	173,675	176,870	182,035	189,565
	(572)	(358.7)	(365.3)	(375.9)	(391.5)	(772.5)	(786.8)	(809.7)	(843.2)
#10	11-1/4	29,430	32,240	37,230	45,595	63,395	69,445	80,185	98,205
	(286)	(130.9)	(143.4)	(165.6)	(202.8)	(282.0)	(308.9)	(356.7)	(436.8)
	15	45,315	49,640	57,320	65,195	97,600	106,915	123,455	140,420
	(381)	(201.6)	(220.8)	(255.0)	(290.0)	(434.1)	(475.6)	(549.2)	(624.6)
	25	97,500	101,380	104,340	108,655	210,000	218,360	224,730	234,030
	(635)	(433.7)	(451.0)	(464.1)	(483.3)	(934.1)	(971.3)	(999.6)	(1041.0)

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (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 to the above values. 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 = 130° F (55° C), max. long term temperature = 110° F (43° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 110° F (43° C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above values by 0.78.
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 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

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]

		Tension — ϕN_n				Shear — ϕV_n			
Rebar size	Effective embedment in. (mm)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
#3	3-3/8	2,790	2,845	2,925	3,045	6,010	6,120	6,300	6,560
	(86)	(12.4)	(12.7)	(13.0)	(13.5)	(26.7)	(27.2)	(28.0)	(29.2)
	4-1/2	3,720	3,790	3,900	4,060	8,015	8,165	8,400	8,750
	(114)	(16.5)	(16.9)	(17.3)	(18.1)	(35.7)	(36.3)	(37.4)	(38.9)
	7-1/2	6,205	6,315	6,500	6,770	13,360	13,605	14,005	14,580
	(191)	(27.6)	(28.1)	(28.9)	(30.1)	(59.4)	(60.5)	(62.3)	(64.9)
#4	4-1/2	4,960	5,055	5,200	5,415	10,690	10,885	11,200	11,665
	(114)	(22.1)	(22.5)	(23.1)	(24.1)	(47.6)	(48.4)	(49.8)	(51.9)
	6	6,615	6,740	6,935	7,220	14,250	14,510	14,935	15,555
	(152)	(29.4)	(30.0)	(30.8)	(32.1)	(63.4)	(64.5)	(66.4)	(69.2)
	10	11,025	11,230	11,560	12,035	23,750	24,185	24,895	25,925
	(254)	(49.0)	(50.0)	(51.4)	(53.5)	(105.6)	(107.6)	(110.7)	(115.3)
#5	5-5/8	7,370	7,970	8,200	8,540	15,875	17,165	17,665	18,395
	(143)	(32.8)	(35.5)	(36.5)	(38.0)	(70.6)	(76.4)	(78.6)	(81.8)
	7-1/2	10,435	10,625	10,935	11,390	22,470	22,885	23,555	24,530
	(191)	(46.4)	(47.3)	(48.6)	(50.7)	(100.0)	(101.8)	(104.8)	(109.1)
	12-1/2	17,390	17,710	18,225	18,980	37,455	38,145	39,255	40,880
	(318)	(77.4)	(78.8)	(81.1)	(84.4)	(166.6)	(169.7)	(174.6)	(181.8)
#6	6-3/4	9,690	10,615	11,810	12,300	20,870	22,860	25,440	26,490
	(171)	(43.1)	(47.2)	(52.5)	(54.7)	(92.8)	(101.7)	(113.2)	(117.8)
	9	14,920	15,300	15,745	16,400	32,130	32,955	33,915	35,320
	(229)	(66.4)	(68.1)	(70.0)	(73.0)	(142.9)	(146.6)	(150.9)	(157.1)
	15	25,040	25,500	26,245	27,330	53,935	54,925	56,530	58,870
	(381)	(111.4)	(113.4)	(116.7)	(121.6)	(239.9)	(244.3)	(251.5)	(261.9)
#7	7-7/8	11,750	11,965	12,315	12,825	25,305	25,770	26,525	27,620
	(200)	(52.3)	(53.2)	(54.8)	(57.0)	(112.6)	(114.6)	(118.0)	(122.9)
	10-1/2	15,665	15,955	16,420	17,100	33,740	34,360	35,365	36,830
	(267)	(69.7)	(71.0)	(73.0)	(76.1)	(150.1)	(152.8)	(157.3)	(163.8)
	17-1/2	26,110	26,590	27,365	28,500	56,235	57,270	58,940	61,380
	(445)	(116.1)	(118.3)	(121.7)	(126.8)	(250.1)	(254.7)	(262.2)	(273.0)
#8	9	14,920	15,720	16,180	16,850	32,130	33,860	34,850	36,295
	(229)	(66.4)	(69.9)	(72.0)	(75.0)	(142.9)	(150.6)	(155.0)	(161.4)
	12	20,585	20,960	21,575	22,465	44,335	45,150	46,470	48,390
	(305)	(91.6)	(93.2)	(96.0)	(99.9)	(197.2)	(200.8)	(206.7)	(215.2)
	20	34,305	34,935	35,955	37,445	73,890	75,250	77,445	80,650
	(508)	(152.6)	(155.4)	(159.9)	(166.6)	(328.7)	(334.7)	(344.5)	(358.7)
#9	10-1/8	17,800	19,500	20,720	21,580	38,340	42,000	44,635	46,480
	(257)	(79.2)	(86.7)	(92.2)	(96.0)	(170.5)	(186.8)	(198.5)	(206.8)
	13-1/2	26,360	26,845	27,630	28,775	56,780	57,825	59,510	61,975
	(343)	(117.3)	(119.4)	(122.9)	(128.0)	(252.6)	(257.2)	(264.7)	(275.7)
	22-1/2	43,935	44,745	46,050	47,955	94,630	96,370	99,185	103,290
	(572)	(195.4)	(199.0)	(204.8)	(213.3)	(420.9)	(428.7)	(441.2)	(459.5)
#10	11-1/4	20,850	22,840	25,585	26,640	44,905	49,190	55,105	57,385
	(286)	(92.7)	(101.6)	(113.8)	(118.5)	(199.7)	(218.8)	(245.1)	(255.3)
	15	32,095	33,145	34,110	35,525	69,135	71,385	73,470	76,510
	(381)	(142.8)	(147.4)	(151.7)	(158.0)	(307.5)	(317.5)	(326.8)	(340.3)
	25	54,240	55,240	56,850	59,205	116,830	118,980	122,450	127,515
	(635)	(241.3)	(245.7)	(252.9)	(263.4)	(519.7)	(529.2)	(544.7)	(567.2)

1 See section 3.1.8 for explanation on development of load values.

2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 22 - 37 as necessary to the above values. 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 = 130° F (55° C), max. long term temperature = 110° F (43° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 110° F (43° C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above values by 0.78.
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 by 0.85.

7 Tabular values are for short term loads only. For sustained loads including overhead use, see section 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by the following reduction factors:
#3 to #6 - α_{seis} = 0.60, #7 - α_{seis} = 0.64, #8 - α_{seis} = 0.68, #9 - α_{seis} = 0.71, #10 - α_{seis} = 0.75
See section 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

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

Rebar size	ASTM A615 Grade 40 [4]			ASTM A615 Grade 60 [4]			ASTM A706 Grade 60 [4]		
	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic[5] Shear $\phi V_{sa,eq}$ lb (kN)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic[5] Shear $\phi V_{sa,eq}$ lb (kN)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic[5] Shear $\phi V_{sa,eq}$ lb (kN)
#3	4,290 (19.1)	2,375 (10.6)	1,665 (7.4)	6,435 (28.6)	3,565 (15.9)	2,495 (11.1)	6,600 (29.4)	3,430 (15.3)	2,400 (10.7)
#4	7,800 (34.7)	4,320 (19.2)	3,025 (13.4)	11,700 (52.0)	6,480 (28.8)	4,535 (20.2)	12,000 (53.4)	6,240 (27.8)	4,370 (19.5)
#5	12,090 (53.8)	6,695 (29.8)	4,685 (20.9)	18,135 (80.7)	10,045 (44.7)	7,030 (31.3)	18,600 (82.7)	9,670 (43.0)	6,770 (30.1)
#6	17,160 (76.3)	9,505 (42.3)	6,655 (29.6)	25,740 (114.5)	14,255 (63.4)	9,980 (44.4)	26,400 (117.4)	13,730 (61.1)	9,610 (42.8)
#7	23,400 (104.1)	12,960 (57.6)	9,070 (40.3)	35,100 (156.1)	19,440 (86.5)	13,610 (60.6)	36,000 (160.1)	18,720 (83.3)	13,105 (58.3)
#8	30,810 (137.0)	17,065 (75.9)	11,945 (53.1)	46,215 (205.6)	25,595 (113.9)	17,915 (79.7)	47,400 (210.8)	24,650 (109.6)	17,255 (76.7)
#9	39,000 (173.5)	21,600 (96.1)	15,120 (67.3)	58,500 (260.2)	32,400 (144.1)	22,680 (100.9)	60,000 (266.9)	31,200 (138.8)	21,840 (97.2)
#10	49,530 (220.3)	27,430 (122.0)	19,200 (85.4)	74,295 (330.5)	41,150 (183.0)	28,805 (128.1)	76,200 (339.0)	39,625 (176.3)	27,740 (123.4)

1 See Section 3.1.8.6 to convert design strength value to ASD value.

2 ASTM A706 Grade 60 rebar are considered ductile steel elements. ASTM A615 Grade 40 and 60 rebar are considered brittle steel elements.

3 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17.

4 Shear = $\phi\ 0.60\ A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17.

5 Seismic Shear = $\alpha_{V,seis}\ \phi\ V_{sa}$: Reduction for seismic shear only.

See section 3.1.8.7 for additional information on seismic applications.

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	0.23	0.13	n/a	n/a	n/a	0.08	0.06	0.04	0.17	0.13	0.08	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	0.19	0.14	0.08	n/a	n/a	n/a
	2 (51)	0.60	0.57	0.54	0.33	0.24	0.14	0.54	0.53	0.52	0.10	0.08	0.05	0.21	0.16	0.09	n/a	n/a	n/a
	3 (76)	0.65	0.61	0.57	0.41	0.30	0.17	0.56	0.55	0.53	0.19	0.14	0.09	0.38	0.29	0.17	n/a	n/a	n/a
	4 (102)	0.70	0.65	0.59	0.49	0.36	0.21	0.57	0.56	0.54	0.29	0.22	0.13	0.50	0.41	0.26	n/a	n/a	n/a
	4-5/8 (117)	0.73	0.67	0.60	0.55	0.40	0.23	0.59	0.57	0.55	0.36	0.27	0.16	0.56	0.45	0.33	0.58	n/a	n/a
	5 (127)	0.75	0.69	0.61	0.59	0.43	0.25	0.59	0.58	0.55	0.41	0.31	0.18	0.60	0.47	0.34	0.61	n/a	n/a
	5-3/4 (146)	0.78	0.71	0.63	0.68	0.50	0.29	0.61	0.59	0.56	0.51	0.38	0.23	0.68	0.52	0.36	0.65	0.59	n/a
	6 (152)	0.80	0.72	0.63	0.71	0.52	0.30	0.61	0.59	0.56	0.54	0.40	0.24	0.71	0.53	0.37	0.66	0.60	n/a
	7 (178)	0.85	0.76	0.66	0.83	0.61	0.35	0.63	0.61	0.58	0.68	0.51	0.31	0.83	0.61	0.41	0.72	0.65	n/a
	8 (203)	0.90	0.80	0.68	0.95	0.69	0.40	0.65	0.62	0.59	0.83	0.62	0.37	0.95	0.69	0.44	0.77	0.70	n/a
	8-3/4 (222)	0.93	0.82	0.69	1.00	0.76	0.44	0.66	0.63	0.59	0.95	0.71	0.43	1.00	0.76	0.47	0.80	0.73	0.61
	9 (229)	0.94	0.83	0.70		0.78	0.45	0.67	0.64	0.60	0.99	0.74	0.45		0.78	0.48	0.81	0.74	0.62
	10 (254)	0.99	0.87	0.72		0.86	0.50	0.68	0.65	0.61	1.00	0.87	0.52		0.86	0.51	0.86	0.78	0.66
	11 (279)	1.00	0.91	0.74		0.95	0.55	0.70	0.67	0.62		1.00	0.60		0.95	0.55	0.90	0.82	0.69
	12 (305)		0.94	0.77		1.00	0.60	0.72	0.68	0.63			0.69		1.00	0.60	0.94	0.85	0.72
	14 (356)		1.00	0.81			0.70	0.76	0.71	0.65			0.86			0.70	1.00	0.92	0.78
	16 (406)			0.86			0.80	0.79	0.74	0.67			1.00			0.80		0.99	0.83
	18 (457)			0.90			0.90	0.83	0.77	0.69						0.90		1.00	0.88
	24 (610)			1.00			1.00	0.94	0.86	0.76						1.00			1.00
	30 (762)							1.00	0.96	0.82									
	36 (914)								1.00	0.89									
	> 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	0.13	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	0.07	0.04	0.19	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	0.21	0.16	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	0.39	0.29	0.18	n/a	n/a	n/a
	4 (102)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.56	0.54	0.30	0.23	0.14	0.61	0.45	0.27	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	0.38	0.28	0.17	0.75	0.56	0.34	0.59	n/a	n/a
	5 (127)	0.75	0.69	0.61	0.99	0.80	0.60	0.59	0.58	0.56	0.42	0.32	0.19	0.85	0.63	0.38	0.61	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	0.52	0.39	0.23	1.00	0.78	0.47	0.66	0.60	n/a
	6 (152)	0.80	0.72	0.63		0.91	0.66	0.61	0.59	0.57	0.56	0.42	0.25		0.83	0.50	0.67	0.61	n/a
	7 (178)	0.85	0.76	0.66		1.00	0.72	0.63	0.61	0.58	0.70	0.53	0.32		1.00	0.63	0.73	0.66	n/a
	8 (203)	0.90	0.80	0.68			0.78	0.65	0.62	0.59	0.86	0.64	0.39			0.77	0.78	0.70	n/a
	8-3/4 (222)	0.93	0.82	0.69			0.83	0.66	0.64	0.60	0.98	0.73	0.44			0.83	0.81	0.74	0.62
	9 (229)	0.94	0.83	0.70			0.85	0.67	0.64	0.60	1.00	0.77	0.46			0.85	0.82	0.75	0.63
	10 (254)	0.99	0.87	0.72			0.91	0.69	0.66	0.61		0.90	0.54			0.91	0.87	0.79	0.66
	11 (279)	1.00	0.91	0.74			0.98	0.71	0.67	0.62		1.00	0.62			0.98	0.91	0.83	0.70
	12 (305)		0.94	0.77			1.00	0.73	0.69	0.63			0.71			1.00	0.95	0.86	0.73
	14 (356)		1.00	0.81				0.76	0.72	0.65			0.89				1.00	0.93	0.79
	16 (406)			0.86				0.80	0.75	0.68			1.00					1.00	0.84
	18 (457)			0.90				0.84	0.78	0.70									0.89
	24 (610)			1.00				0.95	0.87	0.76									1.00
	30 (762)							1.00	0.97	0.83									
	36 (914)								1.00	0.90									
	> 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 318-14 Chapter 17.

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						Concrete thickness factor in shear[5] f_{HV}		
											⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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	0.06	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	0.19	0.14	0.08	n/a	n/a	n/a
	3 (76)	0.61	0.58	0.55	0.34	0.25	0.14	0.54	0.53	0.52	0.12	0.09	0.06	0.25	0.19	0.11	n/a	n/a	n/a
	4 (102)	0.65	0.61	0.57	0.39	0.29	0.17	0.56	0.55	0.53	0.19	0.14	0.09	0.38	0.29	0.17	n/a	n/a	n/a
	5 (127)	0.69	0.64	0.58	0.46	0.33	0.20	0.57	0.56	0.54	0.27	0.20	0.12	0.47	0.38	0.24	n/a	n/a	n/a
	5-3/4 (146)	0.71	0.66	0.60	0.51	0.37	0.22	0.58	0.57	0.55	0.33	0.25	0.15	0.52	0.42	0.30	0.56	n/a	n/a
	6 (152)	0.72	0.67	0.60	0.52	0.38	0.22	0.58	0.57	0.55	0.35	0.26	0.16	0.53	0.43	0.31	0.58	n/a	n/a
	7 (178)	0.76	0.69	0.62	0.61	0.44	0.26	0.60	0.58	0.56	0.44	0.33	0.20	0.61	0.47	0.34	0.62	n/a	n/a
	7-1/4 (184)	0.77	0.70	0.62	0.63	0.46	0.27	0.60	0.58	0.56	0.46	0.35	0.21	0.63	0.49	0.35	0.63	0.57	n/a
	8 (203)	0.80	0.72	0.63	0.69	0.51	0.30	0.61	0.59	0.56	0.54	0.40	0.24	0.69	0.52	0.37	0.66	0.60	n/a
	9 (229)	0.83	0.75	0.65	0.78	0.57	0.33	0.62	0.60	0.57	0.64	0.48	0.29	0.78	0.57	0.39	0.70	0.64	n/a
	10 (254)	0.87	0.78	0.67	0.86	0.63	0.37	0.64	0.61	0.58	0.75	0.56	0.34	0.86	0.63	0.42	0.74	0.67	n/a
	11-1/4 (286)	0.92	0.81	0.69	0.97	0.71	0.42	0.66	0.63	0.59	0.90	0.67	0.40	0.97	0.71	0.45	0.79	0.72	0.60
	12 (305)	0.94	0.83	0.70	1.00	0.76	0.45	0.67	0.64	0.60	0.99	0.74	0.45	1.00	0.76	0.47	0.81	0.74	0.62
	14 (356)	1.00	0.89	0.73		0.89	0.52	0.69	0.66	0.61	1.00	0.94	0.56		0.89	0.53	0.88	0.80	0.67
	16 (406)		0.94	0.77		1.00	0.59	0.72	0.68	0.63		1.00	0.69		1.00	0.59	0.94	0.85	0.72
	18 (457)		1.00	0.80			0.67	0.75	0.70	0.65			0.82			0.67	1.00	0.91	0.76
	20 (508)			0.83			0.74	0.78	0.73	0.66			0.96			0.74		0.95	0.81
	22 (559)			0.87			0.82	0.80	0.75	0.68			1.00			0.82		1.00	0.84
	24 (610)			0.90			0.89	0.83	0.77	0.69						0.89			0.88
	30 (762)			1.00			1.00	0.91	0.84	0.74						1.00			0.99
	36 (914)							1.00	0.91	0.79									1.00
	>48 (1219)								1.00	0.89									

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						Concrete thickness factor in shear[5] f_{HV}		
											⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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	0.11	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	0.19	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	0.53	0.52	0.13	0.10	0.06	0.26	0.19	0.11	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	0.39	0.29	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	0.27	0.21	0.12	0.55	0.41	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	0.34	0.25	0.15	0.68	0.51	0.30	0.57	n/a	n/a
	6 (152)	0.72	0.67	0.60	0.91	0.75	0.57	0.58	0.57	0.55	0.36	0.27	0.16	0.72	0.54	0.32	0.58	n/a	n/a
	7 (178)	0.76	0.69	0.62	1.00	0.83	0.62	0.60	0.58	0.56	0.46	0.34	0.20	0.91	0.68	0.41	0.63	n/a	n/a
	7-1/4 (184)	0.77	0.70	0.62		0.85	0.63	0.60	0.58	0.56	0.48	0.36	0.22	0.96	0.72	0.43	0.64	0.58	n/a
	8 (203)	0.80	0.72	0.63		0.91	0.66	0.61	0.59	0.57	0.56	0.42	0.25	1.00	0.83	0.50	0.67	0.61	n/a
	9 (229)	0.83	0.75	0.65		1.00	0.70	0.63	0.60	0.57	0.66	0.50	0.30		1.00	0.60	0.71	0.65	n/a
	10 (254)	0.87	0.78	0.67			0.75	0.64	0.62	0.58	0.78	0.58	0.35			0.70	0.75	0.68	n/a
	11-1/4 (286)	0.92	0.81	0.69			0.81	0.66	0.63	0.59	0.93	0.70	0.42			0.81	0.80	0.72	0.61
	12 (305)	0.94	0.83	0.70			0.85	0.67	0.64	0.60	1.00	0.77	0.46			0.85	0.82	0.75	0.63
	14 (356)	1.00	0.89	0.73			0.95	0.70	0.66	0.62		0.97	0.58			0.95	0.89	0.81	0.68
	16 (406)		0.94	0.77			1.00	0.73	0.69	0.63		1.00	0.71			1.00	0.95	0.86	0.73
	18 (457)		1.00	0.80				0.75	0.71	0.65			0.84				1.00	0.91	0.77
	20 (508)			0.83				0.78	0.73	0.67			0.99					0.96	0.81
	22 (559)			0.87				0.81	0.76	0.68			1.00					1.00	0.85
	24 (610)			0.90				0.84	0.78	0.70									0.89
	30 (762)			1.00				0.92	0.85	0.75									1.00
	36 (914)							1.00	0.92	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 318-14 Chapter 17.

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 $f_{HV} = 1.0$.

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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
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	0.04	n/a	n/a	n/a
	3-1/8	(79)	0.59	0.57	0.54	0.31	0.23	0.13	0.54	0.53	0.52	0.10	0.07	0.04	0.20	0.14	0.08	n/a	n/a	n/a
	4	(102)	0.62	0.59	0.55	0.35	0.25	0.15	0.55	0.54	0.53	0.15	0.10	0.06	0.29	0.20	0.12	n/a	n/a	n/a
	5	(127)	0.65	0.61	0.57	0.39	0.29	0.17	0.56	0.55	0.53	0.21	0.14	0.09	0.41	0.29	0.17	n/a	n/a	n/a
	6	(152)	0.68	0.63	0.58	0.44	0.32	0.19	0.57	0.55	0.54	0.27	0.19	0.11	0.45	0.38	0.23	n/a	n/a	n/a
	7	(178)	0.71	0.66	0.59	0.49	0.36	0.21	0.58	0.56	0.55	0.34	0.24	0.14	0.50	0.41	0.28	n/a	n/a	n/a
	7-1/8	(181)	0.71	0.66	0.60	0.50	0.37	0.22	0.58	0.56	0.55	0.35	0.24	0.15	0.51	0.41	0.29	0.57	n/a	n/a
	8	(203)	0.74	0.68	0.61	0.55	0.40	0.24	0.59	0.57	0.55	0.41	0.29	0.17	0.56	0.44	0.33	0.61	n/a	n/a
	9	(229)	0.77	0.70	0.62	0.62	0.46	0.27	0.60	0.58	0.56	0.50	0.35	0.21	0.62	0.48	0.35	0.65	0.57	n/a
	10	(254)	0.80	0.72	0.63	0.69	0.51	0.30	0.62	0.59	0.56	0.58	0.40	0.24	0.69	0.52	0.37	0.68	0.60	n/a
	11	(279)	0.83	0.74	0.65	0.76	0.56	0.33	0.63	0.60	0.57	0.67	0.47	0.28	0.76	0.56	0.39	0.71	0.63	n/a
	12	(305)	0.86	0.77	0.66	0.83	0.61	0.36	0.64	0.61	0.58	0.76	0.53	0.32	0.83	0.61	0.41	0.75	0.66	n/a
	14	(356)	0.91	0.81	0.69	0.96	0.71	0.41	0.66	0.63	0.59	0.96	0.67	0.40	0.96	0.71	0.45	0.81	0.71	0.60
	16	(406)	0.97	0.86	0.71	1.00	0.81	0.47	0.69	0.65	0.60	1.00	0.82	0.49	1.00	0.81	0.49	0.86	0.76	0.64
	18	(457)	1.00	0.90	0.74		0.91	0.53	0.71	0.66	0.62		0.98	0.59		0.91	0.54	0.91	0.81	0.68
	20	(508)		0.94	0.77		1.00	0.59	0.73	0.68	0.63		1.00	0.69		1.00	0.59	0.96	0.85	0.72
	22	(559)		0.99	0.79			0.65	0.75	0.70	0.64			0.79			0.65	1.00	0.90	0.76
	24	(610)		1.00	0.82			0.71	0.78	0.72	0.66			0.90			0.71		0.94	0.79
	26	(660)			0.85			0.77	0.80	0.74	0.67			1.00			0.77		0.97	0.82
	28	(711)			0.87			0.83	0.82	0.76	0.68						0.83		1.00	0.85
	30	(762)			0.90			0.89	0.85	0.77	0.69						0.89			0.88
	36	(914)			0.98			1.00	0.92	0.83	0.73						1.00			0.97
	> 48	(1219)			1.00				1.00	0.94	0.81									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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
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	0.14	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	0.10	0.06	0.30	0.21	0.13	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	0.29	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	0.19	0.12	0.54	0.38	0.23	n/a	n/a	n/a
	7	(178)	0.71	0.66	0.59	0.87	0.72	0.56	0.58	0.56	0.55	0.34	0.24	0.15	0.68	0.48	0.29	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	0.25	0.15	0.70	0.50	0.30	0.58	n/a	n/a
	8	(203)	0.74	0.68	0.61	0.96	0.78	0.59	0.59	0.57	0.55	0.42	0.30	0.18	0.84	0.59	0.35	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	0.35	0.21	1.00	0.71	0.42	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	0.41	0.25		0.83	0.50	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	0.48	0.29		0.95	0.57	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	0.54	0.33		1.00	0.65	0.75	0.67	n/a
	14	(356)	0.91	0.81	0.69			0.81	0.66	0.63	0.59	0.97	0.68	0.41			0.81	0.81	0.72	0.61
	16	(406)	0.97	0.86	0.71			0.89	0.69	0.65	0.61	1.00	0.84	0.50			0.89	0.86	0.77	0.65
	18	(457)	1.00	0.90	0.74			0.97	0.71	0.67	0.62		1.00	0.60			0.97	0.92	0.82	0.69
	20	(508)		0.94	0.77			1.00	0.73	0.68	0.63			0.70			1.00	0.97	0.86	0.73
	22	(559)		0.99	0.79				0.76	0.70	0.64			0.81				1.00	0.90	0.76
	24	(610)		1.00	0.82				0.78	0.72	0.66			0.92					0.94	0.79
	26	(660)			0.85				0.80	0.74	0.67			1.00					0.98	0.83
	28	(711)			0.87				0.83	0.76	0.68								1.00	0.86
	30	(762)			0.90				0.85	0.78	0.70									0.89
	36	(914)			0.98				0.92	0.83	0.74									0.97
	> 48	(1219)			1.00				1.00	0.94	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 318-14 Chapter 17.

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 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.	(mm)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	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	0.03	n/a	n/a	n/a
	3-3/4	(95)	0.59	0.57	0.54	0.31	0.23	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	0.32	0.23	0.14	0.54	0.53	0.52	0.12	0.08	0.05	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	0.13	n/a	n/a	n/a
	6	(152)	0.65	0.61	0.57	0.39	0.29	0.17	0.56	0.55	0.53	0.22	0.14	0.08	0.41	0.29	0.17	n/a	n/a	n/a
	7	(178)	0.67	0.63	0.58	0.43	0.32	0.19	0.57	0.55	0.54	0.28	0.18	0.11	0.45	0.36	0.21	n/a	n/a	n/a
	8	(203)	0.70	0.65	0.59	0.48	0.35	0.20	0.58	0.56	0.54	0.34	0.22	0.13	0.49	0.40	0.26	n/a	n/a	n/a
	8-1/2	(216)	0.71	0.66	0.59	0.50	0.37	0.21	0.59	0.56	0.55	0.37	0.24	0.14	0.51	0.41	0.28	0.59	n/a	n/a
	9	(229)	0.72	0.67	0.60	0.52	0.38	0.22	0.59	0.57	0.55	0.40	0.26	0.15	0.53	0.43	0.31	0.60	n/a	n/a
	10	(254)	0.75	0.69	0.61	0.57	0.42	0.25	0.60	0.58	0.55	0.47	0.31	0.18	0.57	0.46	0.33	0.64	n/a	n/a
	10-3/4	(273)	0.77	0.70	0.62	0.62	0.45	0.27	0.61	0.58	0.56	0.53	0.34	0.20	0.62	0.48	0.35	0.66	0.57	n/a
	12	(305)	0.80	0.72	0.63	0.69	0.51	0.30	0.62	0.59	0.56	0.62	0.40	0.24	0.69	0.52	0.37	0.70	0.60	n/a
	14	(356)	0.85	0.76	0.66	0.80	0.59	0.35	0.64	0.61	0.57	0.78	0.51	0.30	0.80	0.59	0.40	0.75	0.65	n/a
	16	(406)	0.90	0.80	0.68	0.92	0.67	0.39	0.66	0.62	0.59	0.96	0.62	0.37	0.92	0.67	0.43	0.80	0.70	n/a
	16-3/4	(425)	0.91	0.81	0.69	0.96	0.71	0.41	0.67	0.63	0.59	1.00	0.67	0.39	0.96	0.71	0.45	0.82	0.71	0.60
	18	(457)	0.94	0.83	0.70	1.00	0.76	0.44	0.68	0.64	0.60		0.74	0.44	1.00	0.76	0.47	0.85	0.74	0.62
	20	(508)	0.99	0.87	0.72		0.84	0.49	0.70	0.65	0.61		0.87	0.51		0.84	0.51	0.90	0.78	0.65
	22	(559)	1.00	0.91	0.74		0.93	0.54	0.72	0.67	0.62		1.00	0.59		0.93	0.55	0.94	0.82	0.68
	24	(610)		0.94	0.77		1.00	0.59	0.74	0.68	0.63			0.67		1.00	0.59	0.99	0.85	0.72
	26	(660)		0.98	0.79			0.64	0.76	0.70	0.64			0.76			0.64	1.00	0.89	0.74
	28	(711)		1.00	0.81			0.69	0.78	0.71	0.65			0.85			0.69		0.92	0.77
	30	(762)			0.83			0.74	0.80	0.73	0.66			0.94			0.74		0.95	0.80
	36	(914)			0.90			0.89	0.86	0.77	0.69			1.00			0.89		1.00	0.88
	> 48	(1219)			1.00			1.00	0.99	0.86	0.76						1.00			1.00

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.	(mm)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)	6-3/4 (171)	9 (229)	15 (381)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	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	0.14	0.08	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	0.09	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
	6	(152)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.53	0.22	0.14	0.09	0.44	0.29	0.17	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	0.18	0.11	0.56	0.36	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	0.22	0.13	0.68	0.44	0.26	n/a	n/a	n/a
	8-1/2	(216)	0.71	0.66	0.59	0.88	0.72	0.56	0.59	0.56	0.55	0.37	0.24	0.14	0.75	0.49	0.29	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	0.26	0.16	0.82	0.53	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	0.31	0.18	0.95	0.62	0.37	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	0.69	0.41	0.66	0.57	n/a
	12	(305)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.56	0.63	0.41	0.24		0.82	0.49	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	0.51	0.31		1.00	0.61	0.76	0.65	n/a
	16	(406)	0.90	0.80	0.68			0.78	0.66	0.62	0.59	0.97	0.63	0.37			0.75	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	0.67	0.40			0.80	0.83	0.72	0.60
	18	(457)	0.94	0.83	0.70			0.85	0.68	0.64	0.60		0.75	0.45			0.85	0.86	0.74	0.62
	20	(508)	0.99	0.87	0.72			0.91	0.70	0.65	0.61		0.88	0.52			0.91	0.90	0.78	0.66
	22	(559)	1.00	0.91	0.74			0.98	0.72	0.67	0.62		1.00	0.60			0.98	0.95	0.82	0.69
	24	(610)		0.94	0.77			1.00	0.74	0.68	0.63			0.69			1.00	0.99	0.86	0.72
	26	(660)		0.98	0.79				0.76	0.70	0.64			0.77				1.00	0.89	0.75
	28	(711)		1.00	0.81				0.79	0.71	0.65			0.87					0.92	0.78
	30	(762)			0.83				0.81	0.73	0.66			0.96					0.96	0.81
	36	(914)			0.90				0.87	0.77	0.69			1.00					1.00	0.88
	> 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 318-14 Chapter 17.

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.

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	0.31	0.23	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
	5	(127)	0.61	0.58	0.55	0.33	0.24	0.14	0.54	0.53	0.52	0.13	0.09	0.05	0.27	0.17	0.09	n/a	n/a	n/a
	6	(152)	0.63	0.60	0.56	0.36	0.26	0.15	0.55	0.54	0.53	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	0.29	0.17	0.56	0.55	0.53	0.22	0.14	0.08	0.40	0.29	0.16	n/a	n/a	n/a
	8	(203)	0.67	0.63	0.58	0.43	0.31	0.18	0.57	0.55	0.53	0.27	0.17	0.09	0.44	0.35	0.19	n/a	n/a	n/a
	9	(229)	0.69	0.64	0.59	0.46	0.34	0.20	0.58	0.56	0.54	0.32	0.21	0.11	0.47	0.39	0.23	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	0.13	0.51	0.41	0.26	0.59	n/a	n/a
	10	(254)	0.71	0.66	0.60	0.50	0.37	0.22	0.59	0.57	0.54	0.38	0.24	0.13	0.51	0.41	0.27	0.59	n/a	n/a
	11	(279)	0.73	0.67	0.60	0.54	0.40	0.23	0.60	0.57	0.55	0.43	0.28	0.15	0.55	0.44	0.31	0.62	n/a	n/a
	12	(305)	0.75	0.69	0.61	0.59	0.43	0.25	0.60	0.58	0.55	0.49	0.32	0.17	0.59	0.46	0.34	0.65	n/a	n/a
	12-1/2	(318)	0.76	0.70	0.62	0.61	0.45	0.26	0.61	0.58	0.55	0.52	0.34	0.19	0.61	0.48	0.35	0.66	0.57	n/a
	14	(356)	0.80	0.72	0.63	0.69	0.50	0.30	0.62	0.59	0.56	0.62	0.40	0.22	0.69	0.52	0.37	0.70	0.60	n/a
	16	(406)	0.84	0.75	0.65	0.78	0.58	0.34	0.64	0.60	0.57	0.76	0.49	0.27	0.78	0.58	0.39	0.75	0.65	n/a
	18	(457)	0.88	0.79	0.67	0.88	0.65	0.38	0.66	0.62	0.58	0.91	0.59	0.32	0.88	0.65	0.42	0.79	0.68	n/a
	19-1/2	(495)	0.91	0.81	0.69	0.96	0.70	0.41	0.67	0.63	0.58	1.00	0.66	0.36	0.96	0.70	0.45	0.82	0.71	0.58
	20	(508)	0.92	0.82	0.69	0.98	0.72	0.42	0.67	0.63	0.59		0.69	0.38	0.98	0.72	0.45	0.83	0.72	0.59
	22	(559)	0.97	0.85	0.71	1.00	0.79	0.46	0.69	0.64	0.60		0.80	0.43	1.00	0.79	0.48	0.87	0.76	0.62
	24	(610)	1.00	0.88	0.73		0.87	0.51	0.71	0.66	0.60		0.91	0.49		0.87	0.52	0.91	0.79	0.65
	26	(660)		0.91	0.75		0.94	0.55	0.73	0.67	0.61		1.00	0.56		0.94	0.55	0.95	0.82	0.67
	28	(711)		0.94	0.77		1.00	0.59	0.74	0.68	0.62			0.62		1.00	0.59	0.99	0.85	0.70
	30	(762)		0.98	0.79			0.63	0.76	0.70	0.63			0.69			0.63	1.00	0.88	0.72
	36	(914)		1.00	0.84			0.76	0.81	0.73	0.66			0.91			0.76		0.97	0.79
	> 48	(1219)			0.96			1.00	0.92	0.81	0.71			1.00			1.00		1.00	0.91

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	0.03	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	0.09	0.05	0.23	0.17	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	0.14	0.10	0.06	0.28	0.21	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	0.14	0.08	0.37	0.27	0.16	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	0.23	0.17	0.10	0.46	0.35	0.21	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	0.28	0.21	0.13	0.56	0.42	0.25	n/a	n/a	n/a
	9	(229)	0.69	0.64	0.59	0.82	0.68	0.54	0.58	0.57	0.55	0.34	0.25	0.15	0.67	0.50	0.30	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	0.39	0.29	0.17	0.77	0.58	0.35	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	0.39	0.30	0.18	0.79	0.59	0.35	0.60	n/a	n/a
	11	(279)	0.73	0.67	0.60	0.95	0.77	0.59	0.60	0.58	0.56	0.45	0.34	0.20	0.91	0.68	0.41	0.63	n/a	n/a
	12	(305)	0.75	0.69	0.61	1.00	0.82	0.61	0.61	0.59	0.56	0.52	0.39	0.23	1.00	0.78	0.47	0.66	n/a	n/a
	12-1/2	(318)	0.76	0.70	0.62		0.84	0.62	0.61	0.59	0.57	0.55	0.41	0.25		0.83	0.50	0.67	0.61	n/a
	14	(356)	0.80	0.72	0.63		0.91	0.66	0.63	0.60	0.57	0.65	0.49	0.29		0.91	0.59	0.71	0.64	n/a
	16	(406)	0.84	0.75	0.65		1.00	0.71	0.64	0.62	0.58	0.80	0.60	0.36		1.00	0.71	0.76	0.69	n/a
	18	(457)	0.88	0.79	0.67			0.76	0.66	0.63	0.59	0.95	0.71	0.43			0.76	0.80	0.73	n/a
	19-1/2	(495)	0.91	0.81	0.69			0.80	0.67	0.64	0.60	1.00	0.80	0.48			0.80	0.84	0.76	0.64
	20	(508)	0.92	0.82	0.69			0.82	0.68	0.65	0.61		0.84	0.50			0.82	0.85	0.77	0.65
	22	(559)	0.97	0.85	0.71			0.87	0.70	0.66	0.62		0.96	0.58			0.87	0.89	0.81	0.68
	24	(610)	1.00	0.88	0.73			0.93	0.71	0.68	0.63		1.00	0.66			0.93	0.93	0.84	0.71
	26	(660)		0.91	0.75			0.99	0.73	0.69	0.64			0.74			0.99	0.96	0.88	0.74
	28	(711)		0.94	0.77			1.00	0.75	0.71	0.65			0.83			1.00	1.00	0.91	0.77
	30	(762)		0.98	0.79				0.77	0.72	0.66			0.92				1.00	0.94	0.79
	36	(914)		1.00	0.84				0.82	0.77	0.69			1.00					1.00	0.87
	> 48	(1219)			0.96				0.93	0.85	0.75									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 318-14 Chapter 17.

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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
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	0.31	0.23	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
	6	(152)	0.61	0.58	0.55	0.33	0.25	0.14	0.55	0.53	0.52	0.14	0.09	0.05	0.29	0.19	0.09	n/a	n/a	n/a
	7	(178)	0.63	0.60	0.56	0.36	0.27	0.16	0.55	0.54	0.53	0.18	0.12	0.06	0.36	0.23	0.12	n/a	n/a	n/a
	8	(203)	0.65	0.61	0.57	0.39	0.29	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.40	0.29	0.15	n/a	n/a	n/a
	9	(229)	0.67	0.63	0.58	0.42	0.31	0.18	0.57	0.55	0.53	0.26	0.17	0.09	0.43	0.34	0.17	n/a	n/a	n/a
	10	(254)	0.69	0.64	0.58	0.45	0.33	0.20	0.58	0.56	0.54	0.31	0.20	0.10	0.46	0.38	0.20	n/a	n/a	n/a
	11	(279)	0.70	0.65	0.59	0.48	0.36	0.21	0.58	0.56	0.54	0.35	0.23	0.12	0.50	0.40	0.23	n/a	n/a	n/a
	11-1/4	(286)	0.71	0.66	0.59	0.49	0.36	0.21	0.59	0.56	0.54	0.37	0.24	0.12	0.50	0.41	0.24	0.58	n/a	n/a
	12	(305)	0.72	0.67	0.60	0.52	0.38	0.22	0.59	0.57	0.54	0.40	0.26	0.13	0.53	0.43	0.27	0.60	n/a	n/a
	13	(330)	0.74	0.68	0.61	0.56	0.41	0.24	0.60	0.57	0.55	0.46	0.30	0.15	0.56	0.45	0.30	0.63	n/a	n/a
	14	(356)	0.76	0.69	0.62	0.60	0.44	0.26	0.61	0.58	0.55	0.51	0.33	0.17	0.60	0.47	0.34	0.65	n/a	n/a
	14-1/4	(362)	0.76	0.70	0.62	0.61	0.45	0.26	0.61	0.58	0.55	0.52	0.34	0.17	0.61	0.48	0.34	0.66	0.57	n/a
	16	(406)	0.80	0.72	0.63	0.69	0.50	0.30	0.62	0.59	0.56	0.62	0.40	0.21	0.69	0.52	0.37	0.70	0.60	n/a
	18	(457)	0.83	0.75	0.65	0.77	0.57	0.33	0.64	0.60	0.57	0.74	0.48	0.25	0.77	0.57	0.39	0.74	0.64	n/a
	20	(508)	0.87	0.78	0.67	0.86	0.63	0.37	0.65	0.61	0.57	0.87	0.56	0.29	0.86	0.63	0.42	0.78	0.67	n/a
	22	(559)	0.91	0.81	0.68	0.94	0.69	0.41	0.67	0.63	0.58	1.00	0.65	0.33	0.94	0.69	0.44	0.82	0.71	n/a
	22-1/4	(565)	0.91	0.81	0.69	0.95	0.70	0.41	0.67	0.63	0.58		0.66	0.34	0.95	0.70	0.45	0.82	0.71	0.57
	24	(610)	0.94	0.83	0.70	1.00	0.76	0.44	0.68	0.64	0.59		0.74	0.38	1.00	0.76	0.47	0.85	0.74	0.59
	26	(660)	0.98	0.86	0.72		0.82	0.48	0.70	0.65	0.59		0.84	0.43		0.82	0.50	0.89	0.77	0.61
	28	(711)	1.00	0.89	0.73		0.88	0.52	0.71	0.66	0.60		0.94	0.48		0.88	0.53	0.92	0.80	0.64
	30	(762)		0.92	0.75		0.95	0.55	0.73	0.67	0.61		1.00	0.53		0.95	0.55	0.95	0.83	0.66
	36	(914)		1.00	0.80		1.00	0.67	0.77	0.70	0.63			0.69		1.00	0.67	1.00	0.91	0.72
	> 48	(1219)			0.90			0.89	0.86	0.77	0.67			1.00			0.89		1.00	0.83

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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
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	0.08	0.05	0.22	0.16	0.10	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	0.21	0.13	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	0.13	0.08	0.36	0.26	0.16	n/a	n/a	n/a
	8	(203)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.54	0.22	0.16	0.10	0.44	0.32	0.19	n/a	n/a	n/a
	9	(229)	0.67	0.63	0.58	0.75	0.64	0.51	0.57	0.56	0.54	0.26	0.19	0.12	0.53	0.38	0.23	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	0.22	0.13	0.62	0.45	0.27	n/a	n/a	n/a
	11	(279)	0.70	0.65	0.59	0.86	0.71	0.55	0.58	0.57	0.55	0.36	0.26	0.16	0.72	0.52	0.31	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	0.27	0.16	0.74	0.54	0.32	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	0.30	0.18	0.82	0.59	0.35	0.61	n/a	n/a
	13	(330)	0.74	0.68	0.61	0.97	0.79	0.59	0.60	0.58	0.56	0.46	0.33	0.20	0.92	0.67	0.40	0.63	n/a	n/a
	14	(356)	0.76	0.69	0.62	1.00	0.83	0.62	0.61	0.59	0.56	0.51	0.37	0.22	1.00	0.74	0.45	0.65	n/a	n/a
	14-1/4	(362)	0.76	0.70	0.62		0.84	0.62	0.61	0.59	0.56	0.53	0.38	0.23		0.76	0.46	0.66	0.59	n/a
	16	(406)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.45	0.27		0.91	0.55	0.70	0.63	n/a
	18	(457)	0.83	0.75	0.65		1.00	0.70	0.64	0.61	0.58	0.75	0.54	0.33		1.00	0.65	0.74	0.67	n/a
	20	(508)	0.87	0.78	0.67			0.75	0.65	0.62	0.59	0.88	0.64	0.38			0.75	0.78	0.70	n/a
	22	(559)	0.91	0.81	0.68			0.80	0.67	0.64	0.60	1.00	0.73	0.44			0.80	0.82	0.74	n/a
	22-1/4	(565)	0.91	0.81	0.69			0.80	0.67	0.64	0.60		0.75	0.45			0.80	0.82	0.74	0.62
	24	(610)	0.94	0.83	0.70			0.85	0.68	0.65	0.61		0.84	0.50			0.85	0.86	0.77	0.65
	26	(660)	0.98	0.86	0.72			0.90	0.70	0.66	0.61		0.94	0.57			0.90	0.89	0.80	0.68
	28	(711)	1.00	0.89	0.73			0.95	0.71	0.67	0.62		1.00	0.63			0.95	0.92	0.83	0.70
	30	(762)		0.92	0.75			1.00	0.73	0.68	0.63			0.70			1.00	0.96	0.86	0.73
	36	(914)		1.00	0.80				0.77	0.72	0.66			0.92				1.00	0.94	0.79
	> 48	(1219)			0.90				0.87	0.80	0.71			1.00					1.00	0.92

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 318-14 Chapter 17.

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[1,2,3]

#9 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 ǁ To edge f_{RV}			Concrete thickness factor in shear[5] 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	0.23	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	0.32	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
	8	(203)	0.63	0.60	0.56	0.37	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	0.40	0.29	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.41	0.29	0.14	n/a	n/a	n/a
	10	(254)	0.66	0.62	0.57	0.42	0.31	0.18	0.57	0.55	0.53	0.26	0.17	0.08	0.44	0.33	0.16	n/a	n/a	n/a
	11	(279)	0.68	0.64	0.58	0.45	0.33	0.19	0.57	0.56	0.53	0.30	0.19	0.09	0.46	0.38	0.19	n/a	n/a	n/a
	12	(305)	0.70	0.65	0.59	0.48	0.35	0.20	0.58	0.56	0.54	0.34	0.22	0.11	0.49	0.40	0.21	n/a	n/a	n/a
	12-7/8	(327)	0.71	0.66	0.60	0.51	0.37	0.22	0.59	0.57	0.54	0.38	0.24	0.12	0.52	0.42	0.23	0.59	n/a	n/a
	13	(330)	0.71	0.66	0.60	0.51	0.37	0.22	0.59	0.57	0.54	0.38	0.25	0.12	0.52	0.42	0.24	0.59	n/a	n/a
	14	(356)	0.73	0.67	0.60	0.54	0.39	0.23	0.59	0.57	0.54	0.43	0.28	0.13	0.55	0.44	0.27	0.61	n/a	n/a
	16	(406)	0.76	0.70	0.62	0.62	0.45	0.26	0.61	0.58	0.55	0.52	0.34	0.16	0.62	0.48	0.33	0.66	n/a	n/a
	16-1/4	(413)	0.77	0.70	0.62	0.63	0.46	0.27	0.61	0.58	0.55	0.53	0.35	0.17	0.63	0.48	0.33	0.66	0.57	n/a
	18	(457)	0.80	0.72	0.63	0.69	0.51	0.30	0.62	0.59	0.56	0.62	0.40	0.19	0.69	0.52	0.37	0.70	0.60	n/a
	20	(508)	0.83	0.75	0.65	0.77	0.56	0.33	0.63	0.60	0.56	0.73	0.47	0.23	0.77	0.56	0.39	0.73	0.64	n/a
	22	(559)	0.86	0.77	0.66	0.85	0.62	0.36	0.65	0.61	0.57	0.84	0.55	0.26	0.85	0.62	0.41	0.77	0.67	n/a
	24	(610)	0.90	0.80	0.68	0.93	0.68	0.40	0.66	0.62	0.57	0.96	0.62	0.30	0.93	0.68	0.43	0.80	0.70	n/a
	25-1/4	(641)	0.92	0.81	0.69	0.97	0.71	0.42	0.67	0.63	0.58	1.00	0.67	0.32	0.97	0.71	0.45	0.83	0.71	0.56
	26	(660)	0.93	0.82	0.69	1.00	0.73	0.43	0.68	0.63	0.58		0.70	0.34	1.00	0.73	0.46	0.84	0.73	0.57
	28	(711)	0.96	0.85	0.71		0.79	0.46	0.69	0.64	0.59		0.78	0.38		0.79	0.48	0.87	0.75	0.59
	30	(762)	0.99	0.87	0.72		0.84	0.49	0.70	0.65	0.59		0.87	0.42		0.84	0.51	0.90	0.78	0.61
	36	(914)	1.00	0.94	0.77		1.00	0.59	0.74	0.68	0.61		1.00	0.55		1.00	0.59	0.99	0.85	0.67
	> 48	(1219)		1.00	0.86			0.79	0.82	0.74	0.65			0.84			0.79	1.00	0.99	0.77

Table 35 - Load adjustment factors for #9 rebar in cracked concrete[1,2,3]

#9 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 ǁ To edge f_{RV}			Concrete thickness factor in shear[5] 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	0.03	0.02	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	0.15	0.09	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	0.10	n/a	n/a	n/a
	7	(178)	0.62	0.59	0.55	0.61	0.54	0.46	0.55	0.54	0.53	0.15	0.10	0.06	0.30	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	0.13	0.08	0.37	0.25	0.15	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	0.15	0.09	0.44	0.30	0.18	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	0.18	0.11	0.52	0.35	0.21	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	0.20	0.12	0.60	0.40	0.24	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	0.23	0.14	0.68	0.46	0.28	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	0.26	0.15	0.76	0.51	0.31	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	0.26	0.16	0.77	0.52	0.31	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	0.29	0.17	0.86	0.58	0.35	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	0.36	0.21	1.00	0.71	0.43	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	0.36	0.22		0.73	0.44	0.66	0.58	n/a
	18	(457)	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
	20	(508)	0.83	0.75	0.65		0.99	0.70	0.64	0.60	0.57	0.73	0.50	0.30		0.99	0.60	0.74	0.65	n/a
	22	(559)	0.86	0.77	0.66		1.00	0.74	0.65	0.61	0.58	0.85	0.57	0.34		1.00	0.69	0.77	0.68	n/a
	24	(610)	0.90	0.80	0.68			0.78	0.66	0.63	0.59	0.97	0.65	0.39			0.78	0.81	0.71	n/a
	25-1/4	(641)	0.92	0.81	0.69			0.81	0.67	0.63	0.59	1.00	0.70	0.42			0.81	0.83	0.73	0.61
	26	(660)	0.93	0.82	0.69			0.82	0.68	0.64	0.60		0.74	0.44			0.82	0.84	0.74	0.62
	28	(711)	0.96	0.85	0.71			0.87	0.69	0.65	0.60		0.82	0.49			0.87	0.87	0.76	0.65
	30	(762)	0.99	0.87	0.72			0.91	0.70	0.66	0.61		0.91	0.55			0.91	0.90	0.79	0.67
	36	(914)	1.00	0.94	0.77			1.00	0.74	0.69	0.63		1.00	0.72			1.00	0.99	0.87	0.73
	> 48	(1219)		1.00	0.86				0.83	0.75	0.68			1.00				1.00	1.00	0.84

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 318-14 Chapter 17.

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 36 - Load adjustment factors for #10 rebar in uncracked concrete [1,2,3]

#10 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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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	0.32	0.23	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	0.33	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	0.36	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	0.38	0.27	0.16	0.55	0.54	0.52	0.19	0.12	0.06	0.38	0.24	0.11	n/a	n/a	n/a
	10	(254)	0.65	0.61	0.57	0.40	0.29	0.17	0.56	0.55	0.53	0.22	0.14	0.07	0.42	0.29	0.13	n/a	n/a	n/a
	11	(279)	0.66	0.62	0.57	0.43	0.31	0.18	0.57	0.55	0.53	0.25	0.16	0.08	0.44	0.33	0.15	n/a	n/a	n/a
	12	(305)	0.68	0.63	0.58	0.45	0.32	0.19	0.57	0.55	0.53	0.29	0.19	0.09	0.47	0.38	0.17	n/a	n/a	n/a
	13	(330)	0.69	0.64	0.59	0.48	0.34	0.20	0.58	0.56	0.54	0.33	0.21	0.10	0.49	0.39	0.20	n/a	n/a	n/a
	14	(356)	0.71	0.66	0.59	0.51	0.36	0.21	0.59	0.56	0.54	0.36	0.24	0.11	0.52	0.41	0.22	n/a	n/a	n/a
	14-1/4	(362)	0.71	0.66	0.60	0.51	0.37	0.22	0.59	0.56	0.54	0.37	0.24	0.11	0.53	0.41	0.23	0.59	n/a	n/a
	15	(381)	0.72	0.67	0.60	0.54	0.38	0.22	0.59	0.57	0.54	0.40	0.26	0.12	0.55	0.43	0.24	0.60	n/a	n/a
	16	(406)	0.74	0.68	0.61	0.57	0.40	0.24	0.60	0.57	0.54	0.45	0.29	0.13	0.57	0.44	0.27	0.62	n/a	n/a
	17	(432)	0.75	0.69	0.61	0.60	0.43	0.25	0.60	0.58	0.55	0.49	0.32	0.15	0.60	0.46	0.29	0.64	n/a	n/a
	18	(457)	0.77	0.70	0.62	0.64	0.46	0.27	0.61	0.58	0.55	0.53	0.35	0.16	0.64	0.48	0.32	0.66	0.57	n/a
	20	(508)	0.80	0.72	0.63	0.71	0.51	0.30	0.62	0.59	0.55	0.62	0.40	0.19	0.71	0.52	0.37	0.70	0.60	n/a
	22	(559)	0.83	0.74	0.65	0.78	0.56	0.33	0.63	0.60	0.56	0.72	0.47	0.22	0.78	0.56	0.39	0.73	0.63	n/a
	24	(610)	0.86	0.77	0.66	0.85	0.61	0.36	0.65	0.61	0.57	0.82	0.53	0.25	0.85	0.61	0.41	0.76	0.66	n/a
	26	(660)	0.89	0.79	0.67	0.92	0.66	0.39	0.66	0.62	0.57	0.92	0.60	0.28	0.92	0.66	0.43	0.79	0.69	n/a
	28	(711)	0.91	0.81	0.69	0.99	0.71	0.41	0.67	0.63	0.58	1.00	0.67	0.31	0.99	0.71	0.45	0.82	0.71	0.55
	30	(762)	0.94	0.83	0.70	1.00	0.76	0.44	0.68	0.64	0.58		0.74	0.35	1.00	0.76	0.47	0.85	0.74	0.57
	36	(914)	1.00	0.90	0.74		0.91	0.53	0.72	0.66	0.60		0.98	0.45		0.91	0.54	0.94	0.81	0.63
	> 48	(1219)		1.00	0.82		1.00	0.71	0.79	0.72	0.63		1.00	0.70		1.00	0.71	1.00	0.94	0.72

Table 37 - Load adjustment factors for #10 rebar in cracked concrete [1,2,3]

#10 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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
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	0.10	n/a	n/a	n/a
	8	(203)	0.62	0.59	0.55	0.62	0.55	0.46	0.55	0.54	0.53	0.16	0.10	0.06	0.32	0.21	0.12	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	0.15	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	0.09	0.44	0.29	0.17	n/a	n/a	n/a
	11	(279)	0.66	0.62	0.57	0.74	0.63	0.51	0.57	0.55	0.54	0.26	0.17	0.10	0.51	0.33	0.20	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	0.11	0.58	0.38	0.22	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	0.13	0.66	0.43	0.25	n/a	n/a	n/a
	14	(356)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.56	0.55	0.37	0.24	0.14	0.73	0.48	0.28	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	0.55	0.38	0.25	0.15	0.75	0.49	0.29	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	0.16	0.82	0.53	0.31	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	0.17	0.90	0.58	0.35	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	0.19	0.98	0.64	0.38	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	0.21	1.00	0.70	0.41	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	0.24		0.82	0.48	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	0.28		0.94	0.56	0.73	0.63	n/a
	24	(610)	0.86	0.77	0.66		1.00	0.73	0.65	0.61	0.58	0.82	0.54	0.32		1.00	0.63	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	0.36			0.71	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	0.40			0.80	0.83	0.72	0.60
	30	(762)	0.94	0.83	0.70			0.85	0.68	0.64	0.60		0.75	0.44			0.85	0.86	0.74	0.62
	36	(914)	1.00	0.90	0.74			0.97	0.72	0.66	0.62		0.98	0.58			0.97	0.94	0.81	0.68
	> 48	(1219)		1.00	0.82			1.00	0.79	0.72	0.65		1.00	0.90			1.00	1.00	0.94	0.79

1 Linear interpolation not permitted.

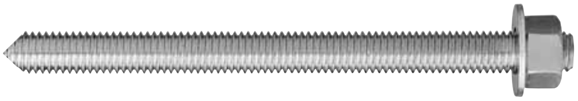
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.

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 318-14 Chapter 17.

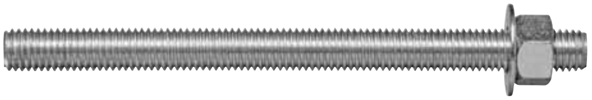
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.

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.

Hilti HIT-HY 200 Adhesive with Hilti HAS/HIT-V Threaded Rod



Hilti HAS Threaded Rod



Hilti HIT-V Threaded Rod

Figure 9 - HAS/HIT-V 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 /HIT-V threaded rod specifications, d

Setting information		Symbol	Units	Nominal rod diameter, d						
				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
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)
Minimum diameter of fixture hole	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]
Minimum diameter of fixture hole	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)
Minimum concrete thickness		h_{min}	in.	h_{ef}+1-1/4		$h_{ef}+2d_o$				
			(mm)	(h_{ef}+30)						
Minimum edge distance[2]		c_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	6-1/4
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(159)
Minimum anchor spacing		s_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/4	5	6-1/4
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(159)

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

2 Edge distance of 1-3/4-inch (44mm) is permitted provided the installation torque is reduced to 0.30 T_{inst} for 5d < s < 16-in. and to 0.5 T_{inst} for s > 16-in.

Figure 10 - HAS/HIT-V threaded rods

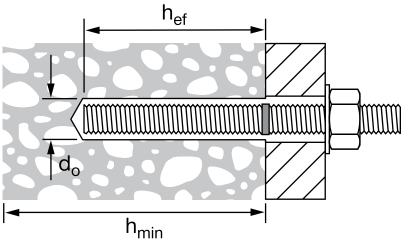
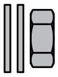


Figure 11 - Installation with (2) washers



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 [1,2,3,4,5,6,7,8,9]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
3/8	2-3/8 (60)	2,855 (12.7)	3,095 (13.8)	3,185 (14.2)	3,315 (14.7)	3,075 (13.7)	3,330 (14.8)	3,430 (15.3)	3,570 (15.9)
	3-3/8 (86)	4,315 (19.2)	4,395 (19.5)	4,525 (20.1)	4,710 (21.0)	9,295 (41.3)	9,465 (42.1)	9,745 (43.3)	10,145 (45.1)
	4-1/2 (114)	5,755 (25.6)	5,860 (26.1)	6,030 (26.8)	6,280 (27.9)	12,395 (55.1)	12,625 (56.2)	12,990 (57.8)	13,530 (60.2)
	7-1/2 (191)	9,590 (42.7)	9,770 (43.5)	10,055 (44.7)	10,470 (46.6)	20,660 (91.9)	21,040 (93.6)	21,650 (96.3)	22,550 (100.3)
1/2	2-3/4 (70)	3,555 (15.8)	3,895 (17.3)	4,500 (20.0)	5,120 (22.8)	7,660 (34.1)	8,395 (37.3)	9,690 (43.1)	11,025 (49.0)
	4-1/2 (114)	7,445 (33.1)	7,815 (34.8)	8,040 (35.8)	8,375 (37.3)	16,035 (71.3)	16,830 (74.9)	17,320 (77.0)	18,040 (80.2)
	6 (152)	10,230 (45.5)	10,420 (46.4)	10,725 (47.7)	11,165 (49.7)	22,035 (98.0)	22,440 (99.8)	23,095 (102.7)	24,050 (107.0)
	10 (254)	17,050 (75.8)	17,365 (77.2)	17,870 (79.5)	18,610 (82.8)	36,725 (163.4)	37,400 (166.4)	38,495 (171.2)	40,085 (178.3)
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)	12,565 (55.9)	13,085 (58.2)	22,415 (99.7)	24,550 (109.2)	27,065 (120.4)	28,185 (125.4)
	7-1/2 (191)	15,985 (71.1)	16,280 (72.4)	16,755 (74.5)	17,450 (77.6)	34,430 (153.2)	35,065 (156.0)	36,085 (160.5)	37,580 (167.2)
	12-1/2 (318)	26,640 (118.5)	27,130 (120.7)	27,925 (124.2)	29,080 (129.4)	57,385 (255.3)	58,440 (260.0)	60,145 (267.5)	62,635 (278.6)
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)	18,845 (83.8)	29,460 (131.0)	32,275 (143.6)	37,265 (165.8)	40,585 (180.5)
	9 (229)	21,060 (93.7)	23,070 (102.6)	24,125 (107.3)	25,125 (111.8)	45,360 (201.8)	49,690 (221.0)	51,965 (231.2)	54,115 (240.7)
	15 (381)	38,365 (170.7)	39,070 (173.8)	40,210 (178.9)	41,875 (186.3)	82,630 (367.6)	84,150 (374.3)	86,610 (385.3)	90,190 (401.2)
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)	25,650 (114.1)	37,125 (165.1)	40,670 (180.9)	46,960 (208.9)	55,245 (245.7)
	10-1/2 (267)	26,540 (118.1)	29,070 (129.3)	32,840 (146.1)	34,200 (152.1)	57,160 (254.3)	62,615 (278.5)	70,730 (314.6)	73,655 (327.6)
	17-1/2 (445)	52,220 (232.3)	53,180 (236.6)	54,730 (243.5)	56,995 (253.5)	112,470 (500.3)	114,540 (509.5)	117,885 (524.4)	122,760 (546.1)
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)	44,665 (198.7)	69,835 (310.6)	76,500 (340.3)	88,335 (392.9)	96,205 (427.9)
	20 (508)	68,205 (303.4)	69,460 (309.0)	71,485 (318.0)	74,445 (331.1)	146,900 (653.4)	149,605 (665.5)	153,970 (684.9)	160,340 (713.2)
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)	69,790 (310.4)	97,600 (434.1)	106,915 (475.6)	123,455 (549.2)	150,320 (668.7)
	25 (635)	97,500 (433.7)	106,805 (475.1)	111,695 (496.8)	116,320 (517.4)	210,000 (934.1)	230,045 (1023.3)	240,580 (1070.1)	250,535 (1114.4)

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary to the above values. 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 = 130° F (55° C), max. long term temperature = 110° F (43° C). For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 110° F (43° C) multiply above values by 0.92. For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above values by 0.78. 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 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

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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				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
3/8	2-3/8 (60)	1,690 (7.5)	1,720 (7.7)	1,775 (7.9)	1,845 (8.2)	1,820 (8.1)	1,855 (8.3)	1,910 (8.5)	1,990 (8.9)
	3-3/8 (86)	2,405 (10.7)	2,450 (10.9)	2,520 (11.2)	2,625 (11.7)	5,175 (23.0)	5,270 (23.4)	5,425 (24.1)	5,650 (25.1)
	4-1/2 (114)	3,205 (14.3)	3,265 (14.5)	3,360 (14.9)	3,500 (15.6)	6,900 (30.7)	7,030 (31.3)	7,235 (32.2)	7,535 (33.5)
	7-1/2 (191)	5,340 (23.8)	5,440 (24.2)	5,600 (24.9)	5,830 (25.9)	11,505 (51.2)	11,715 (52.1)	12,060 (53.6)	12,555 (55.8)
1/2	2-3/4 (70)	2,520 (11.2)	2,675 (11.9)	2,750 (12.2)	2,865 (12.7)	5,425 (24.1)	5,760 (25.6)	5,925 (26.4)	6,170 (27.4)
	4-1/2 (114)	4,295 (19.1)	4,375 (19.5)	4,505 (20.0)	4,690 (20.9)	9,255 (41.2)	9,425 (41.9)	9,700 (43.1)	10,100 (44.9)
	6 (152)	5,730 (25.5)	5,835 (26.0)	6,005 (26.7)	6,250 (27.8)	12,335 (54.9)	12,565 (55.9)	12,930 (57.5)	13,465 (59.9)
	10 (254)	9,545 (42.5)	9,720 (43.2)	10,005 (44.5)	10,420 (46.4)	20,560 (91.5)	20,940 (93.1)	21,550 (95.9)	22,445 (99.8)
5/8	3-1/8 (79)	3,050 (13.6)	3,345 (14.9)	3,860 (17.2)	4,090 (18.2)	6,575 (29.2)	7,200 (32.0)	8,315 (37.0)	8,815 (39.2)
	5-5/8 (143)	6,750 (30.0)	6,870 (30.6)	7,075 (31.5)	7,365 (32.8)	14,535 (64.7)	14,800 (65.8)	15,235 (67.8)	15,865 (70.6)
	7-1/2 (191)	9,000 (40.0)	9,165 (40.8)	9,430 (41.9)	9,820 (43.7)	19,380 (86.2)	19,735 (87.8)	20,310 (90.3)	21,155 (94.1)
	12-1/2 (318)	14,995 (66.7)	15,270 (67.9)	15,720 (69.9)	16,370 (72.8)	32,300 (143.7)	32,895 (146.3)	33,855 (150.6)	35,255 (156.8)
3/4	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,530 (24.6)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	11,910 (53.0)
	6-3/4 (171)	9,690 (43.1)	9,950 (44.3)	10,240 (45.5)	10,665 (47.4)	20,870 (92.8)	21,430 (95.3)	22,055 (98.1)	22,965 (102.2)
	9 (229)	13,025 (57.9)	13,265 (59.0)	13,650 (60.7)	14,215 (63.2)	28,055 (124.8)	28,570 (127.1)	29,405 (130.8)	30,620 (136.2)
	15 (381)	21,710 (96.6)	22,110 (98.3)	22,755 (101.2)	23,695 (105.4)	46,760 (208.0)	47,620 (211.8)	49,010 (218.0)	51,035 (227.0)
7/8	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,460 (24.3)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	11,760 (52.3)
	7-7/8 (200)	11,255 (50.1)	11,465 (51.0)	11,800 (52.5)	12,285 (54.6)	24,245 (107.8)	24,690 (109.8)	25,410 (113.0)	26,465 (117.7)
	10-1/2 (267)	15,010 (66.8)	15,285 (68.0)	15,730 (70.0)	16,380 (72.9)	32,325 (143.8)	32,920 (146.4)	33,885 (150.7)	35,285 (157.0)
	17-1/2 (445)	25,015 (111.3)	25,475 (113.3)	26,220 (116.6)	27,305 (121.5)	53,880 (239.7)	54,870 (244.1)	56,470 (251.2)	58,810 (261.6)
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)	14,795 (65.8)	15,065 (67.0)	15,505 (69.0)	16,150 (71.8)	31,865 (141.7)	32,450 (144.3)	33,400 (148.6)	34,780 (154.7)
	12 (305)	19,725 (87.7)	20,090 (89.4)	20,675 (92.0)	21,530 (95.8)	42,485 (189.0)	43,270 (192.5)	44,530 (198.1)	46,375 (206.3)
	20 (508)	32,875 (146.2)	33,480 (148.9)	34,460 (153.3)	35,885 (159.6)	70,810 (315.0)	72,115 (320.8)	74,220 (330.1)	77,290 (343.8)
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)	24,380 (108.4)	25,390 (112.9)	44,905 (199.7)	49,190 (218.8)	52,510 (233.6)	54,680 (243.2)
	5 (381)	31,015 (138.0)	31,585 (140.5)	32,505 (144.6)	33,850 (150.6)	66,800 (297.1)	68,025 (302.6)	70,015 (311.4)	72,910 (324.3)
	25 (635)	51,690 (229.9)	52,640 (234.2)	54,175 (241.0)	56,420 (251.0)	111,330 (495.2)	113,380 (504.3)	116,690 (519.1)	121,515 (540.5)

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (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 to the above values. 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 = 130° F (55° C), max. long term temperature = 110° F (43° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 110° F (43° C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above values by 0.78.
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 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete, multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear 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 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 41 - Steel design strength for Hilti HAS and HIT-V threaded rods[1]

Nominal anchor diameter in.	HIT-V ASTM A307 Grade A[2]			HAS-E ISO 898 Class 5.8[2]			HAS-E-B ASTM A193 B7[3]			HAS-R stainless steel ASTM F593 - AISI 304/316 SS[2]		
	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)
3/8	3,025 (13.5)	1,395 (6.2)	975 (4.3)	3,655 (16.3)	1,685 (7.5)	1,180 (5.2)	7,265 (32.3)	3,150 (14.0)	2,205 (9.8)	5,040 (22.4)	2,325 (10.3)	1,630 (7.3)
1/2	5,535 (24.6)	3,065 (13.6)	2,145 (9.5)	6,690 (29.8)	3,705 (16.5)	2,595 (11.5)	13,300 (59.2)	6,915 (30.8)	4,840 (21.5)	9,225 (41.0)	5,110 (22.7)	3,575 (15.9)
5/8	8,815 (39.2)	4,880 (21.7)	3,415 (15.2)	10,650 (47.4)	5,900 (26.2)	4,130 (18.4)	21,190 (94.3)	11,020 (49.0)	7,715 (34.3)	14,690 (65.3)	8,135 (36.2)	5,695 (25.3)
3/4	13,045 (58.0)	7,225 (32.1)	5,060 (22.5)	15,765 (70.1)	8,730 (38.8)	6,110 (27.2)	31,360 (139.5)	16,305 (72.5)	11,415 (50.8)	18,480 (82.2)	10,235 (45.5)	7,165 (31.9)
7/8	–	–	–	21,755 (96.8)	12,050 (53.6)	8,435 (37.5)	43,285 (192.5)	22,505 (100.1)	15,755 (70.1)	25,510 (113.5)	14,125 (62.8)	9,890 (44.0)
1	23,620 (105.1)	13,085 (58.2)	9,160 (40.7)	28,540 (127.0)	15,805 (70.3)	11,065 (49.2)	56,785 (252.6)	29,525 (131.3)	20,670 (91.9)	33,465 (148.9)	18,535 (82.4)	12,975 (57.7)
1-1/4	–	–	–	45,670 (203.1)	25,295 (112.5)	17,705 (78.8)	90,850 (404.1)	47,240 (210.1)	33,070 (147.1)	53,540 (238.2)	29,655 (131.9)	20,760 (92.3)

1 See Section 3.1.8.6 to convert design strength value to ASD value.

2 HIT-V, HAS-E, and HAS-R threaded rods are considered brittle steel elements. HIT-V does not comply with % elongation requirements of ASTM A307 Grade A steel. HAS-E does not comply with % elongation requirements of ISO 898-1.

3 HAS-E-B7 rods are considered ductile steel elements.

4 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17.

5 Shear = ϕ 0.60 $A_{se,V} f_{uta}$ as noted in ACI 318-14 Chapter 17. For 3/8-in diameter threaded rod, shear = ϕ 0.50 $A_{se,V} f_{uta}$

6 Seismic Shear = $\alpha_{V,seis} f_{Vsa}$: Reduction for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

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								Concrete thickness factor in shear[5] f_{HV}			
														⊥ Toward edge f_{RV}				∥ To edge f_{RV}							
Embedment h_{ef}	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																									
1-3/4	(44)	n/a	n/a	n/a	n/a	0.39	0.31	0.22	0.13	n/a	n/a	n/a	n/a	0.23	0.08	0.06	0.04	0.46	0.16	0.12	0.07	n/a	n/a	n/a	n/a
1-7/8	(48)	0.60	0.59	0.57	0.54	0.40	0.32	0.23	0.13	0.57	0.53	0.53	0.52	0.25	0.09	0.07	0.04	0.40	0.18	0.13	0.08	n/a	n/a	n/a	n/a
2	(51)	0.60	0.60	0.57	0.54	0.42	0.33	0.24	0.14	0.57	0.54	0.53	0.52	0.28	0.10	0.07	0.04	0.42	0.19	0.15	0.09	n/a	n/a	n/a	n/a
3	(76)	0.66	0.65	0.61	0.57	0.54	0.40	0.29	0.17	0.61	0.55	0.54	0.53	0.51	0.18	0.13	0.08	0.54	0.36	0.27	0.16	n/a	n/a	n/a	n/a
3-5/8	(92)	0.69	0.68	0.63	0.58	0.63	0.45	0.33	0.19	0.63	0.56	0.55	0.54	0.68	0.24	0.18	0.11	0.63	0.46	0.35	0.21	0.72	n/a	n/a	n/a
4	(102)	0.71	0.70	0.65	0.59	0.69	0.48	0.35	0.20	0.64	0.57	0.56	0.54	0.79	0.27	0.21	0.12	0.69	0.49	0.40	0.25	0.75	n/a	n/a	n/a
4-5/8	(117)	0.74	0.73	0.67	0.60	0.80	0.54	0.39	0.23	0.66	0.58	0.57	0.55	0.98	0.34	0.26	0.15	0.80	0.55	0.43	0.31	0.81	0.57	n/a	n/a
5	(127)	0.76	0.75	0.69	0.61	0.87	0.58	0.42	0.24	0.68	0.59	0.57	0.55	1.00	0.38	0.29	0.17	0.87	0.58	0.46	0.33	0.84	0.59	n/a	n/a
5-3/4	(146)	0.80	0.78	0.71	0.63	0.99	0.66	0.48	0.28	0.70	0.60	0.58	0.56		0.47	0.35	0.21	0.99	0.66	0.50	0.35	0.91	0.64	0.58	n/a
6	(152)	0.81	0.80	0.72	0.63	1.00	0.69	0.50	0.29	0.71	0.61	0.59	0.56		0.50	0.38	0.23	1.00	0.69	0.52	0.36	0.92	0.65	0.59	n/a
7	(178)	0.86	0.85	0.76	0.66		0.81	0.59	0.34	0.75	0.62	0.60	0.57		0.63	0.48	0.29		0.81	0.59	0.39	1.00	0.70	0.64	n/a
8	(203)	0.91	0.90	0.80	0.68		0.92	0.67	0.39	0.79	0.64	0.62	0.58		0.77	0.58	0.35		0.92	0.67	0.43		0.75	0.68	n/a
8-3/4	(222)	0.95	0.93	0.82	0.69		1.00	0.74	0.43	0.81	0.65	0.63	0.59		0.89	0.66	0.40		1.00	0.74	0.45		0.78	0.71	0.60
9	(229)	0.97	0.94	0.83	0.70			0.76	0.44	0.82	0.66	0.63	0.59		0.92	0.69	0.42			0.76	0.46		0.80	0.72	0.61
10	(254)	1.00	0.99	0.87	0.72			0.84	0.49	0.86	0.68	0.65	0.60		1.00	0.81	0.49			0.84	0.50		0.84	0.76	0.64
11	(279)		1.00	0.91	0.74			0.93	0.54	0.89	0.69	0.66	0.61			0.94	0.56			0.93	0.54		0.88	0.80	0.67
12	(305)			0.94	0.77			1.00	0.58	0.93	0.71	0.67	0.62			1.00	0.64			1.00	0.58		0.92	0.83	0.70
14	(356)			1.00	0.81				0.68	1.00	0.75	0.70	0.64				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	0.96	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 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								Concrete thickness factor in shear[5] f_{HV}			
														⊥ Toward edge f_{RV}				∥ To edge f_{RV}							
Embedment h_{ef}	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)																									
1-3/4	(44)	n/a	n/a	n/a	n/a	0.55	0.54	0.49	0.43	n/a	n/a	n/a	n/a	0.28	0.10	0.08	0.05	0.55	0.20	0.15	0.09	n/a	n/a	n/a	n/a
1-7/8	(48)	0.60	0.59	0.57	0.54	0.57	0.56	0.50	0.44	0.58	0.54	0.53	0.52	0.31	0.11	0.08	0.05	0.61	0.23	0.17	0.10	n/a	n/a	n/a	n/a
2	(51)	0.60	0.60	0.57	0.54	0.58	0.57	0.51	0.44	0.58	0.54	0.53	0.52	0.34	0.12	0.09	0.06	0.67	0.25	0.19	0.11	n/a	n/a	n/a	n/a
3	(76)	0.66	0.65	0.61	0.57	0.72	0.70	0.60	0.49	0.62	0.56	0.55	0.54	0.62	0.23	0.17	0.10	0.88	0.46	0.34	0.21	n/a	n/a	n/a	n/a
3-5/8	(92)	0.69	0.68	0.63	0.58	0.81	0.78	0.66	0.53	0.65	0.58	0.56	0.54	0.82	0.30	0.23	0.14	1.00	0.61	0.45	0.27	0.76	n/a	n/a	n/a
4	(102)	0.71	0.70	0.65	0.59	0.87	0.84	0.70	0.55	0.66	0.58	0.57	0.55	0.95	0.35	0.26	0.16		0.70	0.53	0.32	0.80	n/a	n/a	n/a
4-5/8	(117)	0.74	0.73	0.67	0.60	0.97	0.93	0.76	0.58	0.69	0.60	0.58	0.56	1.00	0.44	0.33	0.20		0.87	0.66	0.39	0.86	0.62	n/a	n/a
5	(127)	0.76	0.75	0.69	0.61	1.00	0.99	0.80	0.60	0.70	0.60	0.59	0.56		0.49	0.37	0.22		0.98	0.74	0.44	0.90	0.64	n/a	n/a
5-3/4	(146)	0.80	0.78	0.71	0.63		1.00	0.88	0.64	0.73	0.62	0.60	0.57		0.61	0.45	0.27		1.00	0.88	0.55	0.96	0.69	0.63	n/a
6	(152)	0.81	0.80	0.72	0.63			0.91	0.66	0.74	0.62	0.60	0.57		0.65	0.48	0.29			0.91	0.58	0.98	0.71	0.64	n/a
7	(178)	0.86	0.85	0.76	0.66			1.00	0.72	0.78	0.65	0.62	0.59		0.81	0.61	0.37			1.00	0.72	1.00	0.76	0.69	n/a
8	(203)	0.91	0.90	0.80	0.68				0.78	0.82	0.67	0.64	0.60		0.99	0.75	0.45				0.78		0.81	0.74	n/a
8-3/4	(222)	0.95	0.93	0.82	0.69				0.83	0.85	0.68	0.65	0.61		1.00	0.85	0.51				0.83		0.85	0.77	0.65
9	(229)	0.97	0.94	0.83	0.70				0.85	0.86	0.69	0.65	0.61			0.89	0.53				0.85		0.86	0.79	0.66
10	(254)	1.00	0.99	0.87	0.72				0.91	0.90	0.71	0.67	0.62			1.00	0.63				0.91		0.91	0.83	0.70
11	(279)		1.00	0.91	0.74				0.98	0.94	0.73	0.69	0.63				0.72				0.98		0.96	0.87	0.73
12	(305)			0.94	0.77				1.00	0.98	0.75	0.71	0.65				0.82				1.00		1.00	0.91	0.76
14	(356)			1.00	0.81					1.00	0.79	0.74	0.67				1.00							0.98	0.83
16	(406)				0.86						0.83	0.77	0.69											1.00	0.88
18	(457)				0.90						0.87	0.81	0.72												0.94
24	(610)				1.00						1.00	0.91	0.79												1.00
30	(762)											1.00	0.87												
36	(914)												0.94												
>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 318-14 Chapter 17.

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)	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in.	(mm)																								
1-3/4	(44)	n/a	n/a	n/a	n/a	0.35	0.27	0.20	0.12	n/a	n/a	n/a	n/a	0.10	0.05	0.04	0.02	0.21	0.11	0.08	0.05	n/a	n/a	n/a	n/a
2-1/2	(64)	0.60	0.59	0.57	0.54	0.43	0.31	0.23	0.13	0.55	0.53	0.53	0.52	0.18	0.09	0.07	0.04	0.35	0.18	0.13	0.08	n/a	n/a	n/a	n/a
3	(76)	0.62	0.61	0.58	0.55	0.48	0.33	0.24	0.14	0.56	0.54	0.53	0.52	0.23	0.12	0.09	0.05	0.46	0.24	0.17	0.10	n/a	n/a	n/a	n/a
4	(102)	0.66	0.65	0.61	0.57	0.59	0.39	0.29	0.17	0.58	0.55	0.54	0.53	0.36	0.18	0.13	0.08	0.59	0.37	0.27	0.16	0.58	n/a	n/a	n/a
5	(127)	0.69	0.69	0.64	0.58	0.73	0.45	0.33	0.19	0.60	0.57	0.55	0.54	0.50	0.26	0.19	0.11	0.73	0.46	0.37	0.22	0.65	n/a	n/a	n/a
5-3/4	(146)	0.72	0.71	0.66	0.60	0.84	0.50	0.36	0.21	0.62	0.58	0.56	0.54	0.61	0.32	0.23	0.14	0.84	0.50	0.41	0.28	0.69	0.56	n/a	n/a
6	(152)	0.73	0.72	0.67	0.60	0.87	0.51	0.38	0.22	0.63	0.58	0.57	0.55	0.65	0.34	0.25	0.15	0.87	0.52	0.42	0.29	0.71	0.57	n/a	n/a
7	(178)	0.77	0.76	0.69	0.62	1.00	0.59	0.43	0.25	0.65	0.59	0.58	0.55	0.82	0.42	0.31	0.19	1.00	0.59	0.46	0.33	0.77	0.61	n/a	n/a
7-1/4	(184)	0.78	0.77	0.70	0.62		0.61	0.45	0.26	0.65	0.60	0.58	0.56	0.87	0.45	0.33	0.20		0.61	0.47	0.34	0.78	0.62	0.56	n/a
8	(203)	0.81	0.80	0.72	0.63		0.67	0.49	0.29	0.67	0.61	0.59	0.56	1.00	0.52	0.38	0.23		0.67	0.51	0.36	0.82	0.66	0.59	n/a
9	(229)	0.85	0.83	0.75	0.65		0.76	0.56	0.32	0.69	0.62	0.60	0.57		0.62	0.45	0.27		0.76	0.56	0.38	0.87	0.70	0.63	n/a
10	(254)	0.89	0.87	0.78	0.67		0.84	0.62	0.36	0.71	0.63	0.61	0.58		0.72	0.53	0.32		0.84	0.62	0.41	0.92	0.73	0.66	n/a
11-1/4	(286)	0.94	0.92	0.81	0.69		0.95	0.69	0.41	0.74	0.65	0.62	0.59		0.86	0.63	0.38		0.95	0.69	0.44	0.97	0.78	0.70	0.59
12	(305)	0.97	0.94	0.83	0.70		1.00	0.74	0.43	0.75	0.66	0.63	0.59		0.95	0.69	0.42		1.00	0.74	0.46	1.00	0.80	0.72	0.61
14	(356)	1.00	1.00	0.89	0.73			0.86	0.51	0.79	0.69	0.65	0.61		1.00	0.87	0.52			0.86	0.51		0.87	0.78	0.66
16	(406)			0.94	0.77			0.99	0.58	0.83	0.72	0.67	0.62			1.00	0.64			0.99	0.58		0.93	0.83	0.70
18	(457)			1.00	0.80			1.00	0.65	0.88	0.74	0.70	0.64				0.76			1.00	0.65		0.98	0.89	0.75
20	(508)				0.83				0.72	0.92	0.77	0.72	0.65				0.90				0.72		1.00	0.93	0.79
22	(559)				0.87				0.79	0.96	0.80	0.74	0.67				1.00				0.79			0.98	0.83
24	(610)				0.90				0.87	1.00	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				0.96
36	(914)										0.98	0.89	0.78												1.00
>48	(1219)										1.00	1.00	0.87												

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)	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in.	(mm)																								
1-3/4	(44)	n/a	n/a	n/a	n/a	0.50	0.49	0.45	0.41	n/a	n/a	n/a	n/a	0.10	0.07	0.05	0.03	0.21	0.13	0.10	0.06	n/a	n/a	n/a	n/a
2-1/2	(64)	0.60	0.59	0.57	0.54	0.57	0.56	0.50	0.44	0.55	0.54	0.53	0.52	0.18	0.11	0.08	0.05	0.35	0.22	0.17	0.10	n/a	n/a	n/a	n/a
3	(76)	0.62	0.61	0.58	0.55	0.62	0.60	0.53	0.46	0.56	0.55	0.54	0.53	0.23	0.15	0.11	0.07	0.47	0.29	0.22	0.13	n/a	n/a	n/a	n/a
4	(102)	0.66	0.65	0.61	0.57	0.72	0.70	0.60	0.49	0.58	0.56	0.55	0.54	0.36	0.23	0.17	0.10	0.72	0.45	0.34	0.20	0.58	n/a	n/a	n/a
5	(127)	0.69	0.69	0.64	0.58	0.83	0.80	0.67	0.53	0.61	0.58	0.56	0.55	0.50	0.32	0.24	0.14	1.00	0.63	0.48	0.29	0.65	n/a	n/a	n/a
5-3/4	(146)	0.72	0.71	0.66	0.60	0.92	0.88	0.73	0.56	0.62	0.59	0.57	0.55	0.62	0.39	0.29	0.18		0.78	0.59	0.35	0.70	0.60	n/a	n/a
6	(152)	0.73	0.72	0.67	0.60	0.95	0.91	0.75	0.57	0.63	0.59	0.58	0.55	0.66	0.42	0.31	0.19		0.83	0.63	0.38	0.71	0.61	n/a	n/a
7	(178)	0.77	0.76	0.69	0.62	1.00	1.00	0.83	0.62	0.65	0.61	0.59	0.56	0.83	0.53	0.39	0.24		1.00	0.79	0.47	0.77	0.66	n/a	n/a
7-1/4	(184)	0.78	0.77	0.70	0.62			0.85	0.63	0.65	0.61	0.59	0.57	0.88	0.55	0.42	0.25			0.83	0.50	0.78	0.67	0.61	n/a
8	(203)	0.81	0.80	0.72	0.63			0.91	0.66	0.67	0.62	0.60	0.57	1.00	0.64	0.48	0.29			0.91	0.58	0.82	0.70	0.64	n/a
9	(229)	0.85	0.83	0.75	0.65			1.00	0.70	0.69	0.64	0.62	0.58		0.77	0.57	0.34			1.00	0.69	0.87	0.75	0.68	n/a
10	(254)	0.89	0.87	0.78	0.67				0.75	0.71	0.66	0.63	0.59		0.90	0.67	0.40				0.75	0.92	0.79	0.72	n/a
11-1/4	(286)	0.94	0.92	0.81	0.69				0.81	0.74	0.67	0.64	0.60		1.00	0.80	0.48				0.81	0.97	0.84	0.76	0.64
12	(305)	0.97	0.94	0.83	0.70				0.85	0.75	0.69	0.65	0.61			0.88	0.53				0.85	1.00	0.86	0.78	0.66
14	(356)	1.00	1.00	0.89	0.73				0.95	0.79	0.72	0.68	0.63			1.00	0.67				0.95		0.93	0.85	0.71
16	(406)			0.94	0.77				1.00	0.84	0.75	0.70	0.65				0.82				1.00		1.00	0.91	0.76
18	(457)			1.00	0.80					0.88	0.78	0.73	0.66				0.98							0.96	0.81
20	(508)				0.83					0.92	0.81	0.76	0.68				1.00							1.00	0.85
22	(559)				0.87					0.96	0.84	0.78	0.70												0.90
24	(610)				0.90					1.00	0.87	0.81	0.72												0.93
30	(762)				1.00						0.97	0.88	0.77												1.00
36	(914)										1.00	0.96	0.83												
>48	(1219)											1.00	0.94												

[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 318-14 Chapter 17.

[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.

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								Concrete thickness factor in shear[5] f_{HV}			
															⊥ Toward edge f_{RV}				∥ To edge f_{RV}							
Embedment h_{ef}	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	n/a	0.35	0.25	0.18	0.11	n/a	n/a	n/a	n/a	0.09	0.04	0.03	0.02	0.19	0.08	0.06	0.03	n/a	n/a	n/a	n/a
	3-1/8	(79)	0.60	0.59	0.57	0.54	0.47	0.31	0.22	0.13	0.56	0.54	0.53	0.52	0.22	0.10	0.07	0.04	0.45	0.20	0.13	0.08	n/a	n/a	n/a	n/a
	4	(102)	0.62	0.62	0.59	0.55	0.56	0.34	0.25	0.15	0.58	0.55	0.53	0.52	0.32	0.15	0.10	0.06	0.56	0.29	0.19	0.11	n/a	n/a	n/a	n/a
	4-5/8	(117)	0.64	0.64	0.60	0.56	0.62	0.37	0.27	0.16	0.59	0.55	0.54	0.53	0.40	0.18	0.12	0.07	0.62	0.36	0.24	0.14	0.60	n/a	n/a	n/a
	5	(127)	0.66	0.65	0.61	0.57	0.67	0.39	0.28	0.17	0.60	0.56	0.54	0.53	0.45	0.21	0.13	0.08	0.67	0.40	0.27	0.16	0.63	n/a	n/a	n/a
	6	(152)	0.69	0.68	0.63	0.58	0.80	0.43	0.32	0.19	0.62	0.57	0.55	0.54	0.59	0.27	0.18	0.11	0.80	0.44	0.35	0.21	0.69	n/a	n/a	n/a
	7	(178)	0.72	0.71	0.66	0.59	0.90	0.48	0.36	0.21	0.64	0.58	0.56	0.54	0.75	0.34	0.22	0.13	0.94	0.49	0.40	0.27	0.74	n/a	n/a	n/a
	7-1/8	(181)	0.72	0.71	0.66	0.60	0.91	0.49	0.36	0.21	0.64	0.58	0.56	0.54	0.77	0.35	0.23	0.14	0.95	0.50	0.40	0.27	0.75	0.57	n/a	n/a
	8	(203)	0.75	0.74	0.68	0.61	1.00	0.54	0.39	0.23	0.66	0.59	0.57	0.55	0.91	0.41	0.27	0.16	1.00	0.54	0.43	0.32	0.79	0.61	n/a	n/a
	9	(229)	0.78	0.77	0.70	0.62		0.60	0.44	0.26	0.68	0.60	0.58	0.56	1.00	0.50	0.32	0.19		0.60	0.47	0.34	0.84	0.65	0.56	n/a
	10	(254)	0.81	0.80	0.72	0.63		0.67	0.49	0.29	0.70	0.62	0.59	0.56		0.58	0.38	0.23		0.67	0.51	0.36	0.89	0.68	0.59	n/a
	11	(279)	0.84	0.83	0.74	0.65		0.74	0.54	0.32	0.72	0.63	0.60	0.57		0.67	0.44	0.26		0.74	0.54	0.38	0.93	0.71	0.62	n/a
	12	(305)	0.87	0.86	0.77	0.66		0.80	0.59	0.35	0.74	0.64	0.60	0.57		0.76	0.50	0.30		0.80	0.59	0.40	0.97	0.75	0.65	n/a
	14	(356)	0.94	0.91	0.81	0.69		0.94	0.69	0.40	0.77	0.66	0.62	0.59		0.96	0.63	0.38		0.94	0.69	0.44	1.00	0.81	0.70	0.59
	16	(406)	1.00	0.97	0.86	0.71		1.00	0.79	0.46	0.81	0.69	0.64	0.60		1.00	0.76	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	0.85	0.71	0.66	0.61			0.91	0.55			0.89	0.52		0.91	0.79	0.67
	20	(508)			0.94	0.77			0.98	0.58	0.89	0.73	0.67	0.62			1.00	0.64			0.98	0.58		0.96	0.83	0.70
	22	(559)			0.99	0.79			1.00	0.63	0.93	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	0.97	0.78	0.71	0.65				0.84				0.69			0.91	0.77
	26	(660)				0.85				0.75	1.00	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				0.87		0.85	0.76	0.69								0.87			1.00	0.86
	36	(914)				0.98				1.00		0.92	0.81	0.72								1.00				0.94
	>48	(1219)				1.00						1.00	0.92	0.80												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								Concrete thickness factor in shear[5] f_{HV}			
															⊥ Toward edge f_{RV}				∥ To edge f_{RV}							
Embedment h_{ef}	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	n/a	0.47	0.46	0.43	0.40	n/a	n/a	n/a	n/a	0.09	0.05	0.04	0.02	0.19	0.09	0.07	0.04	n/a	n/a	n/a	n/a
	3-1/8	(79)	0.60	0.59	0.57	0.54	0.57	0.56	0.50	0.44	0.56	0.54	0.53	0.52	0.22	0.11	0.08	0.05	0.45	0.22	0.17	0.10	n/a	n/a	n/a	n/a
	4	(102)	0.62	0.62	0.59	0.55	0.64	0.62	0.55	0.46	0.58	0.55	0.54	0.53	0.33	0.16	0.12	0.07	0.65	0.32	0.24	0.15	n/a	n/a	n/a	n/a
	4-5/8	(117)	0.64	0.64	0.60	0.56	0.69	0.67	0.58	0.48	0.59	0.56	0.55	0.53	0.40	0.20	0.15	0.09	0.81	0.40	0.30	0.18	0.60	n/a	n/a	n/a
	5	(127)	0.66	0.65	0.61	0.57	0.72	0.70	0.60	0.49	0.60	0.56	0.55	0.54	0.45	0.23	0.17	0.10	0.91	0.45	0.34	0.20	0.63	n/a	n/a	n/a
	6	(152)	0.69	0.68	0.63	0.58	0.81	0.78	0.66	0.53	0.62	0.57	0.56	0.54	0.60	0.30	0.22	0.13	1.00	0.59	0.45	0.27	0.69	n/a	n/a	n/a
	7	(178)	0.72	0.71	0.66	0.59	0.90	0.87	0.72	0.56	0.64	0.59	0.57	0.55	0.75	0.37	0.28	0.17		0.75	0.56	0.34	0.74	n/a	n/a	n/a
	7-1/8	(181)	0.72	0.71	0.66	0.60	0.91	0.88	0.73	0.56	0.64	0.59	0.57	0.55	0.77	0.38	0.29	0.17		0.77	0.58	0.35	0.75	0.59	n/a	n/a
	8	(203)	0.75	0.74	0.68	0.61	1.00	0.96	0.78	0.59	0.66	0.60	0.58	0.56	0.92	0.46	0.34	0.21		0.91	0.69	0.41	0.79	0.63	n/a	n/a
	9	(229)	0.78	0.77	0.70	0.62		1.00	0.85	0.62	0.68	0.61	0.59	0.57	1.00	0.55	0.41	0.25		1.00	0.82	0.49	0.84	0.67	0.61	n/a
	10	(254)	0.81	0.80	0.72	0.63			0.91	0.66	0.70	0.62	0.60	0.57		0.64	0.48	0.29			0.91	0.57	0.89	0.70	0.64	n/a
	11	(279)	0.84	0.83	0.74	0.65			0.98	0.69	0.72	0.64	0.61	0.58		0.74	0.55	0.33			0.98	0.66	0.93	0.74	0.67	n/a
	12	(305)	0.87	0.86	0.77	0.66			1.00	0.73	0.74	0.65	0.62	0.59		0.84	0.63	0.38			1.00	0.73	0.97	0.77	0.70	n/a
	14	(356)	0.94	0.91	0.81	0.69				0.81	0.78	0.67	0.64	0.60		1.00	0.79	0.48				0.81	1.00	0.83	0.76	0.64
	16	(406)	1.00	0.97	0.86	0.71				0.89	0.82	0.70	0.66	0.62			0.97	0.58				0.89		0.89	0.81	0.68
	18	(457)		1.00	0.90	0.74				0.97	0.85	0.72	0.68	0.63			1.00	0.69				0.97		0.94	0.86	0.72
	20	(508)			0.94	0.77				1.00	0.89	0.75	0.70	0.65				0.81				1.00		0.99	0.90	0.76
	22	(559)			0.99	0.79					0.93	0.77	0.72	0.66				0.94						1.00	0.95	0.80
	24	(610)			1.00	0.82					0.97	0.80	0.74	0.67				1.00							0.99	0.83
	26	(660)				0.85					1.00	0.82	0.77	0.69											1.00	0.87
	28	(711)				0.87						0.85	0.79	0.70												0.90
	30	(762)				0.90						0.87	0.81	0.72												0.93
	36	(914)				0.98						0.95	0.87	0.76												1.00
	>48	(1219)				1.00						1.00	0.99	0.85												

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 318-14 Chapter 17.

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								Concrete thickness factor in shear[5] f_{HV}			
															⊥ Toward edge f_{RV}				‖ To edge f_{RV}							
Embedment h_{ef}		in.	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15
		(mm)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	n/a	0.35	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)	0.60	0.59	0.57	0.54	0.52	0.31	0.22	0.13	0.57	0.54	0.53	0.52	0.27	0.11	0.07	0.04	0.52	0.22	0.14	0.08	n/a	n/a	n/a	n/a
	4	(102)	0.60	0.60	0.57	0.54	0.54	0.31	0.23	0.14	0.57	0.54	0.53	0.52	0.29	0.12	0.08	0.04	0.54	0.24	0.16	0.09	n/a	n/a	n/a	n/a
	5	(127)	0.63	0.62	0.59	0.56	0.64	0.35	0.26	0.15	0.59	0.55	0.54	0.53	0.41	0.17	0.11	0.06	0.64	0.33	0.22	0.12	n/a	n/a	n/a	n/a
	5-1/4	(133)	0.64	0.63	0.60	0.56	0.66	0.36	0.26	0.15	0.60	0.55	0.54	0.53	0.44	0.18	0.12	0.06	0.66	0.36	0.23	0.13	0.62	n/a	n/a	n/a
	6	(152)	0.66	0.65	0.61	0.57	0.72	0.39	0.28	0.17	0.61	0.56	0.55	0.53	0.54	0.22	0.14	0.08	0.76	0.39	0.29	0.16	0.66	n/a	n/a	n/a
	7	(178)	0.68	0.67	0.63	0.58	0.79	0.43	0.31	0.18	0.63	0.57	0.55	0.54	0.68	0.28	0.18	0.10	0.89	0.43	0.36	0.20	0.72	n/a	n/a	n/a
	8	(203)	0.71	0.70	0.65	0.59	0.87	0.47	0.34	0.20	0.65	0.58	0.56	0.54	0.83	0.34	0.22	0.12	1.00	0.47	0.39	0.24	0.77	n/a	n/a	n/a
	8-1/2	(216)	0.72	0.71	0.66	0.59	0.91	0.49	0.36	0.21	0.66	0.59	0.56	0.54	0.91	0.37	0.24	0.13		0.49	0.40	0.26	0.79	0.59	n/a	n/a
	9	(229)	0.73	0.72	0.67	0.60	0.95	0.51	0.37	0.22	0.67	0.59	0.57	0.55	0.99	0.40	0.26	0.14		0.52	0.41	0.29	0.81	0.60	n/a	n/a
	10	(254)	0.76	0.75	0.69	0.61	1.00	0.56	0.41	0.24	0.68	0.60	0.58	0.55	1.00	0.47	0.31	0.17		0.56	0.44	0.33	0.86	0.64	n/a	n/a
	10-3/4	(273)	0.78	0.77	0.70	0.62		0.60	0.44	0.26	0.70	0.61	0.58	0.55		0.53	0.34	0.19		0.60	0.47	0.34	0.89	0.66	0.57	n/a
	12	(305)	0.81	0.80	0.72	0.63		0.67	0.49	0.29	0.72	0.62	0.59	0.56		0.62	0.40	0.22		0.67	0.50	0.36	0.94	0.70	0.60	n/a
	14	(356)	0.86	0.85	0.76	0.66		0.78	0.57	0.34	0.76	0.64	0.61	0.57		0.78	0.51	0.28		0.78	0.57	0.39	1.00	0.75	0.65	n/a
	16	(406)	0.91	0.90	0.80	0.68		0.89	0.66	0.38	0.79	0.66	0.62	0.58		0.96	0.62	0.34		0.89	0.66	0.42		0.80	0.70	n/a
	16-3/4	(425)	0.93	0.91	0.81	0.69		0.93	0.69	0.40	0.81	0.67	0.63	0.59		1.00	0.67	0.37		0.93	0.69	0.43		0.82	0.71	0.58
	18	(457)	0.97	0.94	0.83	0.70		1.00	0.74	0.43	0.83	0.68	0.64	0.59			0.74	0.41		1.00	0.74	0.46		0.85	0.74	0.61
	20	(508)	1.00	0.99	0.87	0.72			0.82	0.48	0.87	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	0.91	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	0.94	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	0.98	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	1.00	0.78	0.71	0.64				0.79				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	0.74								1.00				0.99

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								Concrete thickness factor in shear[5] f_{HV}			
															⊥ Toward edge f_{RV}				‖ To edge f_{RV}							
Embedment h_{ef}		in.	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15	3-1/2	6-3/4	9	15
		(mm)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)	(89)	(171)	(229)	(381)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	n/a	0.45	0.44	0.42	0.39	n/a	n/a	n/a	n/a	0.09	0.03	0.03	0.02	0.17	0.07	0.05	0.03	n/a	n/a	n/a	n/a
	3-3/4	(95)	0.60	0.59	0.57	0.54	0.57	0.56	0.50	0.44	0.57	0.54	0.53	0.52	0.27	0.11	0.08	0.05	0.54	0.22	0.16	0.10	n/a	n/a	n/a	n/a
	4	(102)	0.60	0.60	0.57	0.54	0.58	0.57	0.51	0.44	0.57	0.54	0.53	0.52	0.30	0.12	0.09	0.05	0.59	0.24	0.18	0.11	n/a	n/a	n/a	n/a
	5	(127)	0.63	0.62	0.59	0.56	0.65	0.63	0.56	0.47	0.59	0.55	0.54	0.53	0.41	0.17	0.13	0.08	0.83	0.34	0.25	0.15	n/a	n/a	n/a	n/a
	5-1/4	(133)	0.64	0.63	0.60	0.56	0.67	0.65	0.57	0.47	0.60	0.55	0.54	0.53	0.45	0.18	0.14	0.08	0.89	0.36	0.27	0.16	0.62	n/a	n/a	n/a
	6	(152)	0.66	0.65	0.61	0.57	0.72	0.70	0.60	0.49	0.61	0.56	0.55	0.54	0.54	0.22	0.17	0.10	1.00	0.44	0.33	0.20	0.67	n/a	n/a	n/a
	7	(178)	0.68	0.67	0.63	0.58	0.79	0.77	0.65	0.52	0.63	0.57	0.56	0.54	0.69	0.28	0.21	0.12		0.56	0.42	0.25	0.72	n/a	n/a	n/a
	8	(203)	0.71	0.70	0.65	0.59	0.87	0.84	0.70	0.55	0.65	0.58	0.57	0.55	0.84	0.34	0.25	0.15		0.68	0.51	0.30	0.77	n/a	n/a	n/a
	8-1/2	(216)	0.72	0.71	0.66	0.59	0.91	0.88	0.72	0.56	0.66	0.59	0.57	0.55	0.92	0.37	0.28	0.17		0.75	0.56	0.33	0.79	0.59	n/a	n/a
	9	(229)	0.73	0.72	0.67	0.60	0.95	0.91	0.75	0.57	0.67	0.59	0.58	0.55	1.00	0.41	0.30	0.18		0.82	0.61	0.36	0.82	0.61	n/a	n/a
	10	(254)	0.76	0.75	0.69	0.61	1.00	0.99	0.80	0.60	0.69	0.60	0.58	0.56		0.48	0.36	0.21		0.95	0.71	0.43	0.86	0.64	n/a	n/a
	10-3/4	(273)	0.78	0.77	0.70	0.62		1.00	0.84	0.62	0.70	0.61	0.59	0.56		0.53	0.40	0.24		1.00	0.79	0.47	0.89	0.66	0.60	n/a
	12	(305)	0.81	0.80	0.72	0.63			0.91	0.66	0.72	0.62	0.60	0.57		0.63	0.47	0.28			0.91	0.56	0.94	0.70	0.63	n/a
	14	(356)	0.86	0.85	0.76	0.66			1.00	0.72	0.76	0.64	0.62	0.58		0.79	0.59	0.35			1.00	0.71	1.00	0.76	0.68	n/a
	16	(406)	0.91	0.90	0.80	0.68				0.78	0.80	0.66	0.63	0.60		0.97	0.72	0.43				0.78		0.81	0.73	n/a
	16-3/4	(425)	0.93	0.91	0.81	0.69				0.81	0.81	0.67	0.64	0.60		1.00	0.77	0.46				0.81		0.83	0.75	0.63
	18	(457)	0.97	0.94	0.83	0.70				0.85	0.83	0.68	0.65	0.61			0.86	0.51				0.85		0.86	0.78	0.65
	20	(508)	1.00	0.99	0.87	0.72				0.91	0.87	0.70	0.67	0.62			1.00	0.60				0.91		0.90	0.82	0.69
	22	(559)		1.00	0.91	0.74				0.98	0.91	0.72	0.68	0.63				0.70				0.98		0.95	0.86	0.72
	24	(610)			0.94	0.77				1.00	0.94	0.74	0.70	0.64				0.79				1.00		0.99	0.90	0.76
	26	(660)			0.98	0.79					0.98	0.76	0.72	0.65				0.89						1.00	0.93	0.79
	28	(711)			1.00	0.81					1.00	0.79	0.73	0.67				1.00							0.97	0.82
	30	(762)				0.83						0.81	0.75	0.68											1.00	0.84
	36	(914)				0.90						0.87	0.80	0.71												0.93
	>48	(1219)				1.00						0.99	0.90	0.79												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 318-14 Chapter 17.

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.

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)	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4 (44)	n/a	n/a	n/a	n/a	0.39	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)	0.60	0.59	0.57	0.54	0.57	0.30	0.22	0.13	0.58	0.54	0.53	0.52	0.35	0.11	0.07	0.04	0.63	0.22	0.14	0.07	n/a	n/a	n/a	n/a
	5 (127)	0.61	0.61	0.58	0.55	0.60	0.32	0.24	0.14	0.59	0.54	0.53	0.52	0.43	0.13	0.09	0.04	0.70	0.27	0.17	0.09	n/a	n/a	n/a	n/a
	5-1/2 (140)	0.62	0.62	0.59	0.55	0.63	0.34	0.25	0.15	0.60	0.55	0.54	0.52	0.50	0.15	0.10	0.05	0.76	0.31	0.20	0.10	0.65	n/a	n/a	n/a
	6 (152)	0.63	0.63	0.60	0.56	0.66	0.35	0.26	0.15	0.61	0.55	0.54	0.52	0.57	0.17	0.11	0.06	0.83	0.35	0.23	0.12	0.68	n/a	n/a	n/a
	7 (178)	0.66	0.65	0.61	0.57	0.72	0.39	0.28	0.17	0.63	0.56	0.55	0.53	0.71	0.22	0.14	0.07	0.97	0.39	0.29	0.15	0.73	n/a	n/a	n/a
	8 (203)	0.68	0.67	0.63	0.58	0.78	0.42	0.31	0.18	0.65	0.57	0.55	0.53	0.87	0.27	0.17	0.09	1.00	0.43	0.35	0.18	0.78	n/a	n/a	n/a
	9 (229)	0.70	0.69	0.64	0.59	0.85	0.45	0.33	0.20	0.67	0.58	0.56	0.54	1.00	0.32	0.21	0.11		0.46	0.38	0.21	0.83	n/a	n/a	n/a
	9-7/8 (251)	0.72	0.71	0.66	0.59	0.90	0.49	0.36	0.21	0.69	0.59	0.56	0.54		0.37	0.24	0.12		0.49	0.40	0.24	0.87	0.59	n/a	n/a
	10 (254)	0.72	0.71	0.66	0.60	0.91	0.49	0.36	0.21	0.69	0.59	0.57	0.54		0.38	0.24	0.12		0.50	0.40	0.25	0.87	0.59	n/a	n/a
	11 (279)	0.74	0.73	0.67	0.60	0.98	0.53	0.39	0.23	0.71	0.60	0.57	0.55		0.43	0.28	0.14		0.53	0.43	0.29	0.91	0.62	n/a	n/a
	12 (305)	0.77	0.75	0.69	0.61	1.00	0.57	0.42	0.25	0.73	0.60	0.58	0.55		0.49	0.32	0.16		0.57	0.45	0.33	0.95	0.65	n/a	n/a
	12-1/2 (318)	0.78	0.76	0.70	0.62		0.60	0.44	0.26	0.74	0.61	0.58	0.55		0.52	0.34	0.17		0.60	0.46	0.34	0.97	0.66	0.57	n/a
	14 (356)	0.81	0.80	0.72	0.63		0.67	0.49	0.29	0.77	0.62	0.59	0.56		0.62	0.40	0.21		0.67	0.50	0.36	1.00	0.70	0.60	n/a
	16 (406)	0.86	0.84	0.75	0.65		0.76	0.56	0.33	0.80	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)	0.90	0.88	0.79	0.67		0.86	0.63	0.37	0.84	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)	0.93	0.91	0.81	0.69		0.93	0.68	0.40	0.87	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)	0.94	0.92	0.82	0.69		0.95	0.70	0.41	0.88	0.67	0.63	0.58			0.69	0.35		0.95	0.70	0.44		0.83	0.72	0.58
	22 (559)	0.99	0.97	0.85	0.71		1.00	0.77	0.45	0.92	0.69	0.64	0.59			0.80	0.40		1.00	0.77	0.47		0.87	0.76	0.60
	24 (610)	1.00	1.00	0.88	0.73			0.84	0.49	0.96	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	0.99	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	1.00	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				0.64			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 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)	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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	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	0.05	0.03	n/a	n/a	n/a	n/a
	4-3/8 (111)	0.60	0.59	0.57	0.54	0.57	0.56	0.50	0.44	0.58	0.54	0.53	0.52	0.36	0.12	0.09	0.05	0.71	0.24	0.18	0.11	n/a	n/a	n/a	n/a
	5 (127)	0.61	0.61	0.58	0.55	0.60	0.59	0.52	0.45	0.60	0.55	0.54	0.53	0.43	0.15	0.11	0.07	0.87	0.29	0.22	0.13	n/a	n/a	n/a	n/a
	5-1/2 (140)	0.62	0.62	0.59	0.55	0.63	0.62	0.54	0.46	0.61	0.55	0.54	0.53	0.50	0.17	0.13	0.08	1.00	0.34	0.25	0.15	0.65	n/a	n/a	n/a
	6 (152)	0.63	0.63	0.60	0.56	0.66	0.64	0.56	0.47	0.61	0.56	0.55	0.53	0.57	0.19	0.14	0.09		0.38	0.29	0.17	0.68	n/a	n/a	n/a
	7 (178)	0.66	0.65	0.61	0.57	0.72	0.70	0.60	0.49	0.63	0.56	0.55	0.54	0.72	0.24	0.18	0.11		0.48	0.36	0.22	0.73	n/a	n/a	n/a
	8 (203)	0.68	0.67	0.63	0.58	0.78	0.76	0.64	0.52	0.65	0.57	0.56	0.54	0.88	0.29	0.22	0.13		0.59	0.44	0.26	0.78	n/a	n/a	n/a
	9 (229)	0.70	0.69	0.64	0.59	0.85	0.82	0.68	0.54	0.67	0.58	0.57	0.55	1.00	0.35	0.26	0.16		0.70	0.53	0.32	0.83	n/a	n/a	n/a
	9-7/8 (251)	0.72	0.71	0.66	0.59	0.90	0.87	0.72	0.56	0.69	0.59	0.58	0.55		0.40	0.30	0.18		0.81	0.60	0.36	0.87	0.60	n/a	n/a
	10 (254)	0.72	0.71	0.66	0.60	0.91	0.88	0.73	0.56	0.69	0.59	0.58	0.55		0.41	0.31	0.18		0.82	0.62	0.37	0.87	0.61	n/a	n/a
	11 (279)	0.74	0.73	0.67	0.60	0.98	0.95	0.77	0.59	0.71	0.60	0.58	0.56		0.47	0.36	0.21		0.95	0.71	0.43	0.92	0.64	n/a	n/a
	12 (305)	0.77	0.75	0.69	0.61	1.00	1.00	0.82	0.61	0.73	0.61	0.59	0.56		0.54	0.41	0.24		1.00	0.81	0.49	0.96	0.66	n/a	n/a
	12-1/2 (318)	0.78	0.76	0.70	0.62			0.84	0.62	0.74	0.62	0.60	0.57		0.57	0.43	0.26			0.84	0.52	0.98	0.68	0.62	n/a
	14 (356)	0.81	0.80	0.72	0.63			0.91	0.66	0.77	0.63	0.61	0.58		0.68	0.51	0.31			0.91	0.61	1.00	0.72	0.65	n/a
	16 (406)	0.86	0.84	0.75	0.65			1.00	0.71	0.81	0.65	0.62	0.59		0.83	0.62	0.37			1.00	0.71		0.77	0.70	n/a
	18 (457)	0.90	0.88	0.79	0.67				0.76	0.84	0.67	0.64	0.60		0.99	0.74	0.45				0.76		0.81	0.74	n/a
	19-1/2 (495)	0.93	0.91	0.81	0.69				0.80	0.87	0.68	0.65	0.61		1.00	0.84	0.50				0.80		0.85	0.77	0.65
	20 (508)	0.94	0.92	0.82	0.69				0.82	0.88	0.68	0.65	0.61			0.87	0.52				0.82		0.86	0.78	0.66
	22 (559)	0.99	0.97	0.85	0.71				0.87	0.92	0.70	0.67	0.62			1.00	0.60				0.87		0.90	0.82	0.69
	24 (610)	1.00	1.00	0.88	0.73				0.93	0.96	0.72	0.68	0.63				0.69				0.93		0.94	0.85	0.72
	26 (660)			0.91	0.75				0.99	1.00	0.74	0.70	0.64				0.78				0.99		0.98	0.89	0.75
	28 (711)			0.94	0.77				1.00		0.76	0.71	0.65				0.87				1.00		1.00	0.92	0.78
	30 (762)			0.98	0.79						0.78	0.73	0.66				0.96							0.96	0.81
	36 (914)			1.00	0.84						0.83	0.77	0.69				1.00							1.00	0.88
	>48 (1219)				0.96						0.94	0.86	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 318-14 Chapter 17.

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								Concrete thickness factor in shear[5] f_{HV}			
														⊥ Toward edge f_{RV}				ǁ To edge f_{RV}							
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	0.38	0.23	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)	0.60	0.59	0.57	0.54	0.57	0.31	0.22	0.13	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.03	0.65	0.22	0.14	0.07	n/a	n/a	n/a	n/a
	6 (152)	0.62	0.61	0.58	0.55	0.62	0.33	0.24	0.14	0.60	0.55	0.53	0.52	0.48	0.14	0.09	0.04	0.74	0.29	0.19	0.09	n/a	n/a	n/a	n/a
	6-1/4 (159)	0.62	0.62	0.59	0.55	0.63	0.34	0.25	0.15	0.61	0.55	0.54	0.52	0.51	0.15	0.10	0.05	0.77	0.30	0.20	0.09	0.65	n/a	n/a	n/a
	7 (178)	0.64	0.63	0.60	0.56	0.67	0.36	0.26	0.15	0.62	0.55	0.54	0.52	0.61	0.18	0.12	0.06	0.87	0.36	0.23	0.11	0.69	n/a	n/a	n/a
	8 (203)	0.66	0.65	0.61	0.57	0.72	0.39	0.28	0.17	0.64	0.56	0.55	0.53	0.74	0.22	0.14	0.07	0.99	0.40	0.29	0.14	0.74	n/a	n/a	n/a
	9 (229)	0.67	0.67	0.63	0.58	0.77	0.42	0.31	0.18	0.65	0.57	0.55	0.53	0.89	0.26	0.17	0.08	1.00	0.43	0.34	0.16	0.78	n/a	n/a	n/a
	10 (254)	0.69	0.69	0.64	0.58	0.83	0.45	0.33	0.19	0.67	0.58	0.56	0.53	1.00	0.31	0.20	0.09		0.46	0.37	0.19	0.83	n/a	n/a	n/a
	11 (279)	0.71	0.70	0.65	0.59	0.89	0.48	0.35	0.21	0.69	0.58	0.56	0.54		0.35	0.23	0.11		0.49	0.39	0.22	0.87	n/a	n/a	n/a
	11-1/4 (286)	0.72	0.71	0.66	0.59	0.90	0.49	0.36	0.21	0.69	0.59	0.56	0.54		0.37	0.24	0.11		0.50	0.40	0.23	0.88	0.58	n/a	n/a
	12 (305)	0.73	0.72	0.67	0.60	0.95	0.51	0.37	0.22	0.70	0.59	0.57	0.54		0.40	0.26	0.12		0.52	0.41	0.25	0.91	0.60	n/a	n/a
	13 (330)	0.75	0.74	0.68	0.61	1.00	0.55	0.40	0.23	0.72	0.60	0.57	0.55		0.46	0.30	0.14		0.55	0.44	0.28	0.94	0.63	n/a	n/a
	14 (356)	0.77	0.76	0.69	0.62		0.59	0.43	0.25	0.74	0.61	0.58	0.55		0.51	0.33	0.16		0.59	0.46	0.31	0.98	0.65	n/a	n/a
	14-1/4 (362)	0.78	0.76	0.70	0.62		0.60	0.44	0.26	0.74	0.61	0.58	0.55		0.52	0.34	0.16		0.60	0.46	0.32	0.99	0.66	0.57	n/a
	16 (406)	0.81	0.80	0.72	0.63		0.67	0.49	0.29	0.77	0.62	0.59	0.56		0.62	0.40	0.19		0.67	0.50	0.36	1.00	0.70	0.60	n/a
	18 (457)	0.85	0.83	0.75	0.65		0.76	0.55	0.32	0.81	0.64	0.60	0.56		0.74	0.48	0.23		0.76	0.55	0.38		0.74	0.64	n/a
	20 (508)	0.89	0.87	0.78	0.67		0.84	0.61	0.36	0.84	0.65	0.61	0.57		0.87	0.56	0.27		0.84	0.61	0.40		0.78	0.67	n/a
	22 (559)	0.93	0.91	0.81	0.68		0.93	0.67	0.40	0.88	0.67	0.63	0.58		1.00	0.65	0.31		0.93	0.67	0.43		0.82	0.71	n/a
	22-1/4 (565)	0.93	0.91	0.81	0.69		0.94	0.68	0.40	0.88	0.67	0.63	0.58			0.66	0.32		0.94	0.68	0.43		0.82	0.71	0.56
	24 (610)	0.97	0.94	0.83	0.70		1.00	0.74	0.43	0.91	0.68	0.64	0.58			0.74	0.35		1.00	0.74	0.46		0.85	0.74	0.58
	26 (660)	1.00	0.98	0.86	0.72			0.80	0.47	0.94	0.70	0.65	0.59			0.84	0.40			0.80	0.48		0.89	0.77	0.60
	28 (711)		1.00	0.89	0.73			0.86	0.50	0.98	0.71	0.66	0.60			0.94	0.44			0.86	0.51		0.92	0.80	0.62
	30 (762)			0.92	0.75			0.92	0.54	1.00	0.73	0.67	0.60			1.00	0.49			0.92	0.54		0.95	0.83	0.65
	36 (914)			1.00	0.80			1.00	0.65		0.77	0.70	0.62				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 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								Concrete thickness factor in shear[5] f_{HV}			
														⊥ Toward edge f_{RV}				ǁ To edge f_{RV}							
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)	0.60	0.59	0.57	0.54	0.57	0.56	0.50	0.44	0.59	0.54	0.53	0.52	0.37	0.11	0.08	0.05	0.74	0.22	0.17	0.10	n/a	n/a	n/a	n/a
	6 (152)	0.62	0.61	0.58	0.55	0.62	0.60	0.53	0.46	0.60	0.55	0.54	0.53	0.49	0.15	0.11	0.07	0.97	0.29	0.22	0.13	n/a	n/a	n/a	n/a
	6-1/4 (159)	0.62	0.62	0.59	0.55	0.63	0.61	0.54	0.46	0.61	0.55	0.54	0.53	0.52	0.15	0.12	0.07	1.00	0.31	0.23	0.14	0.66	n/a	n/a	n/a
	7 (178)	0.64	0.63	0.60	0.56	0.67	0.65	0.57	0.47	0.62	0.55	0.54	0.53	0.61	0.18	0.14	0.08		0.37	0.27	0.16	0.69	n/a	n/a	n/a
	8 (203)	0.66	0.65	0.61	0.57	0.72	0.70	0.60	0.49	0.64	0.56	0.55	0.54	0.75	0.22	0.17	0.10		0.45	0.34	0.20	0.74	n/a	n/a	n/a
	9 (229)	0.67	0.67	0.63	0.58	0.77	0.75	0.64	0.51	0.65	0.57	0.56	0.54	0.89	0.27	0.20	0.12		0.53	0.40	0.24	0.79	n/a	n/a	n/a
	10 (254)	0.69	0.69	0.64	0.58	0.83	0.80	0.67	0.53	0.67	0.58	0.56	0.55	1.00	0.31	0.23	0.14		0.63	0.47	0.28	0.83	n/a	n/a	n/a
	11 (279)	0.71	0.70	0.65	0.59	0.89	0.86	0.71	0.55	0.69	0.58	0.57	0.55		0.36	0.27	0.16		0.72	0.54	0.32	0.87	n/a	n/a	n/a
	11-1/4 (286)	0.72	0.71	0.66	0.59	0.90	0.87	0.72	0.56	0.69	0.59	0.57	0.55		0.37	0.28	0.17		0.75	0.56	0.34	0.88	0.59	n/a	n/a
	12 (305)	0.73	0.72	0.67	0.60	0.95	0.91	0.75	0.57	0.71	0.59	0.58	0.55		0.41	0.31	0.18		0.82	0.62	0.37	0.91	0.61	n/a	n/a
	13 (330)	0.75	0.74	0.68	0.61	1.00	0.97	0.79	0.59	0.72	0.60	0.58	0.56		0.46	0.35	0.21		0.93	0.70	0.42	0.95	0.63	n/a	n/a
	14 (356)	0.77	0.76	0.69	0.62		1.00	0.83	0.62	0.74	0.61	0.59	0.56		0.52	0.39	0.23		1.00	0.78	0.47	0.98	0.66	n/a	n/a
	14-1/4 (362)	0.78	0.76	0.70	0.62			0.84	0.62	0.74	0.61	0.59	0.56		0.53	0.40	0.24			0.80	0.48	0.99	0.66	0.60	n/a
	16 (406)	0.81	0.80	0.72	0.63			0.91	0.66	0.77	0.62	0.60	0.57		0.63	0.47	0.28			0.91	0.57	1.00	0.70	0.64	n/a
	18 (457)	0.85	0.83	0.75	0.65			1.00	0.70	0.81	0.64	0.61	0.58		0.75	0.57	0.34			1.00	0.68		0.74	0.68	n/a
	20 (508)	0.89	0.87	0.78	0.67				0.75	0.84	0.65	0.63	0.59		0.88	0.66	0.40				0.75		0.78	0.71	n/a
	22 (559)	0.93	0.91	0.81	0.68				0.80	0.88	0.67	0.64	0.60		1.00	0.77	0.46				0.80		0.82	0.75	n/a
	22-1/4 (565)	0.93	0.91	0.81	0.69				0.80	0.88	0.67	0.64	0.60			0.78	0.47				0.80		0.83	0.75	0.63
	24 (610)	0.97	0.94	0.83	0.70				0.85	0.91	0.68	0.65	0.61			0.87	0.52				0.85		0.86	0.78	0.66
	26 (660)	1.00	0.98	0.86	0.72				0.90	0.95	0.70	0.66	0.62			0.98	0.59				0.90		0.89	0.81	0.68
	28 (711)		1.00	0.89	0.73				0.95	0.98	0.71	0.68	0.63			1.00	0.66				0.95		0.93	0.84	0.71
	30 (762)			0.92	0.75				1.00	1.00	0.73	0.69	0.64				0.73				1.00		0.96	0.87	0.74
	36 (914)			1.00	0.80						0.78	0.73	0.66				0.96						1.00	0.96	0.81
	>48 (1219)				0.90						0.87	0.80	0.72				1.00							1.00	0.93

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 318-14 Chapter 17.

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 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)		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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	n/a	0.37	0.23	0.16	0.09	n/a	n/a	n/a	n/a	0.05	0.02	0.01	0.00	0.11	0.03	0.02	0.01	n/a	n/a	n/a	n/a
	6-1/4	(159)	0.60	0.59	0.57	0.54	0.57	0.32	0.22	0.13	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.03	0.67	0.22	0.14	0.07	n/a	n/a	n/a	n/a
	7	(178)	0.61	0.60	0.58	0.55	0.60	0.34	0.23	0.14	0.60	0.54	0.53	0.52	0.43	0.13	0.08	0.04	0.73	0.26	0.17	0.08	n/a	n/a	n/a	n/a
	8	(203)	0.62	0.62	0.59	0.55	0.64	0.36	0.25	0.15	0.61	0.55	0.54	0.52	0.53	0.16	0.10	0.05	0.82	0.31	0.20	0.10	0.66	n/a	n/a	n/a
	9	(229)	0.64	0.63	0.60	0.56	0.68	0.38	0.27	0.16	0.62	0.55	0.54	0.52	0.63	0.19	0.12	0.06	0.93	0.38	0.24	0.11	0.70	n/a	n/a	n/a
	10	(254)	0.66	0.65	0.61	0.57	0.72	0.41	0.28	0.17	0.64	0.56	0.55	0.53	0.74	0.22	0.14	0.07	1.00	0.41	0.29	0.13	0.74	n/a	n/a	n/a
	11	(279)	0.67	0.66	0.62	0.57	0.76	0.43	0.30	0.18	0.65	0.57	0.55	0.53	0.86	0.25	0.16	0.08		0.44	0.33	0.15	0.78	n/a	n/a	n/a
	12	(305)	0.69	0.68	0.63	0.58	0.81	0.46	0.32	0.19	0.66	0.57	0.55	0.53	0.98	0.29	0.19	0.09		0.46	0.36	0.17	0.81	n/a	n/a	n/a
	13	(330)	0.70	0.69	0.64	0.59	0.85	0.48	0.34	0.20	0.68	0.58	0.56	0.54	1.00	0.33	0.21	0.10		0.49	0.38	0.20	0.84	n/a	n/a	n/a
	14	(356)	0.72	0.71	0.66	0.59	0.90	0.51	0.35	0.21	0.69	0.59	0.56	0.54		0.36	0.24	0.11		0.52	0.40	0.22	0.87	0.58	n/a	n/a
	14-1/4	(362)	0.72	0.71	0.66	0.60	0.91	0.52	0.36	0.21	0.69	0.59	0.56	0.54		0.37	0.24	0.11		0.52	0.40	0.23	0.88	0.59	n/a	n/a
	15	(381)	0.73	0.72	0.67	0.60	0.95	0.54	0.37	0.22	0.70	0.59	0.57	0.54		0.40	0.26	0.12		0.54	0.41	0.24	0.91	0.60	n/a	n/a
	16	(406)	0.75	0.74	0.68	0.61	1.00	0.56	0.39	0.23	0.72	0.60	0.57	0.54		0.45	0.29	0.13		0.57	0.43	0.27	0.94	0.62	n/a	n/a
	17	(432)	0.76	0.75	0.69	0.61		0.60	0.42	0.24	0.73	0.60	0.58	0.55		0.49	0.32	0.15		0.60	0.45	0.29	0.96	0.64	n/a	n/a
	18	(457)	0.78	0.77	0.70	0.62		0.63	0.44	0.26	0.75	0.61	0.58	0.55		0.53	0.35	0.16		0.63	0.47	0.32	0.99	0.66	0.57	n/a
	20	(508)	0.81	0.80	0.72	0.63		0.70	0.49	0.29	0.77	0.62	0.59	0.55		0.62	0.40	0.19		0.70	0.50	0.36	1.00	0.70	0.60	n/a
	22	(559)	0.84	0.83	0.74	0.65		0.77	0.54	0.32	0.80	0.63	0.60	0.56		0.72	0.47	0.22		0.77	0.54	0.37		0.73	0.63	n/a
	24	(610)	0.87	0.86	0.77	0.66		0.84	0.59	0.34	0.83	0.65	0.61	0.57		0.82	0.53	0.25		0.84	0.59	0.39		0.76	0.66	n/a
	26	(660)	0.90	0.89	0.79	0.67		0.91	0.64	0.37	0.86	0.66	0.62	0.57		0.92	0.60	0.28		0.91	0.64	0.41		0.79	0.69	n/a
	28	(711)	0.94	0.91	0.81	0.69		0.98	0.69	0.40	0.88	0.67	0.63	0.58		1.00	0.67	0.31		0.98	0.69	0.43		0.82	0.71	0.55
	30	(762)	0.97	0.94	0.83	0.70		1.00	0.73	0.43	0.91	0.68	0.64	0.58			0.74	0.35		1.00	0.73	0.46		0.85	0.74	0.57
	36	(914)	1.00	1.00	0.90	0.74			0.88	0.52	0.99	0.72	0.66	0.60			0.98	0.45			0.88	0.52		0.94	0.81	0.63
	>48	(1219)			1.00	0.82			1.00	0.69	1.00	0.79	0.72	0.63			1.00	0.70			1.00	0.69		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)		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)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	n/a	0.41	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)	0.60	0.59	0.57	0.54	0.57	0.56	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
	7	(178)	0.61	0.60	0.58	0.55	0.60	0.58	0.52	0.45	0.60	0.54	0.53	0.52	0.44	0.13	0.09	0.05	0.88	0.26	0.17	0.10	n/a	n/a	n/a	n/a
	8	(203)	0.62	0.62	0.59	0.55	0.64	0.62	0.55	0.46	0.61	0.55	0.54	0.53	0.54	0.16	0.11	0.06	1.00	0.32	0.21	0.13	0.66	n/a	n/a	n/a
	9	(229)	0.64	0.63	0.60	0.56	0.68	0.66	0.57	0.48	0.62	0.55	0.54	0.53	0.64	0.19	0.13	0.08		0.38	0.25	0.15	0.70	n/a	n/a	n/a
	10	(254)	0.66	0.65	0.61	0.57	0.72	0.70	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
	11	(279)	0.67	0.66	0.62	0.57	0.76	0.74	0.63	0.51	0.65	0.57	0.55	0.54	0.86	0.26	0.17	0.10		0.51	0.34	0.21	0.78	n/a	n/a	n/a
	12	(305)	0.69	0.68	0.63	0.58	0.81	0.78	0.66	0.53	0.66	0.57	0.56	0.54	0.98	0.29	0.20	0.12		0.58	0.39	0.24	0.81	n/a	n/a	n/a
	13	(330)	0.70	0.69	0.64	0.59	0.85	0.82	0.69	0.54	0.68	0.58	0.56	0.54	1.00	0.33	0.22	0.13		0.66	0.44	0.27	0.85	n/a	n/a	n/a
	14	(356)	0.72	0.71	0.66	0.59	0.90	0.87	0.72	0.56	0.69	0.59	0.57	0.55		0.37	0.25	0.15		0.73	0.49	0.30	0.88	0.58	n/a	n/a
	14-1/4	(362)	0.72	0.71	0.66	0.60	0.91	0.88	0.73	0.56	0.70	0.59	0.57	0.55		0.38	0.25	0.15		0.75	0.51	0.30	0.89	0.59	n/a	n/a
	15	(381)	0.73	0.72	0.67	0.60	0.95	0.91	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
	16	(406)	0.75	0.74	0.68	0.61	1.00	0.96	0.78	0.59	0.72	0.60	0.57	0.55		0.45	0.30	0.18		0.90	0.60	0.36	0.94	0.63	n/a	n/a
	17	(432)	0.76	0.75	0.69	0.61		1.00	0.81	0.61	0.73	0.60	0.58	0.56		0.49	0.33	0.20		0.98	0.66	0.40	0.97	0.64	n/a	n/a
	18	(457)	0.78	0.77	0.70	0.62			0.85	0.62	0.75	0.61	0.58	0.56		0.54	0.36	0.22		1.00	0.72	0.43	0.99	0.66	0.58	n/a
	20	(508)	0.81	0.80	0.72	0.63			0.91	0.66	0.77	0.62	0.59	0.57		0.63	0.42	0.25			0.84	0.51	1.00	0.70	0.61	n/a
	22	(559)	0.84	0.83	0.74	0.65			0.98	0.69	0.80	0.63	0.60	0.57		0.72	0.49	0.29			0.97	0.58		0.73	0.64	n/a
	24	(610)	0.87	0.86	0.77	0.66			1.00	0.73	0.83	0.65	0.61	0.58		0.82	0.55	0.33			1.00	0.67		0.77	0.67	n/a
	26	(660)	0.90	0.89	0.79	0.67				0.77	0.86	0.66	0.62	0.59		0.93	0.63	0.38				0.75		0.80	0.70	n/a
	28	(711)	0.94	0.91	0.81	0.69				0.81	0.88	0.67	0.63	0.59		1.00	0.70	0.42				0.81		0.83	0.72	0.61
	30	(762)	0.97	0.94	0.83	0.70				0.85	0.91	0.68	0.64	0.60			0.77	0.46				0.85		0.86	0.75	0.63
	36	(914)	1.00	1.00	0.90	0.74				0.97	0.99	0.72	0.67	0.62			1.00	0.61				0.97		0.94	0.82	0.69
	>48	(1219)			1.00	0.82				1.00	1.00	0.79	0.72	0.66				0.94				1.00		1.00	0.95	0.80

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 318-14 Chapter 17.

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

HIT-HY 200 with HIS-N Inserts

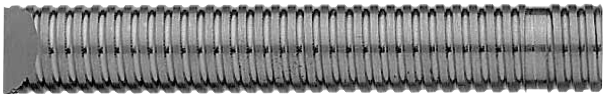


Figure 12 - HIS-N and HIS-RN internally threaded insert installation conditions

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 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)
Minimum concrete thickness		h_{min}	in. (mm)	5.9 (150)	6.7 (170)	9.1 (230)	10.6 (270)
Minimum edge distance		c_{min}	in (mm)	3-1/4 (48)	4 (64)	5 (79)	5-1/2 (95)
Minimum anchor spacing		s_{min}	in (mm)	3-1/4 (48)	4 (64)	5 (79)	5-1/2 (95)

Figure 13 - HIS-N and HIS-RN specifications

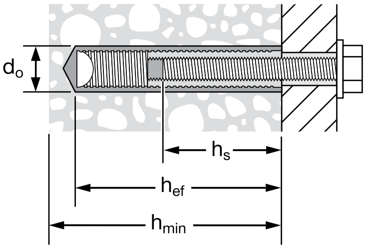


Table 57 - Hilti HIT-HY 200 adhesive design strength with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete [1,2,3,4,5,6,7,8,9]

Thread size	Effective embedment in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 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)	10,585 (47.1)	15,375 (68.4)	16,840 (74.9)	19,445 (86.5)	22,800 (101.4)
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				Shear — ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.4 MPa) lb (kN)
3/8-16 UNC	4-3/8 (111)	5,055 (22.5)	5,540 (24.6)	5,720 (25.4)	5,960 (26.5)	10,890 (48.4)	11,930 (53.1)	12,325 (54.8)	12,835 (57.1)
1/2-13 UNC	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	8,575 (38.1)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	18,470 (82.2)
5/8-11 UNC	6-3/4 (171)	9,690 (43.1)	10,615 (47.2)	11,630 (51.7)	12,110 (53.9)	20,870 (92.8)	22,860 (101.7)	25,050 (111.4)	26,085 (116.0)
3/4-10 UNC	8-1/8 (206)	12,795 (56.9)	14,015 (62.3)	15,260 (67.9)	15,890 (70.7)	27,560 (122.6)	30,190 (134.3)	32,865 (146.2)	34,225 (152.2)

1 See section 3.1.8 for explanation on development of load values.
2 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Apply spacing, edge distance, and concrete thickness factors in tables 60 - 61 as necessary to the above values. 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 = 130° F (55° C), max. long term temperature = 110° F (43° C).
For temperature range B: Max. short term temperature = 176° F (80° C), max. long term temperature = 110° F (43° C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248° F (120° C), max. long term temperature = 162° F (72° C) multiply above values by 0.78.
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 3.1.8.8.
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.60.
See section 3.1.8.7 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[1,2,3]

Thread size	ACI 318-14 Chapter 17 Based Design					
	ASTM A193 B7			ASTM A193 Grade B8M stainless steel		
	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)
3/8-16 UNC	6,300 (28.0)	3,490 (15.5)	2,445 (10.9)	5,540 (24.6)	3,070 (13.7)	2,150 (9.6)
1/2-13 UNC	11,530 (51.3)	6,385 (28.4)	4,470 (19.9)	10,145 (45.1)	5,620 (25.0)	3,935 (17.5)
5/8-11 UNC	18,365 (81.7)	10,170 (45.2)	7,120 (31.6)	16,160 (71.9)	8,950 (39.8)	6,265 (27.9)
3/4-10 UNC	27,180 (120.9)	15,055 (67.0)	10,540 (46.9)	23,915 (106.4)	13,245 (58.9)	9,270 (41.2)

1 See section 3.1.8.6 to convert design strength (factored resistance) value to ASD value.
2 Hilti HIS-N and HIS-RN inserts with steel bolts are to be considered brittle steel elements.
3 Table values are the lesser of steel failure in the HIS-N insert or inserted steel bolt.
4 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17.
5 Shear values determined by static shear tests with $\phi V_{sa} \leq \phi\ 0.60\ A_{se,V}\ f_{uta}$ as noted in ACI 318-14 Chapter 17.
6 Seismic Shear = $\alpha_{V,seis}\ \phi_{Vsa}$: Reduction for seismic shear only. See section 3.1.8.7 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								Concrete thickness factor in shear[5] f_{HV}			
															⊥ Toward edge f_{RV}				‖ To edge f_{RV}							
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		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
h_{ef}		(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)	0.60	n/a	n/a	n/a	0.37	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)	0.62	0.60	n/a	n/a	0.41	0.40	n/a	n/a	0.56	0.55	n/a	n/a	0.21	0.19	n/a	n/a	0.41	0.38	n/a	n/a	n/a	n/a	n/a	n/a
	5	(127)	0.65	0.62	0.60	n/a	0.48	0.45	0.39	n/a	0.57	0.57	0.55	n/a	0.29	0.26	0.17	n/a	0.48	0.45	0.33	n/a	n/a	n/a	n/a	n/a
	5-1/2	(140)	0.66	0.63	0.61	0.60	0.51	0.48	0.41	0.37	0.58	0.58	0.56	0.55	0.34	0.30	0.19	0.15	0.51	0.48	0.39	0.29	n/a	n/a	n/a	n/a
	6	(152)	0.68	0.64	0.62	0.61	0.54	0.51	0.43	0.39	0.59	0.58	0.56	0.55	0.39	0.35	0.22	0.17	0.54	0.51	0.43	0.33	0.60	n/a	n/a	n/a
	7	(178)	0.71	0.67	0.64	0.62	0.62	0.57	0.48	0.42	0.60	0.60	0.57	0.56	0.49	0.43	0.28	0.21	0.62	0.57	0.48	0.42	0.64	0.62	n/a	n/a
	8	(203)	0.74	0.69	0.66	0.64	0.71	0.65	0.52	0.45	0.62	0.61	0.58	0.57	0.60	0.53	0.34	0.26	0.71	0.65	0.52	0.45	0.69	0.66	n/a	n/a
	9	(229)	0.77	0.72	0.67	0.66	0.80	0.73	0.57	0.49	0.63	0.62	0.59	0.58	0.71	0.63	0.40	0.31	0.80	0.73	0.57	0.49	0.73	0.70	n/a	n/a
	10	(254)	0.80	0.74	0.69	0.68	0.88	0.81	0.62	0.53	0.65	0.64	0.60	0.58	0.83	0.74	0.47	0.36	0.88	0.81	0.62	0.53	0.77	0.74	0.64	n/a
	11	(279)	0.83	0.76	0.71	0.70	0.97	0.89	0.68	0.56	0.66	0.65	0.61	0.59	0.96	0.86	0.55	0.41	0.97	0.89	0.68	0.56	0.81	0.78	0.67	0.61
	12	(305)	0.86	0.79	0.73	0.71	1.00	0.97	0.74	0.60	0.68	0.66	0.62	0.60	1.00	0.98	0.62	0.47	1.00	0.97	0.74	0.60	0.84	0.81	0.70	0.64
	14	(356)	0.92	0.84	0.77	0.75		1.00	0.86	0.70	0.71	0.69	0.64	0.62		1.00	0.78	0.59		1.00	0.86	0.70	0.91	0.87	0.75	0.69
	16	(406)	0.98	0.88	0.81	0.79			0.98	0.80	0.74	0.72	0.66	0.63			0.96	0.73			0.98	0.80	0.97	0.94	0.80	0.73
	18	(457)	1.00	0.93	0.85	0.82			1.00	0.90	0.77	0.75	0.68	0.65			1.00	0.87			1.00	0.90	1.00	0.99	0.85	0.78
	24	(610)		1.00	0.97	0.93				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								Concrete thickness factor in shear[5] f_{HV}			
															⊥ Toward edge f_{RV}				‖ To edge f_{RV}							
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		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
h_{ef}		(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)	0.60	n/a	n/a	n/a	0.57	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)	0.62	0.60	n/a	n/a	0.62	0.56	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)	0.65	0.62	0.60	n/a	0.70	0.62	0.57	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)	0.66	0.63	0.61	0.60	0.74	0.66	0.59	0.57	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)	0.68	0.64	0.62	0.61	0.79	0.69	0.62	0.59	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)	0.71	0.67	0.64	0.62	0.87	0.75	0.67	0.64	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)	0.74	0.69	0.66	0.64	0.97	0.82	0.72	0.68	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)	0.77	0.72	0.67	0.66	1.00	0.89	0.77	0.73	0.63	0.62	0.59	0.58	0.72	0.64	0.41	0.31			0.82	0.62	0.73	0.70	n/a	n/a
	10	(254)	0.80	0.74	0.69	0.68		0.97	0.83	0.78	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)	0.83	0.76	0.71	0.70		1.00	0.89	0.83	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)	0.86	0.79	0.73	0.71			0.95	0.89	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)	0.92	0.84	0.77	0.75			1.00	1.00	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)	0.98	0.88	0.81	0.79					0.74	0.72	0.66	0.64			0.97	0.73					0.97	0.94	0.81	0.74
	18	(457)	1.00	0.93	0.85	0.82					0.77	0.75	0.68	0.65			1.00	0.87					1.00	0.99	0.86	0.78
	24	(610)		1.00	0.97	0.93					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 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 318-14 Chapter 17.

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 $f_{HV} = 1.0$.

3.2.3.3.2 Canadian Limit State design

Limit State Design of anchors is described in the provisions of CSA A23.3-14 Annex D for post-installed anchors tested and assessed in accordance with ACI 355.2 for mechanical anchors and ACI 355.4 for adhesive anchors. This section contains the Limit State Design tables with unfactored characteristic loads that are based on the published loads in ICC Evaluation Services ESR-3187. These tables are followed by factored resistance tables. The factored resitance tables have characteristic design loads that are prefactored by the applicable reduction factors for a single anchor with no anchor-to-anchor spacing or edge distance adjustments for the convenience of the user of this document. All the figures in the previous ACI 318-14 Chapter 17 design section are applicable to Limit State Design and the tables will reference these figures.

For a detailed explanation of the tables developed in accordance with CSA A23.3-14 Annex D, refer to Section 3.1.8. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.ca

Table 62 - Steel factored resistance for Hilti HIT-Z and HIT-Z-R anchor rods[1]

Nominal anchor diameter in.	HIT-Z Carbon Steel Rod[2]			HIT-Z-R Stainless Steel Rod[2]		
	Tensile N_{sar}[3] lb (kN)	Shear V_{sar}[4] lb (kN)	Seismic shear $V_{sar,eq}$[5] lb (kN)	Tensile N_{sar}[3] lb (kN)	Shear V_{sar}[4] lb (kN)	Seismic shear $V_{sar,eq}$[5] lb (kN)
3/8	4,345 (19.3)	1,775 (7.9)	1,775 (7.9)	4,345 (19.3)	2,420 (10.8)	2,420 (10.8)
1/2	7,960 (35.4)	3,250 (14.5)	2,115 (9.4)	7,960 (35.4)	4,435 (19.7)	3,325 (14.8)
5/8	12,675 (56.4)	5,180 (23.0)	3,365 (15.0)	12,675 (56.4)	7,065 (31.4)	4,590 (20.4)
3/4	18,725 (83.3)	7,650 (34.0)	4,975 (22.1)	18,725 (83.3)	10,435 (46.4)	6,785 (30.2)

[1] See section 3.1.8.6 to convert design strength value to ASD value.

[2] HIT-Z and HIT-Z-R anchor rods are considered brittle steel elements.

[3] Tensile = $A_{se,N}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Annex D.

[4] Shear values determined by static shear tests with $V_{sar} \leq A_{se,V}\ \phi_s\ 0.60\ f_{uta}$ R as noted in CSA A23.3-14 Annex D.

[5] Seismic Shear = $\alpha_{V,seis}\ V_{sar}$: Reduction factor for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 63 - Hilti HIT-HY 200 design information with Hilti HIT-Z and HIT-R-Z anchor rods in hammer drilled holes or diamond core drilled holes in accordance with CSA A23.3-14[1]

Design parameter		Symbol	Units	Nominal rod diameter (in.)				Ref
				3/8	1/2	5/8	3/4	A23.3-14
Nominal anchor diameter		d_a	mm	9.5	12.7	15.9	19.1	
Effective minimum embedment[2]		h_{ef}	mm	60	70	95	102	
Effective maximum embedment[2]		h_{ef}	mm	114	152	190	216	
Minimum concrete thickness[3]		h_{min}	mm	See tables 6 to 9 of this section or table 8 of ESR-3187				
Critical edge distance		c_{ac}	–	See section 4.1.10.1 of ESR-3187				
Minimum edge distance[4]		c_{ac}	–	See tables 6 to 9 of this section or table 8 of ESR-3187				
Minimum anchor spacing[4]		s_{min}	–					
Coeff. for factored concrete breakout resistance, uncracked concrete		$k_{c,uncr}{}^5$	–	10				D.6.2.2
Coeff. for factored concrete breakout resistance, cracked concrete		$k_{c,cr}{}^5$	–	7				D.6.2.2
Concrete material resistance factor		ϕ_c	–	0.65				8.4.2
Resistance modification factor for tension and shear, concrete failure modes, Condition B[4]		R_{conc}	–	1.00				D.5.3(c)
Temp range A[7]	Characteristic pullout resistance in cracked concrete	$N_{p,cr}$	psi (MPa)	7,952 (35.4)	10,936 (48.6)	21,391 (95.2)	27,930 (124.2)	D.6.3.1
	Characteristic pullout resistance in uncracked concrete	$N_{p,uncr}$	psi (MPa)	7,952 (35.4)	11,719 (52.1)	21,391 (95.2)	28,460 (126.6)	D.6.3.1
Temp range B[7]	Characteristic pullout resistance in cracked concrete	$N_{p,cr}$	psi (MPa)	7,952 (35.4)	10,936 (48.6)	21,391 (95.2)	27,930 (124.2)	D.6.3.1
	Characteristic pullout resistance in uncracked concrete	$N_{p,uncr}$	psi (MPa)	7,952 (35.4)	11,719 (52.1)	21,391 (95.2)	28,460 (126.6)	D.6.3.1
Temp range C[7]	Characteristic pullout resistance in cracked concrete	$N_{p,cr}$	psi (MPa)	7,182 (31.9)	9,877 (43.9)	19,321 (85.9)	25,277 (112.4)	D.6.3.1
	Characteristic pullout resistance in uncracked concrete	$N_{p,uncr}$	psi (MPa)	7,182 (31.9)	10,585 (47.1)	19,321 (85.9)	25,705 (114.3)	D.6.3.1
Reduction for seismic tension		$\alpha_{N,seis}$	–	0.94	1.0			
Permissible installation conditions	Resistance modification factor tension and shear, pullout failure dry concrete	Anchor category	–	1				D.5.3 (c)
		R_{dry}	–	1.00				
	Resistance modification factor tension and shear, pullout failure water-saturated concrete	Anchor category	–	1				D.5.3 (c)
		R_{ws}	–	1.00				

1 Design information in this table is taken from ICC-ES ESR-3187, dated September, 2015, tables 8 and 10, and converted for use with CSA A23.3-14 Annex D.

2 See figure 2 of this section.

3 See figure 5 of this section.

4 See figure 6 of this section.

5 For all design cases, $\psi_{c,N} = 1.0$. The appropriate coefficient for breakout resistance for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.

6 For use with the load combinations of CSA A23.3-14 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.

7 Temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
Temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C).
Temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C).
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.

Table 64 - Hilti HIT-HY 200 adhesive factored resistance with concrete/pullout failure for Hilti HIT-Z and HIT-Z-R anchor rods in uncracked concrete[1,2,3,4,5,6,7,8, 9,10]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	2-3/8 (60)	3,060 (13.6)	3,425 (15.2)	3,750 (16.7)	4,330 (19.3)	3,060 (13.6)	3,425 (15.2)	3,750 (16.7)	4,330 (19.3)
	3-3/8 (86)	5,175 (23.0)	5,175 (23.0)	5,175 (23.0)	5,175 (23.0)	10,375 (46.1)	11,600 (51.6)	12,705 (56.5)	14,670 (65.3)
	4-1/2 (114)	5,175 (23.0)	5,175 (23.0)	5,175 (23.0)	5,175 (23.0)	15,970 (71.0)	17,855 (79.4)	19,560 (87.0)	22,585 (100.5)
1/2	2-3/4 (70)	3,815 (17.0)	4,265 (19.0)	4,670 (20.8)	5,395 (24.0)	7,630 (33.9)	8,530 (37.9)	9,345 (41.6)	10,790 (48.0)
	4-1/2 (114)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	15,970 (71.0)	17,855 (79.4)	19,560 (87.0)	22,585 (100.5)
	6 (152)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	7,615 (33.9)	24,590 (109.4)	27,490 (122.3)	30,115 (134.0)	34,775 (154.7)
5/8	3-3/4 (95)	6,075 (27.0)	6,790 (30.2)	7,440 (33.1)	8,590 (38.2)	12,150 (54.0)	13,585 (60.4)	14,880 (66.2)	17,185 (76.4)
	5-5/8 (143)	11,160 (49.6)	12,480 (55.5)	13,670 (60.8)	13,895 (61.8)	22,320 (99.3)	24,955 (111.0)	27,335 (121.6)	31,565 (140.4)
	7-1/2 (191)	13,895 (61.8)	13,895 (61.8)	13,895 (61.8)	13,895 (61.8)	34,365 (152.9)	38,420 (170.9)	42,090 (187.2)	48,600 (216.2)
3/4	4 (102)	6,690 (29.8)	7,480 (33.3)	8,195 (36.5)	9,465 (42.1)	13,385 (59.5)	14,965 (66.6)	16,395 (72.9)	18,930 (84.2)
	6-3/4 (171)	14,670 (65.3)	16,400 (73.0)	17,970 (79.9)	18,500 (82.3)	29,340 (130.5)	32,805 (145.9)	35,935 (159.8)	41,495 (184.6)
	8-1/2 (216)	18,500 (82.3)	18,500 (82.3)	18,500 (82.3)	18,500 (82.3)	41,460 (184.4)	46,355 (206.2)	50,780 (225.9)	58,635 (260.8)

Table 65 - Hilti HIT-HY 200 adhesive factored resistance with concrete/pullout failure for Hilti HIT-Z and HIT-Z-R anchor rods in cracked concrete[1,2,3,4,5,6,7,8,9,10]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	2-3/8 (60)	2,145 (9.5)	2,395 (10.7)	2,625 (11.7)	3,030 (13.5)	2,145 (9.5)	2,395 (10.7)	2,625 (11.7)	3,030 (13.5)
	3-3/8 (86)	3,630 (16.2)	4,060 (18.1)	4,445 (19.8)	5,135 (22.8)	7,260 (32.3)	8,120 (36.1)	8,895 (39.6)	10,270 (45.7)
	4-1/2 (114)	5,175 (23.0)	5,175 (23.0)	5,175 (23.0)	5,175 (23.0)	11,180 (49.7)	12,500 (55.6)	13,695 (60.9)	15,810 (70.3)
1/2	2-3/4 (70)	2,670 (11.9)	2,985 (13.3)	3,270 (14.5)	3,775 (16.8)	5,340 (23.8)	5,970 (26.6)	6,540 (29.1)	7,555 (33.6)
	4-1/2 (114)	5,590 (24.9)	6,250 (27.8)	6,845 (30.5)	7,100 (31.6)	11,180 (49.7)	12,500 (55.6)	13,695 (60.9)	15,810 (70.3)
	6 (152)	7,100 (31.6)	7,100 (31.6)	7,100 (31.6)	7,100 (31.6)	17,215 (76.6)	19,245 (85.6)	21,080 (93.8)	24,340 (108.3)
5/8	3-3/4 (95)	4,250 (18.9)	4,755 (21.1)	5,210 (23.2)	6,015 (26.8)	8,505 (37.8)	9,510 (42.3)	10,415 (46.3)	12,030 (53.5)
	5-5/8 (143)	7,810 (34.8)	8,735 (38.9)	9,570 (42.6)	11,050 (49.1)	15,625 (69.5)	17,470 (77.7)	19,135 (85.1)	22,095 (98.3)
	7-1/2 (191)	12,030 (53.5)	13,445 (59.8)	13,895 (61.8)	13,895 (61.8)	24,055 (107.0)	26,895 (119.6)	29,460 (131.1)	34,020 (151.3)
3/4	4 (102)	4,685 (20.8)	5,240 (23.3)	5,740 (25.5)	6,625 (29.5)	9,370 (41.7)	10,475 (46.6)	11,475 (51.0)	13,250 (58.9)
	6-3/4 (171)	10,270 (45.7)	11,480 (51.1)	12,575 (55.9)	14,525 (64.6)	20,540 (91.4)	22,965 (102.1)	25,155 (111.9)	29,045 (129.2)
	8-1/2 (216)	14,510 (64.6)	16,225 (72.2)	17,775 (79.1)	18,150 (80.7)	29,025 (129.1)	32,450 (144.3)	35,545 (158.1)	41,045 (182.6)

1 See Section 3.1.8 for explanation on development of load values.

2 See Section 3.1.8.6 to convert design strength 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 to the above values. Compare to the steel values in table 62. The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C). For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 1.00. For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.90. 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 including overhead use, see Section 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength (factored resistance) by la as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension only by the following reduction factors:
3/8-in diameter - $\alpha_{N,seis}$ = 0.705 1/2-in to 3/4-in diameter - $\alpha_{N,seis}$ = 0.75
See section 3.1.8.7 for additional information on seismic applications.

10 Hilti HIT-Z(-R) rods may be installed in diamond cored holes with no reduction in published data above.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 66 - Steel factored resistance for CA rebar[1]

Rebar size	CSA-G30.18 Grade 400[2]		
	Tensile N_{sar}[3] lb (kN)	Shear V_{sar}[4] lb (kN)	Seismic shear $V_{sar,eq}$[5] lb (kN)
10M	7,245 (32.2)	4,035 (17.9)	2,825 (12.6)
15M	14,525 (64.6)	8,090 (36.0)	5,665 (25.2)
20M	21,570 (95.9)	12,020 (53.5)	8,415 (37.4)
25M	36,025 (160.2)	20,070 (89.3)	14,050 (62.5)
30M	50,715 (225.6)	28,255 (125.7)	19,780 (88.0)

1 See section 3.1.8.6 to convert design strength value to ASD value.

2 CSA-G30.18 Grade 400 rebar are considered ductile steel elements.

3 Tensile = $A_{se,N}$ ϕ_s f_{uta} R as noted in CSA A23.3-14 Annex D.

4 Shear = $A_{se,V}$ ϕ_s 0.60 f_{uta} R as noted in CSA A23.3-14 Annex D.

5 Seismic Shear = $\alpha_{V,seis}$ V_{sar} : Reduction factor for seismic shear only. See CSA A23.3-14 Annex D for additional information on seismic applications.

Table 67 - Specifications for CA rebar installed with HIT-HY 200 adhesive

Setting information		Symbol	Units	Rebar size				
				10M	15M	20M	25M	30M
Nominal bit size		d_o	in.	5/8	3/4	1	1-1/8	1-3/8
Effective embedment	minimum	$h_{ef,min}$	mm	60	80	90	101	120
	maximum	$h_{ef,max}$	mm	226	320	390	504	598
Minimum concrete member thickness		h_{min}	mm	h_{ef} + 30	h_{ef} + $2d_o$			

Note: The installation specifications in table 67 above and the data in tables 66 through 80 pertain to the use of Hilti HIT-HY 200 with rebar designed as a post-installed anchor using the provisions of CSA A23.3-14 Annex D. For the use of Hilti HIT-HY 200 with rebar for typical development calculations according to CSA A23.3-14 Chapter 12, refer to section 3.1.8.14 for the design method and tables 94 through 98 at the end of this section.

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 68 - Hilti HIT-HY 200 adhesive design information with CA rebar in hammer drilled holes in accordance with CSA A23.3-14 Annex D[1]

Design parameter		Symbol	Units	Rebar size					Ref
				10M	15M	20M	25M	30M	A23.3-14
Rebar diameter		d_a	mm	11.3	16.0	19.5	25.2	29.9	
Effective minimum embedment[2]		$h_{ef,min}$	mm	70	80	90	101	120	
Effective maximum embedment[2]		$h_{ef,max}$	mm	226	320	390	504	598	
Minimum concrete thickness[2]		h_{min}	mm	h_{ef} + 30	h_{ef} + $2d_o$				
Critical edge distance		c_{ac}	–	see ESR-3187, section 4.1.10					
Minimum edge distance		c_{min}[3]	mm	57	80	98	126	150	
Minimum rebar spacing		s_{min}	mm	57	80	98	126	150	
Coeff. for factored conc. breakout resistance, uncracked concrete		$k_{c,uncr}$[4]	–	10					D.6.2.2
Coeff. for factored conc. breakout resistance, cracked concrete		$k_{c,cr}$[4]	–	7					D.6.2.2
Concrete material resistance factor		$A_{se,N}$	–	0.65					8.4.2
Resistance modification factor for tension and shear, concrete failure modes, Condition B[5]		ϕ_s	–	1.00					D.5.3(c)
Temp range A[6]	Characteristic bond stress in cracked concrete[7]	τ_{cr}	psi	1,075	1,085	1,095	840	850	D.6.5.2
			(MPa)	(7.4)	(7.5)	(7.6)	(5.8)	(5.9)	
	Characteristic bond stress in uncracked concrete[7]	τ_{uncr}	psi	1,560	1,560	1,560	1,560	1,560	D.6.5.2
			(MPa)	(10.8)	(10.8)	(10.8)	(10.8)	(10.8)	
Temp range B[6]	Characteristic bond stress in cracked concrete[7]	τ_{cr}	psi	990	995	1,005	775	780	D.6.5.2
			(MPa)	(6.8)	(6.9)	(6.9)	(5.3)	(5.4)	
	Characteristic bond stress in uncracked concrete[7]	τ_{uncr}	psi	1,435	1,435	1,435	1,435	1,435	D.6.5.2
			(MPa)	(9.9)	(9.9)	(9.9)	(9.9)	(9.9)	
Temp range C[6]	Characteristic bond stress in cracked concrete[7]	τ_{cr}	psi	845	850	860	660	670	D.6.5.2
			(MPa)	(5.8)	(5.9)	(5.9)	(4.6)	(4.6)	
	Characteristic bond stress in uncracked concrete[7]	τ_{uncr}	psi	1,230	1,230	1,230	1,230	1,230	D.6.5.2
			(MPa)	(8.5)	(8.5)	(8.5)	(8.5)	(8.5)	
Reduction for seismic tension		$\alpha_{N,seis}$	–	0.80			0.85	0.97	
Permissible installation conditions[5]	Resistance modification factor tension & shear, bond failure dry concrete	Anchor category	–	1					D.5.3 (c)
		R_{dry}	–	1.00					
	Resistance modification factor tension & shear, bond failure water-saturated concrete	Anchor category	–	2					D.5.3 (c)
		R_{dry}	–	0.85					

1 Design information in this table is taken from ICC-ES ESR-3187, dated September, 2015, tables 20 and 21, and converted for use with CSA A23.3-14 Annex D.

2 See figure 8 of this section.

3 Minimum edge distance may be reduced to 45mm provided rebar remains untorqued. See ESR-3187 section 4.1.9.2.

4 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate coefficient for breakout resistance for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.

5 For use with the load combinations of CSA A23.3-14 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.

6 Temperature range A: Max. short term temperature = 130°F 55°C), max. long term temperature = 110°F (43°C).
Temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C).
Temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C).
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.

7 Bond strength values corresponding to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [for SI: $(f'_c / 17.2)^{0.1}$].

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 69 - Hilti HIT-HY 200 adhesive factored resistance with concrete/bond failure for CA rebar in uncracked concrete[1,2,3,4,5,6,7,8,9]

Rebar size	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
10M	4-1/2	6,515	6,665	6,785	6,985	13,030	13,325	13,570	13,965
	(115)	(29.0)	(29.6)	(30.2)	(31.1)	(58.0)	(59.3)	(60.4)	(62.1)
	7-1/16	10,200	10,430	10,620	10,930	20,395	20,855	21,240	21,860
	(180)	(45.4)	(46.4)	(47.2)	(48.6)	(90.7)	(92.8)	(94.5)	(97.2)
	8-7/8	12,805	13,095	13,335	13,725	25,610	26,185	26,670	27,450
	(226)	(57.0)	(58.2)	(59.3)	(61.0)	(113.9)	(116.5)	(118.6)	(122.1)
15M	5-11/16	11,410	11,895	12,115	12,465	22,820	23,790	24,230	24,935
	(145)	(50.8)	(52.9)	(53.9)	(55.5)	(101.5)	(105.8)	(107.8)	(110.9)
	9-13/16	20,055	20,510	20,885	21,495	40,110	41,015	41,770	42,990
	(250)	(89.2)	(91.2)	(92.9)	(95.6)	(178.4)	(182.5)	(185.8)	(191.2)
	12-5/8	25,670	26,250	26,735	27,515	51,345	52,500	53,470	55,030
	(320)	(114.2)	(116.8)	(118.9)	(122.4)	(228.4)	(233.5)	(237.8)	(244.8)
20M	7-7/8	18,485	19,995	20,365	20,960	36,965	39,990	40,730	41,915
	(200)	(82.2)	(88.9)	(90.6)	(93.2)	(164.4)	(177.9)	(181.2)	(186.5)
	14	34,710	35,495	36,145	37,200	69,420	70,985	72,290	74,400
	(355)	(154.4)	(157.9)	(160.8)	(165.5)	(308.8)	(315.8)	(321.6)	(331.0)
	15-3/8	38,130	38,990	39,710	40,870	76,265	77,985	79,420	81,735
	(390)	(169.6)	(173.4)	(176.6)	(181.8)	(339.2)	(346.9)	(353.3)	(363.6)
25M	9-1/16	22,795	25,485	27,920	31,145	45,590	50,970	55,835	62,295
	(230)	(101.4)	(113.4)	(124.2)	(138.5)	(202.8)	(226.7)	(248.4)	(277.1)
	15-15/16	51,175	52,330	53,290	54,845	102,345	104,655	106,580	109,690
	(405)	(227.6)	(232.8)	(237.0)	(244.0)	(455.3)	(465.5)	(474.1)	(487.9)
	19-13/16	63,680	65,120	66,315	68,255	127,365	130,240	132,635	136,505
	(504)	(283.3)	(289.7)	(295.0)	(303.6)	(566.5)	(579.3)	(590.0)	(607.2)
30M	10-1/4	27,395	30,630	33,555	38,745	54,795	61,260	67,110	77,490
	(260)	(121.9)	(136.3)	(149.3)	(172.3)	(243.7)	(272.5)	(298.5)	(344.7)
	17-15/16	63,425	69,750	71,035	73,110	126,850	139,505	142,070	146,220
	(455)	(282.1)	(310.3)	(316.0)	(325.2)	(564.3)	(620.5)	(632.0)	(650.4)
	23-9/16	89,650	91,675	93,360	96,085	179,305	183,350	186,725	192,170
	(598)	(398.8)	(407.8)	(415.3)	(427.4)	(797.6)	(815.6)	(830.6)	(854.8)

1 See Section 3.1.8 for explanation on development of load values.

2 See Section 3.1.8.6 to convert design strength value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 71 - 80 as necessary to the above values. Compare to the steel values in table 66. The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C). For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.92. For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.78. 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 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

Table 70 - Hilti HIT-HY 200 adhesive factored resistance with concrete/bond failure for CA rebar in cracked concrete[1,2,3,4,5,6,7,8,9]

Rebar size	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
10M	4-1/2	4,490	4,590	4,675	4,810	8,980	9,185	9,350	9,625
	(115)	(20.0)	(20.4)	(20.8)	(21.4)	(39.9)	(40.8)	(41.6)	(42.8)
	7-1/16	7,030	7,185	7,320	7,530	14,055	14,375	14,635	15,065
	(180)	(31.3)	(32.0)	(32.6)	(33.5)	(62.5)	(63.9)	(65.1)	(67.0)
	8-7/8	8,825	9,025	9,190	9,455	17,650	18,045	18,380	18,915
	(226)	(39.3)	(40.1)	(40.9)	(42.1)	(78.5)	(80.3)	(81.7)	(84.1)
15M	5-11/16	7,985	8,275	8,425	8,670	15,975	16,545	16,850	17,345
	(145)	(35.5)	(36.8)	(37.5)	(38.6)	(71.1)	(73.6)	(75.0)	(77.1)
	9-13/16	13,950	14,265	14,525	14,950	27,900	28,530	29,055	29,900
	(250)	(62.0)	(63.4)	(64.6)	(66.5)	(124.1)	(126.9)	(129.2)	(133.0)
	12-5/8	17,855	18,260	18,595	19,135	35,710	36,515	37,190	38,275
	(320)	(79.4)	(81.2)	(82.7)	(85.1)	(158.8)	(162.4)	(165.4)	(170.2)
20M	7-7/8	12,940	14,035	14,295	14,710	25,875	28,070	28,590	29,420
	(200)	(57.6)	(62.4)	(63.6)	(65.4)	(115.1)	(124.9)	(127.2)	(130.9)
	14	24,365	24,915	25,370	26,110	48,725	49,825	50,745	52,225
	(355)	(108.4)	(110.8)	(112.9)	(116.2)	(216.7)	(221.6)	(225.7)	(232.3)
	15-3/8	26,765	27,370	27,875	28,685	53,530	54,740	55,745	57,375
	(390)	(119.1)	(121.7)	(124.0)	(127.6)	(238.1)	(243.5)	(248.0)	(255.2)
25M	9-1/16	15,650	16,000	16,295	16,770	31,295	32,005	32,590	33,545
	(230)	(69.6)	(71.2)	(72.5)	(74.6)	(139.2)	(142.4)	(145.0)	(149.2)
	15-15/16	27,555	28,175	28,695	29,530	55,110	56,355	57,390	59,065
	(405)	(122.6)	(125.3)	(127.6)	(131.4)	(245.1)	(250.7)	(255.3)	(262.7)
	19-13/16	34,290	35,065	35,710	36,750	68,580	70,130	71,420	73,505
	(504)	(152.5)	(156.0)	(158.8)	(163.5)	(305.1)	(311.9)	(317.7)	(327.0)
30M	10-1/4	19,180	21,440	22,115	22,765	38,355	42,885	44,235	45,525
	(260)	(85.3)	(95.4)	(98.4)	(101.3)	(170.6)	(190.8)	(196.8)	(202.5)
	17-15/16	37,165	38,005	38,705	39,835	74,335	76,010	77,410	79,670
	(455)	(165.3)	(169.1)	(172.2)	(177.2)	(330.7)	(338.1)	(344.3)	(354.4)
	23-9/16	48,850	49,950	50,870	52,355	97,695	99,900	101,740	104,710
	(598)	(217.3)	(222.2)	(226.3)	(232.9)	(434.6)	(444.4)	(452.6)	(465.8)

1 See Section 3.1.8 for explanation on development of load values.

2 See Section 3.1.8.6 to convert design strength value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 71 - 80 as necessary to the above values. Compare to the steel values in table 66. The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C). For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.92. For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.78. 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 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by the following reduction factors:
10M to 20M - α_{seis} = 0.60, 25M - α_{seis} = 0.64, 30M - α_{seis} = 0.73
See section 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 71 - Load adjustment factors for 10M rebar in uncracked concrete[1,2,3]

10M 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						Concrete thickness factor in shear[5] f_{HV}		
											⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
Embedment h_{ef} in.	(mm)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-8/9 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.25	0.15	0.12	n/a	n/a	n/a	0.06	0.04	0.03	0.12	0.08	0.06	n/a	n/a	n/a
2-3/16	(55)	0.58	0.55	0.54	0.27	0.17	0.13	0.53	0.52	0.52	0.09	0.05	0.04	0.17	0.11	0.09	n/a	n/a	n/a
3	(76)	0.61	0.57	0.56	0.31	0.20	0.15	0.54	0.53	0.53	0.14	0.09	0.07	0.28	0.18	0.14	n/a	n/a	n/a
4	(102)	0.65	0.59	0.57	0.37	0.23	0.18	0.56	0.54	0.54	0.22	0.14	0.11	0.40	0.28	0.22	n/a	n/a	n/a
5	(127)	0.68	0.62	0.59	0.44	0.27	0.21	0.57	0.56	0.55	0.30	0.19	0.15	0.46	0.35	0.31	n/a	n/a	n/a
5-11/16	(145)	0.71	0.63	0.61	0.49	0.30	0.24	0.59	0.56	0.55	0.37	0.23	0.19	0.51	0.37	0.33	0.58	n/a	n/a
6	(152)	0.72	0.64	0.61	0.51	0.32	0.25	0.59	0.57	0.56	0.40	0.25	0.20	0.53	0.38	0.34	0.60	n/a	n/a
7	(178)	0.76	0.66	0.63	0.60	0.37	0.29	0.60	0.58	0.57	0.50	0.32	0.25	0.60	0.42	0.36	0.65	n/a	n/a
8	(203)	0.79	0.69	0.65	0.68	0.42	0.33	0.62	0.59	0.58	0.61	0.39	0.31	0.68	0.46	0.39	0.69	n/a	n/a
8-1/4	(210)	0.80	0.69	0.65	0.71	0.44	0.35	0.62	0.59	0.58	0.64	0.41	0.33	0.71	0.47	0.40	0.70	0.61	n/a
9	(229)	0.83	0.71	0.67	0.77	0.48	0.38	0.63	0.60	0.59	0.73	0.47	0.37	0.77	0.50	0.42	0.73	0.63	n/a
10-1/16	(256)	0.87	0.74	0.69	0.86	0.53	0.42	0.65	0.61	0.60	0.86	0.55	0.44	0.86	0.54	0.45	0.78	0.67	0.62
11	(279)	0.90	0.76	0.71	0.94	0.58	0.46	0.66	0.62	0.61	0.98	0.63	0.50	0.94	0.58	0.48	0.81	0.70	0.65
12	(305)	0.94	0.78	0.72	1.00	0.64	0.50	0.68	0.63	0.61	1.00	0.72	0.57	1.00	0.64	0.51	0.85	0.73	0.68
14	(356)	1.00	0.83	0.76		0.74	0.59	0.71	0.66	0.63		0.90	0.72		0.74	0.59	0.92	0.79	0.73
16	(406)		0.88	0.80		0.85	0.67	0.74	0.68	0.65		1.00	0.88		0.85	0.67	0.98	0.84	0.78
18	(457)		0.92	0.84		0.96	0.75	0.77	0.70	0.67			1.00		0.96	0.75	1.00	0.89	0.83
24	(610)		1.00	0.95		1.00	1.00	0.86	0.77	0.73					1.00	1.00		1.00	0.96
30	(762)			1.00				0.95	0.83	0.79									1.00
36	(914)							1.00	0.90	0.84									
> 48	(1219)								1.00	0.96									

Table 72 - Load adjustment factors for 10M rebar in cracked concrete[1,2,3]

10M 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						Concrete thickness factor in shear[5] f_{HV}		
											⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
Embedment h_{ef} in.	(mm)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-8/9 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)	4-1/2 (115)	7-1/16 (180)	8-7/8 (226)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)																			
1-3/4	(44)	n/a	n/a	n/a	0.49	0.44	0.42	n/a	n/a	n/a	0.06	0.04	0.03	0.13	0.08	0.07	n/a	n/a	n/a
2-3/16	(55)	0.58	0.55	0.54	0.52	0.46	0.43	0.53	0.52	0.52	0.09	0.06	0.05	0.18	0.11	0.09	n/a	n/a	n/a
3	(76)	0.61	0.57	0.56	0.60	0.50	0.47	0.55	0.53	0.53	0.15	0.09	0.07	0.29	0.19	0.15	n/a	n/a	n/a
4	(102)	0.65	0.59	0.57	0.70	0.56	0.51	0.56	0.55	0.54	0.22	0.14	0.11	0.45	0.29	0.23	n/a	n/a	n/a
5	(127)	0.68	0.62	0.59	0.80	0.62	0.56	0.58	0.56	0.55	0.31	0.20	0.16	0.62	0.40	0.32	n/a	n/a	n/a
5-11/16	(145)	0.71	0.63	0.61	0.88	0.66	0.59	0.59	0.56	0.56	0.38	0.24	0.19	0.76	0.49	0.39	0.59	n/a	n/a
6	(152)	0.72	0.64	0.61	0.91	0.68	0.61	0.59	0.57	0.56	0.41	0.26	0.21	0.82	0.52	0.42	0.61	n/a	n/a
7	(178)	0.76	0.66	0.63	1.00	0.74	0.65	0.61	0.58	0.57	0.52	0.33	0.26	1.00	0.66	0.53	0.66	n/a	n/a
8	(203)	0.79	0.69	0.65		0.81	0.70	0.62	0.59	0.58	0.63	0.40	0.32		0.81	0.64	0.70	n/a	n/a
8-1/4	(210)	0.80	0.69	0.65		0.83	0.72	0.63	0.59	0.58	0.66	0.42	0.34		0.83	0.68	0.71	0.61	n/a
9	(229)	0.83	0.71	0.67		0.88	0.76	0.64	0.60	0.59	0.75	0.48	0.38		0.88	0.76	0.74	0.64	n/a
10-1/16	(256)	0.87	0.74	0.69		0.96	0.81	0.65	0.61	0.60	0.89	0.57	0.46		0.96	0.81	0.79	0.68	0.63
11	(279)	0.90	0.76	0.71		1.00	0.86	0.67	0.63	0.61	1.00	0.65	0.52		1.00	0.86	0.82	0.71	0.66
12	(305)	0.94	0.78	0.72			0.92	0.68	0.64	0.62		0.74	0.59			0.92	0.86	0.74	0.69
14	(356)	1.00	0.83	0.76			1.00	0.71	0.66	0.64		0.94	0.74			1.00	0.93	0.80	0.74
16	(406)		0.88	0.80				0.75	0.68	0.66		1.00	0.91				0.99	0.85	0.79
18	(457)		0.92	0.84				0.78	0.70	0.68			1.00				1.00	0.91	0.84
24	(610)		1.00	0.95				0.87	0.77	0.73								1.00	0.97
30	(762)			1.00				0.96	0.84	0.79									1.00
36	(914)							1.00	0.91	0.85									
> 48	(1219)								1.00	0.97									

1 Linear interpolation not permitted.

2 Shaded area with reduced edge distance is permitted provided the 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 CSA A23.3-14 Annex 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 73 - Load adjustment factors for 15M rebar in uncracked concrete[1,2,3]

15M 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)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.25	0.14	0.11	n/a	n/a	n/a	0.04	0.02	0.02	0.08	0.05	0.04	n/a	n/a	n/a
	3-1/8	(80)	0.59	0.55	0.54	0.31	0.17	0.13	0.54	0.53	0.52	0.10	0.06	0.05	0.20	0.12	0.09	n/a	n/a	n/a
	4	(102)	0.62	0.57	0.55	0.35	0.19	0.15	0.55	0.53	0.53	0.14	0.08	0.07	0.29	0.17	0.13	n/a	n/a	n/a
	5	(127)	0.65	0.58	0.57	0.39	0.22	0.17	0.56	0.54	0.53	0.20	0.12	0.09	0.40	0.23	0.18	n/a	n/a	n/a
	6	(152)	0.68	0.60	0.58	0.44	0.25	0.19	0.57	0.55	0.54	0.27	0.15	0.12	0.45	0.31	0.24	n/a	n/a	n/a
	7	(178)	0.70	0.62	0.59	0.49	0.27	0.21	0.58	0.56	0.55	0.33	0.19	0.15	0.50	0.35	0.30	n/a	n/a	n/a
	7-1/4	(184)	0.71	0.62	0.60	0.50	0.28	0.22	0.58	0.56	0.55	0.35	0.20	0.16	0.51	0.35	0.31	0.58	n/a	n/a
	8	(203)	0.73	0.64	0.61	0.54	0.30	0.24	0.59	0.56	0.55	0.41	0.24	0.18	0.55	0.37	0.33	0.61	n/a	n/a
	9	(229)	0.76	0.65	0.62	0.61	0.34	0.26	0.60	0.57	0.56	0.49	0.28	0.22	0.61	0.40	0.35	0.64	n/a	n/a
	10	(254)	0.79	0.67	0.63	0.68	0.38	0.29	0.61	0.58	0.57	0.57	0.33	0.26	0.68	0.43	0.37	0.68	n/a	n/a
	11-3/8	(289)	0.83	0.69	0.65	0.77	0.43	0.33	0.63	0.59	0.58	0.69	0.40	0.31	0.77	0.46	0.39	0.72	0.60	n/a
	12	(305)	0.85	0.70	0.66	0.81	0.46	0.35	0.64	0.60	0.58	0.75	0.43	0.34	0.81	0.48	0.40	0.74	0.62	n/a
	14-1/8	(359)	0.91	0.74	0.69	0.96	0.54	0.42	0.66	0.61	0.60	0.96	0.55	0.43	0.96	0.54	0.45	0.81	0.67	0.62
	16	(406)	0.97	0.77	0.71	1.00	0.61	0.47	0.68	0.63	0.61	1.00	0.67	0.52	1.00	0.61	0.49	0.86	0.71	0.66
	18	(457)	1.00	0.80	0.74		0.68	0.53	0.71	0.64	0.62		0.80	0.62		0.68	0.54	0.91	0.76	0.70
	20	(508)		0.84	0.76		0.76	0.59	0.73	0.66	0.63		0.93	0.73		0.76	0.59	0.96	0.80	0.73
	22	(559)		0.87	0.79		0.84	0.65	0.75	0.67	0.65		1.00	0.84		0.84	0.65	1.00	0.84	0.77
	24	(610)		0.91	0.82		0.91	0.71	0.78	0.69	0.66			0.96		0.91	0.71		0.87	0.80
	30	(762)		1.00	0.90		1.00	0.88	0.84	0.74	0.70			1.00		1.00	0.88		0.98	0.90
	36	(914)			0.98			1.00	0.91	0.79	0.74						1.00		1.00	0.99
	> 48	(1219)			1.00				1.00	0.88	0.82									1.00

Table 74 - Load adjustment factors for 15M rebar in cracked concrete[1,2,3]

15M 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)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)	5-11/16 (145)	9-13/16 (250)	12-5/8 (320)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.46	0.41	0.40	n/a	n/a	n/a	0.04	0.02	0.02	0.09	0.05	0.04	n/a	n/a	n/a
	3-1/8	(80)	0.59	0.55	0.54	0.55	0.46	0.44	0.54	0.53	0.52	0.10	0.06	0.05	0.21	0.12	0.09	n/a	n/a	n/a
	4	(102)	0.62	0.57	0.55	0.62	0.50	0.46	0.55	0.53	0.53	0.15	0.09	0.07	0.30	0.17	0.13	n/a	n/a	n/a
	5	(127)	0.65	0.58	0.57	0.69	0.54	0.49	0.56	0.54	0.53	0.21	0.12	0.09	0.41	0.24	0.19	n/a	n/a	n/a
	6	(152)	0.68	0.60	0.58	0.77	0.58	0.52	0.57	0.55	0.54	0.27	0.16	0.12	0.54	0.31	0.25	n/a	n/a	n/a
	7	(178)	0.70	0.62	0.59	0.86	0.62	0.56	0.58	0.56	0.55	0.34	0.20	0.15	0.68	0.40	0.31	n/a	n/a	n/a
	7-1/4	(184)	0.71	0.62	0.60	0.88	0.63	0.56	0.58	0.56	0.55	0.36	0.21	0.16	0.72	0.42	0.33	0.58	n/a	n/a
	8	(203)	0.73	0.64	0.61	0.95	0.66	0.59	0.59	0.56	0.55	0.42	0.24	0.19	0.84	0.48	0.38	0.61	n/a	n/a
	9	(229)	0.76	0.65	0.62	1.00	0.71	0.62	0.60	0.57	0.56	0.50	0.29	0.23	1.00	0.58	0.45	0.65	n/a	n/a
	10	(254)	0.79	0.67	0.63		0.76	0.66	0.62	0.58	0.57	0.58	0.34	0.26		0.68	0.53	0.68	n/a	n/a
	11-3/8	(289)	0.83	0.69	0.65		0.82	0.71	0.63	0.59	0.58	0.71	0.41	0.32		0.82	0.64	0.73	0.61	n/a
	12	(305)	0.85	0.70	0.66		0.86	0.73	0.64	0.60	0.58	0.77	0.44	0.35		0.86	0.70	0.75	0.62	n/a
	14-1/8	(359)	0.91	0.74	0.69		0.97	0.81	0.66	0.61	0.60	0.98	0.57	0.44		0.97	0.81	0.81	0.68	0.62
	16	(406)	0.97	0.77	0.71		1.00	0.88	0.69	0.63	0.61	1.00	0.69	0.54		1.00	0.88	0.86	0.72	0.66
	18	(457)	1.00	0.80	0.74			0.96	0.71	0.65	0.62		0.82	0.64			0.96	0.92	0.76	0.70
	20	(508)		0.84	0.76			1.00	0.73	0.66	0.64		0.96	0.75			1.00	0.96	0.80	0.74
	22	(559)		0.87	0.79				0.76	0.68	0.65		1.00	0.86				1.00	0.84	0.78
	24	(610)		0.91	0.82				0.78	0.69	0.66			0.98					0.88	0.81
	30	(762)		1.00	0.90				0.85	0.74	0.71			1.00					0.99	0.91
	36	(914)			0.98				0.92	0.79	0.75								1.00	0.99
	> 48	(1219)			1.00				1.00	0.89	0.83									1.00

1 Linear interpolation not permitted.

2 Shaded area with reduced edge distance is permitted provided the 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 CSA A23.3-14 Annex 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 75 - Load adjustment factors for 20M rebar in uncracked concrete[1,2,3]

20M 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}		7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8
	in.	(mm)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.21	0.11	0.10	n/a	n/a	n/a	0.03	0.01	0.01	0.06	0.03	0.03	n/a	n/a	n/a
	3-7/8	(98)	0.58	0.55	0.54	0.27	0.15	0.13	0.53	0.52	0.52	0.09	0.05	0.04	0.18	0.10	0.09	n/a	n/a	n/a
	4	(102)	0.58	0.55	0.54	0.27	0.15	0.13	0.53	0.52	0.52	0.10	0.05	0.05	0.19	0.10	0.09	n/a	n/a	n/a
	5	(127)	0.61	0.56	0.55	0.30	0.17	0.15	0.54	0.53	0.53	0.13	0.07	0.07	0.27	0.14	0.13	n/a	n/a	n/a
	6	(152)	0.63	0.57	0.57	0.34	0.18	0.17	0.55	0.53	0.53	0.17	0.09	0.09	0.35	0.19	0.17	n/a	n/a	n/a
	7	(178)	0.65	0.58	0.58	0.37	0.20	0.18	0.56	0.54	0.54	0.22	0.12	0.11	0.41	0.24	0.22	n/a	n/a	n/a
	8	(203)	0.67	0.60	0.59	0.41	0.22	0.20	0.57	0.55	0.54	0.27	0.15	0.13	0.44	0.29	0.26	n/a	n/a	n/a
	9	(229)	0.69	0.61	0.60	0.45	0.24	0.22	0.58	0.55	0.55	0.32	0.17	0.16	0.47	0.33	0.32	n/a	n/a	n/a
	10	(254)	0.71	0.62	0.61	0.49	0.27	0.24	0.59	0.56	0.55	0.38	0.20	0.18	0.51	0.35	0.33	0.59	n/a	n/a
	11	(279)	0.73	0.63	0.62	0.54	0.29	0.27	0.60	0.56	0.56	0.43	0.23	0.21	0.55	0.37	0.35	0.62	n/a	n/a
	12	(305)	0.75	0.64	0.63	0.59	0.32	0.29	0.60	0.57	0.56	0.49	0.27	0.24	0.59	0.38	0.36	0.65	n/a	n/a
	14	(356)	0.80	0.67	0.65	0.69	0.37	0.34	0.62	0.58	0.58	0.62	0.34	0.31	0.69	0.42	0.40	0.70	n/a	n/a
	16	(406)	0.84	0.69	0.67	0.78	0.43	0.39	0.64	0.59	0.59	0.76	0.41	0.37	0.78	0.46	0.43	0.74	0.61	n/a
	18	(457)	0.88	0.71	0.70	0.88	0.48	0.44	0.66	0.60	0.60	0.91	0.49	0.45	0.88	0.50	0.46	0.79	0.64	0.62
	20	(508)	0.92	0.74	0.72	0.98	0.53	0.48	0.67	0.62	0.61	1.00	0.57	0.52	0.98	0.54	0.50	0.83	0.68	0.66
	22	(559)	0.97	0.76	0.74	1.00	0.59	0.53	0.69	0.63	0.62		0.66	0.60	1.00	0.59	0.54	0.87	0.71	0.69
	24	(610)	1.00	0.79	0.76		0.64	0.58	0.71	0.64	0.63		0.76	0.69		0.64	0.58	0.91	0.74	0.72
	26	(660)		0.81	0.78		0.69	0.63	0.73	0.65	0.64		0.85	0.78		0.69	0.63	0.95	0.77	0.75
	28	(711)		0.83	0.80		0.75	0.68	0.74	0.66	0.65		0.95	0.87		0.75	0.68	0.99	0.80	0.78
	30	(762)		0.86	0.83		0.80	0.73	0.76	0.67	0.66		1.00	0.96		0.80	0.73	1.00	0.83	0.81
	36	(914)		0.93	0.89		0.96	0.87	0.81	0.71	0.69			1.00		0.96	0.87		0.91	0.88
	> 48	(1219)		1.00	1.00		1.00	1.00	0.92	0.78	0.76					1.00	1.00		1.00	1.00

Table 76 - Load adjustment factors for 20M rebar in cracked concrete[1,2,3]

20M 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}		7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8	7-7/8	14	15-3/8
	in.	(mm)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)	(200)	(355)	(390)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.43	0.39	0.39	n/a	n/a	n/a	0.03	0.02	0.01	0.06	0.03	0.03	n/a	n/a	n/a
	3-7/8	(98)	0.58	0.55	0.54	0.53	0.45	0.44	0.53	0.52	0.52	0.09	0.05	0.05	0.18	0.10	0.09	n/a	n/a	n/a
	4	(102)	0.58	0.55	0.54	0.54	0.45	0.44	0.54	0.52	0.52	0.10	0.05	0.05	0.19	0.10	0.10	n/a	n/a	n/a
	5	(127)	0.61	0.56	0.55	0.59	0.48	0.47	0.54	0.53	0.53	0.14	0.07	0.07	0.27	0.15	0.13	n/a	n/a	n/a
	6	(152)	0.63	0.57	0.57	0.64	0.51	0.49	0.55	0.53	0.53	0.18	0.10	0.09	0.36	0.19	0.17	n/a	n/a	n/a
	7	(178)	0.65	0.58	0.58	0.70	0.53	0.52	0.56	0.54	0.54	0.22	0.12	0.11	0.45	0.24	0.22	n/a	n/a	n/a
	8	(203)	0.67	0.60	0.59	0.76	0.56	0.54	0.57	0.55	0.54	0.27	0.15	0.13	0.55	0.30	0.27	n/a	n/a	n/a
	9	(229)	0.69	0.61	0.60	0.82	0.59	0.57	0.58	0.55	0.55	0.33	0.18	0.16	0.65	0.35	0.32	n/a	n/a	n/a
	10	(254)	0.71	0.62	0.61	0.88	0.62	0.60	0.59	0.56	0.55	0.38	0.21	0.19	0.77	0.41	0.38	0.59	n/a	n/a
	11	(279)	0.73	0.63	0.62	0.95	0.65	0.62	0.60	0.56	0.56	0.44	0.24	0.22	0.88	0.48	0.43	0.62	n/a	n/a
	12	(305)	0.75	0.64	0.63	1.00	0.69	0.65	0.61	0.57	0.57	0.50	0.27	0.25	1.00	0.54	0.49	0.65	n/a	n/a
	14	(356)	0.80	0.67	0.65		0.75	0.71	0.62	0.58	0.58	0.64	0.34	0.31		0.68	0.62	0.70	n/a	n/a
	16	(406)	0.84	0.69	0.67		0.82	0.77	0.64	0.59	0.59	0.77	0.42	0.38		0.82	0.76	0.75	0.61	n/a
	18	(457)	0.88	0.71	0.70		0.89	0.83	0.66	0.60	0.60	0.93	0.50	0.45		0.89	0.83	0.80	0.65	0.63
	20	(508)	0.92	0.74	0.72		0.96	0.90	0.68	0.62	0.61	1.00	0.58	0.53		0.96	0.90	0.84	0.68	0.66
	22	(559)	0.97	0.76	0.74		1.00	0.96	0.69	0.63	0.62		0.67	0.61		1.00	0.96	0.88	0.72	0.69
	24	(610)	1.00	0.79	0.76			1.00	0.71	0.64	0.63		0.77	0.70			1.00	0.92	0.75	0.72
	26	(660)		0.81	0.78				0.73	0.65	0.64		0.87	0.79				0.96	0.78	0.75
	28	(711)		0.83	0.80				0.75	0.66	0.65		0.97	0.88				0.99	0.81	0.78
	30	(762)		0.86	0.83				0.76	0.67	0.66		1.00	0.98				1.00	0.84	0.81
	36	(914)		0.93	0.89				0.82	0.71	0.70			1.00					0.92	0.89
	> 48	(1219)		1.00	1.00				0.92	0.78	0.76								1.00	1.00

1 Linear interpolation not permitted.

2 Shaded area with reduced edge distance is permitted provided the 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 CSA A23.3-14 Annex 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.

Table 77 - Load adjustment factors for 25M rebar in uncracked concrete[1,2,3]

25M 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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
Embedment h_{ef}			9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16
	in.	(mm)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.22	0.12	0.10	n/a	n/a	n/a	0.02	0.01	0.01	0.04	0.02	0.02	n/a	n/a	n/a
	5	(127)	0.59	0.55	0.54	0.30	0.17	0.13	0.54	0.52	0.52	0.11	0.05	0.04	0.22	0.10	0.08	n/a	n/a	n/a
	6	(152)	0.61	0.56	0.55	0.33	0.18	0.14	0.55	0.53	0.52	0.14	0.06	0.05	0.28	0.13	0.10	n/a	n/a	n/a
	7	(178)	0.63	0.57	0.56	0.36	0.20	0.16	0.55	0.53	0.53	0.18	0.08	0.06	0.36	0.16	0.13	n/a	n/a	n/a
	8	(203)	0.65	0.58	0.57	0.39	0.21	0.17	0.56	0.54	0.53	0.22	0.10	0.08	0.41	0.20	0.16	n/a	n/a	n/a
	9	(229)	0.67	0.59	0.58	0.42	0.23	0.18	0.57	0.54	0.53	0.26	0.12	0.09	0.44	0.24	0.19	n/a	n/a	n/a
	10	(254)	0.68	0.60	0.58	0.45	0.25	0.20	0.58	0.54	0.54	0.30	0.14	0.11	0.47	0.28	0.22	n/a	n/a	n/a
	11-9/16	(294)	0.71	0.62	0.60	0.50	0.28	0.22	0.59	0.55	0.54	0.38	0.17	0.14	0.52	0.34	0.28	0.59	n/a	n/a
	12	(305)	0.72	0.63	0.60	0.52	0.28	0.23	0.59	0.55	0.55	0.40	0.18	0.15	0.53	0.36	0.29	0.60	n/a	n/a
	14	(356)	0.76	0.65	0.62	0.60	0.33	0.26	0.61	0.56	0.55	0.50	0.23	0.18	0.60	0.39	0.34	0.65	n/a	n/a
	16	(406)	0.79	0.67	0.63	0.69	0.38	0.30	0.62	0.57	0.56	0.62	0.28	0.22	0.69	0.42	0.37	0.69	n/a	n/a
	18	(457)	0.83	0.69	0.65	0.77	0.42	0.34	0.64	0.58	0.57	0.74	0.33	0.27	0.77	0.46	0.39	0.74	n/a	n/a
	18-7/16	(469)	0.84	0.69	0.66	0.79	0.43	0.35	0.64	0.58	0.57	0.76	0.35	0.28	0.79	0.46	0.40	0.75	0.57	n/a
	20	(508)	0.87	0.71	0.67	0.86	0.47	0.37	0.65	0.59	0.58	0.86	0.39	0.31	0.86	0.49	0.42	0.78	0.60	n/a
	22-3/8	(568)	0.91	0.73	0.69	0.96	0.53	0.42	0.67	0.60	0.59	1.00	0.46	0.37	0.96	0.53	0.45	0.82	0.63	0.59
	24	(610)	0.94	0.75	0.70	1.00	0.56	0.45	0.68	0.61	0.59		0.51	0.41	1.00	0.56	0.47	0.85	0.65	0.61
	26	(660)	0.98	0.77	0.72		0.61	0.49	0.70	0.62	0.60		0.58	0.46		0.61	0.50	0.89	0.68	0.63
	28	(711)	1.00	0.79	0.74		0.66	0.52	0.71	0.62	0.61		0.65	0.52		0.66	0.53	0.92	0.71	0.66
	30	(762)		0.81	0.75		0.71	0.56	0.73	0.63	0.62		0.72	0.58		0.71	0.56	0.95	0.73	0.68
	36	(914)		0.88	0.80		0.85	0.67	0.77	0.66	0.64		0.94	0.76		0.85	0.67	1.00	0.80	0.74
	> 48	(1219)		1.00	0.90		1.00	0.90	0.86	0.71	0.68		1.00	1.00		1.00	0.90		0.92	0.86

Table 78 - Load adjustment factors for 25M rebar in cracked concrete[1,2,3]

25M 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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			∥ To edge f_{RV}					
Embedment h_{ef}			9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16	9-1/16	15-15/16	19-13/16
	in.	(mm)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)	(230)	(405)	(504)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.42	0.39	0.38	n/a	n/a	n/a	0.02	0.01	0.01	0.05	0.03	0.02	n/a	n/a	n/a
	5	(127)	0.59	0.55	0.54	0.55	0.46	0.44	0.54	0.53	0.52	0.11	0.06	0.05	0.23	0.13	0.10	n/a	n/a	n/a
	6	(152)	0.61	0.56	0.55	0.60	0.48	0.46	0.55	0.53	0.53	0.15	0.08	0.07	0.30	0.17	0.14	n/a	n/a	n/a
	7	(178)	0.63	0.57	0.56	0.65	0.51	0.48	0.55	0.54	0.53	0.19	0.11	0.09	0.38	0.21	0.17	n/a	n/a	n/a
	8	(203)	0.65	0.58	0.57	0.70	0.53	0.50	0.56	0.54	0.54	0.23	0.13	0.11	0.46	0.26	0.21	n/a	n/a	n/a
	9	(229)	0.67	0.59	0.58	0.75	0.56	0.51	0.57	0.55	0.54	0.27	0.16	0.13	0.55	0.31	0.25	n/a	n/a	n/a
	10	(254)	0.68	0.60	0.58	0.80	0.59	0.53	0.58	0.55	0.55	0.32	0.18	0.15	0.64	0.37	0.29	n/a	n/a	n/a
	11-9/16	(294)	0.71	0.62	0.60	0.89	0.63	0.57	0.59	0.56	0.55	0.40	0.23	0.18	0.80	0.46	0.37	0.60	n/a	n/a
	12	(305)	0.72	0.63	0.60	0.91	0.64	0.58	0.59	0.56	0.56	0.42	0.24	0.19	0.85	0.48	0.39	0.61	n/a	n/a
	14	(356)	0.76	0.65	0.62	1.00	0.69	0.62	0.61	0.58	0.56	0.53	0.30	0.24	1.00	0.61	0.49	0.66	n/a	n/a
	16	(406)	0.79	0.67	0.63		0.75	0.66	0.63	0.59	0.57	0.65	0.37	0.30		0.74	0.59	0.71	n/a	n/a
	18	(457)	0.83	0.69	0.65		0.81	0.71	0.64	0.60	0.58	0.78	0.44	0.35		0.81	0.71	0.75	n/a	n/a
	18-7/16	(469)	0.84	0.69	0.66		0.83	0.72	0.64	0.60	0.59	0.81	0.46	0.37		0.83	0.72	0.76	0.63	n/a
	20	(508)	0.87	0.71	0.67		0.87	0.75	0.66	0.61	0.59	0.91	0.52	0.42		0.87	0.75	0.79	0.66	n/a
	22-3/8	(568)	0.91	0.73	0.69		0.95	0.81	0.68	0.62	0.60	1.00	0.61	0.49		0.95	0.81	0.84	0.69	0.64
	24	(610)	0.94	0.75	0.70		1.00	0.85	0.69	0.63	0.61		0.68	0.55		1.00	0.85	0.87	0.72	0.67
	26	(660)	0.98	0.77	0.72			0.90	0.70	0.64	0.62		0.77	0.62			0.90	0.90	0.75	0.69
	28	(711)	1.00	0.79	0.74			0.95	0.72	0.65	0.63		0.86	0.69			0.95	0.94	0.78	0.72
	30	(762)		0.81	0.75			1.00	0.73	0.66	0.64		0.95	0.76			1.00	0.97	0.80	0.75
	36	(914)		0.88	0.80				0.78	0.69	0.67		1.00	1.00				1.00	0.88	0.82
	> 48	(1219)		1.00	0.90				0.88	0.76	0.72								1.00	0.94

1 Linear interpolation not permitted.

2 Shaded area with reduced edge distance is permitted provided the 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 CSA A23.3-14 Annex 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 79 - Load adjustment factors for 30M rebar in uncracked concrete[1,2,3]

30M 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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
Embedment h_{ef}	in.	(mm)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.23	0.13	0.09	n/a	n/a	n/a	0.02	0.01	0.01	0.04	0.02	0.01	n/a	n/a	n/a
	5-7/8	(150)	0.60	0.55	0.54	0.33	0.18	0.13	0.54	0.52	0.52	0.12	0.05	0.04	0.23	0.10	0.07	n/a	n/a	n/a
	6	(152)	0.60	0.56	0.54	0.33	0.18	0.13	0.54	0.52	0.52	0.12	0.05	0.04	0.24	0.10	0.07	n/a	n/a	n/a
	7	(178)	0.61	0.57	0.55	0.36	0.19	0.14	0.55	0.53	0.52	0.15	0.06	0.05	0.30	0.13	0.09	n/a	n/a	n/a
	8	(203)	0.63	0.57	0.56	0.38	0.20	0.15	0.55	0.53	0.52	0.18	0.08	0.06	0.36	0.16	0.11	n/a	n/a	n/a
	9	(229)	0.65	0.58	0.56	0.41	0.22	0.16	0.56	0.53	0.53	0.22	0.09	0.07	0.42	0.19	0.13	n/a	n/a	n/a
	10	(254)	0.66	0.59	0.57	0.44	0.23	0.18	0.57	0.54	0.53	0.25	0.11	0.08	0.45	0.22	0.16	n/a	n/a	n/a
	11	(279)	0.68	0.60	0.58	0.46	0.25	0.19	0.57	0.54	0.53	0.29	0.13	0.09	0.47	0.25	0.18	n/a	n/a	n/a
	12	(305)	0.70	0.61	0.58	0.49	0.26	0.20	0.58	0.55	0.54	0.33	0.14	0.10	0.50	0.29	0.21	n/a	n/a	n/a
	13-1/4	(337)	0.72	0.62	0.59	0.53	0.28	0.21	0.59	0.55	0.54	0.39	0.17	0.12	0.54	0.33	0.24	0.60	n/a	n/a
	14	(356)	0.73	0.63	0.60	0.55	0.30	0.22	0.59	0.55	0.54	0.42	0.18	0.13	0.56	0.36	0.26	0.61	n/a	n/a
	16	(406)	0.76	0.65	0.61	0.63	0.34	0.25	0.61	0.56	0.55	0.51	0.22	0.16	0.63	0.40	0.32	0.65	n/a	n/a
	18	(457)	0.79	0.67	0.63	0.71	0.38	0.28	0.62	0.57	0.56	0.61	0.26	0.19	0.71	0.42	0.36	0.69	n/a	n/a
	20	(508)	0.83	0.69	0.64	0.79	0.42	0.32	0.63	0.58	0.56	0.72	0.31	0.22	0.79	0.45	0.38	0.73	n/a	n/a
	20-7/8	(531)	0.84	0.69	0.65	0.82	0.44	0.33	0.64	0.58	0.56	0.77	0.33	0.24	0.82	0.47	0.39	0.75	n/a	n/a
	22	(559)	0.86	0.70	0.66	0.87	0.46	0.35	0.65	0.58	0.57	0.83	0.36	0.26	0.87	0.49	0.40	0.77	0.58	n/a
	24	(610)	0.89	0.72	0.67	0.94	0.50	0.38	0.66	0.59	0.57	0.94	0.41	0.29	0.94	0.52	0.42	0.80	0.61	n/a
	26-9/16	(675)	0.93	0.75	0.69	1.00	0.56	0.42	0.68	0.60	0.58	1.00	0.47	0.34	1.00	0.56	0.45	0.84	0.64	0.57
	28	(711)	0.96	0.76	0.70		0.59	0.44	0.69	0.61	0.59		0.51	0.37		0.59	0.47	0.86	0.65	0.59
	30	(762)	0.99	0.78	0.71		0.63	0.47	0.70	0.61	0.59		0.57	0.41		0.63	0.49	0.89	0.68	0.61
	36	(914)	1.00	0.83	0.75		0.76	0.57	0.74	0.64	0.61		0.75	0.54		0.76	0.57	0.98	0.74	0.66
	> 48	(1219)		0.95	0.84		1.00	0.76	0.82	0.68	0.65		1.00	0.83		1.00	0.76	1.00	0.86	0.77

Table 80 - Load adjustment factors for 30M rebar in cracked concrete[1,2,3]

30M 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						Concrete thickness factor in shear[5] f_{HV}		
												⊥ Toward edge f_{RV}			‖ To edge f_{RV}					
Embedment h_{ef}	in.	(mm)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)	10-1/4 (260)	17-15/16 (455)	23-9/16 (598)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in. (mm)	1-3/4	(44)	n/a	n/a	n/a	0.41	0.38	0.38	n/a	n/a	n/a	0.02	0.01	0.01	0.04	0.02	0.02	n/a	n/a	n/a
	5-7/8	(150)	0.60	0.55	0.54	0.56	0.47	0.44	0.54	0.53	0.52	0.12	0.06	0.05	0.23	0.12	0.09	n/a	n/a	n/a
	6	(152)	0.60	0.56	0.54	0.57	0.47	0.44	0.54	0.53	0.52	0.12	0.06	0.05	0.24	0.13	0.10	n/a	n/a	n/a
	7	(178)	0.61	0.57	0.55	0.61	0.49	0.46	0.55	0.53	0.53	0.15	0.08	0.06	0.30	0.16	0.12	n/a	n/a	n/a
	8	(203)	0.63	0.57	0.56	0.65	0.51	0.47	0.55	0.54	0.53	0.19	0.10	0.07	0.37	0.19	0.15	n/a	n/a	n/a
	9	(229)	0.65	0.58	0.56	0.69	0.53	0.49	0.56	0.54	0.53	0.22	0.12	0.09	0.44	0.23	0.18	n/a	n/a	n/a
	10	(254)	0.66	0.59	0.57	0.74	0.56	0.50	0.57	0.54	0.54	0.26	0.14	0.10	0.52	0.27	0.21	n/a	n/a	n/a
	11	(279)	0.68	0.60	0.58	0.79	0.58	0.52	0.57	0.55	0.54	0.30	0.16	0.12	0.60	0.31	0.24	n/a	n/a	n/a
	12	(305)	0.70	0.61	0.58	0.83	0.60	0.54	0.58	0.55	0.54	0.34	0.18	0.14	0.68	0.36	0.27	n/a	n/a	n/a
	13-1/4	(337)	0.72	0.62	0.59	0.89	0.63	0.56	0.59	0.56	0.55	0.40	0.21	0.16	0.79	0.41	0.32	0.60	n/a	n/a
	14	(356)	0.73	0.63	0.60	0.93	0.65	0.57	0.59	0.56	0.55	0.43	0.22	0.17	0.86	0.45	0.34	0.62	n/a	n/a
	16	(406)	0.76	0.65	0.61	1.00	0.70	0.61	0.61	0.57	0.56	0.52	0.27	0.21	1.00	0.55	0.42	0.66	n/a	n/a
	18	(457)	0.79	0.67	0.63		0.75	0.64	0.62	0.58	0.57	0.62	0.33	0.25		0.65	0.50	0.70	n/a	n/a
	20	(508)	0.83	0.69	0.64		0.81	0.68	0.64	0.59	0.57	0.73	0.38	0.29		0.77	0.58	0.74	n/a	n/a
	20-7/8	(531)	0.84	0.69	0.65		0.83	0.70	0.64	0.59	0.58	0.78	0.41	0.31		0.82	0.62	0.75	n/a	n/a
	22	(559)	0.86	0.70	0.66		0.86	0.72	0.65	0.60	0.58	0.84	0.44	0.34		0.86	0.67	0.77	0.62	n/a
	24	(610)	0.89	0.72	0.67		0.92	0.76	0.66	0.61	0.59	0.96	0.50	0.38		0.92	0.76	0.81	0.65	n/a
	26-9/16	(675)	0.93	0.75	0.69		0.99	0.81	0.68	0.62	0.60	1.00	0.59	0.45		0.99	0.81	0.85	0.68	0.62
	28	(711)	0.96	0.76	0.70		1.00	0.84	0.69	0.62	0.60		0.63	0.48		1.00	0.84	0.87	0.70	0.64
	30	(762)	0.99	0.78	0.71			0.88	0.70	0.63	0.61		0.70	0.54			0.88	0.90	0.73	0.66
	36	(914)	1.00	0.83	0.75			1.00	0.74	0.66	0.63		0.93	0.70			1.00	0.99	0.80	0.73
	> 48	(1219)		0.95	0.84				0.82	0.71	0.68		1.00	1.00				1.00	0.92	0.84

1 Linear interpolation not permitted.

2 Shaded area with reduced edge distance is permitted provided the 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 CSA A23.3-14 Annex 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.

Table 81 - Steel factored resistance for Hilti HIT-V and HAS threaded rods[1]

Nominal anchor diameter in.	HIT-V ASTMA307 Grade A[2]			HAS ISO 898 Class 5.8[2]			HAS-E B7 ASTM A193 B7[3]			HAS-R stainless steel ASTM F593 - AISI 304/316 SS[2]		
	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ lb (kN)	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ lb (kN)	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ lb (kN)	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ lb (kN)
3/8	2,765 (12.3)	1,285 (5.7)	900 (4.0)	3,345 (14.9)	1,555 (6.9)	1,090 (4.8)	6,585 (29.3)	3,090 (13.7)	2,165 (9.6)	4,610 (20.5)	2,140 (9.5)	1,500 (6.7)
1/2	5,065 (22.5)	2,825 (12.6)	1,975 (8.8)	6,125 (27.2)	3,410 (15.2)	2,385 (10.6)	12,060 (53.6)	6,785 (30.2)	4,750 (21.1)	8,445 (37.6)	4,705 (20.9)	3,295 (14.7)
5/8	8,070 (35.9)	4,495 (20.0)	3,145 (14.0)	9,750 (43.4)	5,430 (24.2)	3,800 (16.9)	19,210 (85.4)	10,805 (48.1)	7,565 (33.7)	13,445 (59.8)	7,490 (33.3)	5,245 (23.3)
3/4	11,940 (53.1)	6,650 (29.6)	4,655 (20.7)	14,430 (64.2)	8,040 (35.8)	5,630 (25.0)	28,430 (126.5)	15,990 (71.1)	11,195 (49.8)	16,915 (75.2)	9,425 (41.9)	6,600 (29.4)
7/8	-	-	-	19,915 (88.6)	11,095 (49.4)	7,765 (34.5)	39,245 (174.6)	22,075 (98.2)	15,450 (68.7)	23,350 (103.9)	13,010 (57.9)	9,105 (40.5)
1	21,620 (96.2)	12,045 (53.6)	8,430 (37.5)	26,125 (116.2)	14,555 (64.7)	10,190 (45.3)	51,485 (229.0)	28,960 (128.8)	20,270 (90.2)	30,635 (136.3)	17,065 (75.9)	11,945 (53.1)
1-1/4	-	-	-	41,805 (186.0)	23,290 (103.6)	16,305 (72.5)	82,370 (366.4)	46,335 (206.1)	32,435 (144.3)	49,010 (218.0)	27,305 (121.5)	19,115 (85.0)

[1] See Section 3.1.8.6 to convert design strength value to ASD value.

[2] HIT-V, HAS, and HAS-R threaded rods are considered brittle steel elements. HIT-V does not comply with % elongation requirements of ASTM A307 Grade A steel HAS does not comply with % elongation requirements of ISO 898-1.

[3] HAS-E B7 rods are considered ductile steel elements.

[4] Tensile = $A_{se,N}$ ϕ_s f_{uta} R as noted in CSA A23.3-14 Annex D

[5] Shear = $A_{se,V}$ ϕ_s 0.60 f_{uta} R as noted in CSA A23.3-14 Annex D. For 3/8-in diameter threaded rod, shear = $A_{se,V}$ ϕ_s 0.50 f_{uta} R.

[6] Seismic Shear = $\alpha_{V,seis}$ V_{sar} : Reduction factor for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 82 - Hilti HIT-HY 200 design information with HAS/HIT-V threaded rods in hammer drilled holes in accordance with CSA A23.3-14 Annex D[1]

	Design parameter	Symbol	Units	Nominal rod diameter (in.)							Ref
				3/8	1/2	5/8	3/4	7/8	1	1-1/4	A23.3-14
Nominal anchor Diameter.		d_a	mm	9.5	12.7	15.9	19.1	22.2	25.4	31.8	
Effective minimum embedment[2]		$h_{ef,min}$	mm	60	70	79	89	89	102	127	
Effective maximum embedment[2]		$h_{ef,max}$	mm	191	254	318	381	445	508	635	
Minimum concrete thickness[2]		h_{min}	mm	h_{ef} + 30		h_{ef} + $2d_o$					
Critical edge distance		c_{ac}		see ESR-3187, section 4.1.10.2							
Minimum edge distance		c_{min}[3]	mm	48	64	79	95	111	127	159	
Minimum anchor spacing		s_{min}	mm	48	64	79	95	111	127	159	
Coeff. for factored conc. breakout resistance, uncracked concrete		$k_{c,uncr}$[4]	–	10							D.6.2.2
Coeff. for factored conc. breakout resistance, cracked concrete		$k_{c,cr}$[4]	–	7							D.6.2.2
Concrete material resistance factor		ϕ_c	–	0.65							8.4.2
Resistance modification factor for tension and shear, concrete failure modes, Condition B[5]		R_{conc}	–	1.00							D.5.3(c)
Temp. range A[6]	Characteristic bond stress in cracked concrete[7]	τ_{cr}	psi (MPa)	930 (6.4)	935 (6.4)	940 (6.5)	945 (6.5)	800 (5.5)	805 (5.6)	810 (5.6)	D.6.5.2
	Characteristic bond stress in uncracked concrete[7]	τ_{uncr}	psi (MPa)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	D.6.5.2
Temp. range B[6]	Characteristic bond stress in cracked concrete[7]	τ_{cr}	psi (MPa)	855 (5.9)	860 (5.9)	865 (6.0)	870 (6.0)	735 (5.1)	740 (5.1)	745 (5.1)	D.6.5.2
	Characteristic bond stress in uncracked concrete[7]	τ_{uncr}	psi (MPa)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	D.6.5.2
Temp. range C[6]	Characteristic bond stress in cracked concrete[7]	τ_{cr}	psi (MPa)	730 (5.0)	735 (5.1)	740 (5.1)	745 (5.1)	630	635 (4.4)	635 (4.4)	D.6.5.2
	Characteristic bond stress in uncracked concrete[7]	τ_{uncr}	psi (MPa)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	D.6.5.2
Reduction for seismic tension		$\alpha_{N,seis}$	–	0.8				1.0			
Permissible installation conditions	Resistance modification factor tension & shear, bond failure dry concrete	Anchor category	–	1							D.5.3 (c)
		R_{dry}	–	1.00							
	Resistance modification factor tension & shear, bond failure water-saturated concrete	Anchor category	–	2							D.5.3 (c)
		R_{dry}	–	0.85							

1 Design information in this table is taken from ICC-ES ESR-3187, dated September, 2015, tables 12 and 14, and converted for use with CSA A23.3-14 Annex D.

2 See figure 10 of this section.

3 Minimum edge distance may be reduced to 45mm ≤ c_{ai} < 5d provided T_{inst} is reduced. See ESR-3187 section 4.1.9.2.

4 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate coefficient for breakout resistance for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.

5 For use with the load combinations of CSA A23.3-14 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.

6 Temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
Temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C).
Temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C).
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.

7 Bond strength values corresponding to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [for SI: $(f'_c / 17.2)^{0.1}$].

HIT-HY 200 Adhesive Anchoring System 3.2.3

Table 83 - Hilti HIT-HY 200 adhesive factored resistance with concrete/bond failure for threaded rod in uncracked concrete[1,2,3,4,5,6,7,8,9]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	2-3/8	3,060	3,155	3,210	3,305	3,060	3,155	3,210	3,305
	(60)	(13.6)	(14.0)	(14.3)	(14.7)	(13.6)	(14.0)	(14.3)	(14.7)
	3-3/8	4,385	4,480	4,565	4,695	8,765	8,965	9,130	9,395
	(86)	(19.5)	(19.9)	(20.3)	(20.9)	(39.0)	(39.9)	(40.6)	(41.8)
	4-1/2	5,845	5,975	6,085	6,265	11,685	11,950	12,170	12,525
	(114)	(26.0)	(26.6)	(27.1)	(27.9)	(52.0)	(53.2)	(54.1)	(55.7)
	7-1/2	9,740	9,960	10,145	10,440	19,480	19,920	20,285	20,875
	(191)	(43.3)	(44.3)	(45.1)	(46.4)	(86.6)	(88.6)	(90.2)	(92.9)
1/2	2-3/4	3,815	4,265	4,670	5,105	7,630	8,530	9,345	10,205
	(70)	(17.0)	(19.0)	(20.8)	(22.7)	(33.9)	(37.9)	(41.6)	(45.4)
	4-1/2	7,790	7,965	8,115	8,350	15,585	15,935	16,230	16,700
	(114)	(34.7)	(35.4)	(36.1)	(37.1)	(69.3)	(70.9)	(72.2)	(74.3)
	6	10,390	10,625	10,820	11,135	20,780	21,245	21,635	22,270
	(152)	(46.2)	(47.3)	(48.1)	(49.5)	(92.4)	(94.5)	(96.2)	(99.1)
	10	17,315	17,705	18,030	18,555	34,630	35,410	36,060	37,115
	(254)	(77.0)	(78.8)	(80.2)	(82.5)	(154.0)	(157.5)	(160.4)	(165.1)
5/8	3-1/8	4,620	5,165	5,660	6,535	9,245	10,335	11,320	13,070
	(79)	(20.6)	(23.0)	(25.2)	(29.1)	(41.1)	(46.0)	(50.4)	(58.1)
	5-5/8	11,160	12,450	12,680	13,050	22,320	24,900	25,355	26,095
	(143)	(49.6)	(55.4)	(56.4)	(58.0)	(99.3)	(110.8)	(112.8)	(116.1)
	7-1/2	16,235	16,600	16,905	17,400	32,465	33,200	33,810	34,795
	(191)	(72.2)	(73.8)	(75.2)	(77.4)	(144.4)	(147.7)	(150.4)	(154.8)
	12-1/2	27,055	27,665	28,175	28,995	54,110	55,330	56,345	57,990
	(318)	(120.3)	(123.1)	(125.3)	(129.0)	(240.7)	(246.1)	(250.6)	(258.0)
3/4	3-1/2	5,480	6,125	6,710	7,745	10,955	12,250	13,420	15,495
	(89)	(24.4)	(27.2)	(29.8)	(34.5)	(48.7)	(54.5)	(59.7)	(68.9)
	6-3/4	14,670	16,400	17,970	18,790	29,340	32,805	35,935	37,580
	(171)	(65.3)	(73.0)	(79.9)	(83.6)	(130.5)	(145.9)	(159.8)	(167.2)
	9	22,585	23,900	24,340	25,055	45,175	47,805	48,685	50,105
	(229)	(100.5)	(106.3)	(108.3)	(111.4)	(200.9)	(212.6)	(216.6)	(222.9)
	15	38,960	39,835	40,570	41,755	77,915	79,675	81,140	83,510
	(381)	(173.3)	(177.2)	(180.5)	(185.7)	(346.6)	(354.4)	(360.9)	(371.5)
7/8	3-1/2	5,480	6,125	6,710	7,745	10,955	12,250	13,420	15,495
	(89)	(24.4)	(27.2)	(29.8)	(34.5)	(48.7)	(54.5)	(59.7)	(68.9)
	7-7/8	18,485	20,670	22,640	25,575	36,975	41,340	45,285	51,150
	(200)	(82.2)	(91.9)	(100.7)	(113.8)	(164.5)	(183.9)	(201.4)	(227.5)
	10-1/2	28,465	31,820	33,130	34,100	56,925	63,645	66,265	68,200
	(267)	(126.6)	(141.6)	(147.4)	(151.7)	(253.2)	(283.1)	(294.8)	(303.4)
	17-1/2	53,025	54,225	55,220	56,830	106,055	108,445	110,440	113,665
	(445)	(235.9)	(241.2)	(245.6)	(252.8)	(471.7)	(482.4)	(491.3)	(505.6)
1	4	6,690	7,480	8,195	9,465	13,385	14,965	16,395	18,930
	(102)	(29.8)	(33.3)	(36.5)	(42.1)	(59.5)	(66.6)	(72.9)	(84.2)
	9	22,585	25,255	27,665	31,945	45,175	50,505	55,325	63,885
	(229)	(100.5)	(112.3)	(123.1)	(142.1)	(200.9)	(224.7)	(246.1)	(284.2)
	12	34,775	38,880	42,590	44,540	69,550	77,760	85,180	89,075
	(305)	(154.7)	(172.9)	(189.5)	(198.1)	(309.4)	(345.9)	(378.9)	(396.2)
	20	69,260	70,820	72,125	74,230	138,520	141,645	144,250	148,460
	(508)	(308.1)	(315.0)	(320.8)	(330.2)	(616.2)	(630.1)	(641.7)	(660.4)
1-1/4	5	9,355	10,455	11,455	13,225	18,705	20,915	22,910	26,455
	(127)	(41.6)	(46.5)	(51.0)	(58.8)	(83.2)	(93.0)	(101.9)	(117.7)
	11-1/4	31,565	35,290	38,660	44,640	63,135	70,585	77,320	89,285
	(286)	(140.4)	(157.0)	(172.0)	(198.6)	(280.8)	(314.0)	(343.9)	(397.1)
	15	48,600	54,335	59,520	68,730	97,200	108,670	119,045	137,460
	(381)	(216.2)	(241.7)	(264.8)	(305.7)	(432.4)	(483.4)	(529.5)	(611.4)
	25	104,570	110,660	112,695	115,985	209,140	221,320	225,390	231,970
	(635)	(465.1)	(492.2)	(501.3)	(515.9)	(930.3)	(984.5)	(1002.6)	(1031.8)

[1] See Section 3.1.8 for explanation on development of load values.

[2] See Section 3.1.8.6 to convert design strength value to ASD value.

[3] Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

[4] Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary to the above values. Compare to the steel values in table 81. The lesser of the values is to be used for the design.

[5] Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.78.
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 3.1.8.8.

[8] Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51.
For all-lightweight, λ_a = 0.45

[9] Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 84 - Hilti HIT-HY 200 adhesive factored resistance 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 - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	2-3/8 (60)	1,720 (7.6)	1,755 (7.8)	1,790 (8.0)	1,840 (8.2)	1,720 (7.6)	1,755 (7.8)	1,790 (8.0)	1,840 (8.2)
	3-3/8 (86)	2,440 (10.9)	2,495 (11.1)	2,540 (11.3)	2,615 (11.6)	4,880 (21.7)	4,990 (22.2)	5,085 (22.6)	5,230 (23.3)
	4-1/2 (114)	3,255 (14.5)	3,330 (14.8)	3,390 (15.1)	3,490 (15.5)	6,510 (29.0)	6,655 (29.6)	6,780 (30.1)	6,975 (31.0)
	7-1/2 (191)	5,425 (24.1)	5,545 (24.7)	5,650 (25.1)	5,815 (25.9)	10,850 (48.3)	11,090 (49.3)	11,295 (50.2)	11,625 (51.7)
1/2	2-3/4 (70)	2,665 (11.9)	2,725 (12.1)	2,775 (12.3)	2,855 (12.7)	5,330 (23.7)	5,450 (24.3)	5,550 (24.7)	5,715 (25.4)
	4-1/2 (114)	4,360 (19.4)	4,460 (19.8)	4,545 (20.2)	4,675 (20.8)	8,725 (38.8)	8,920 (39.7)	9,085 (40.4)	9,350 (41.6)
	6 (152)	5,815 (25.9)	5,950 (26.5)	6,055 (26.9)	6,235 (27.7)	11,635 (51.7)	11,895 (52.9)	12,115 (53.9)	12,470 (55.5)
	10 (254)	9,695 (43.1)	9,915 (44.1)	10,095 (44.9)	10,390 (46.2)	19,390 (86.2)	19,825 (88.2)	20,190 (89.8)	20,780 (92.4)
5/8	3-1/8 (79)	3,235 (14.4)	3,615 (16.1)	3,960 (17.6)	4,080 (18.1)	6,470 (28.8)	7,235 (32.2)	7,925 (35.2)	8,160 (36.3)
	5-5/8 (143)	6,855 (30.5)	7,005 (31.2)	7,135 (31.7)	7,345 (32.7)	13,705 (61.0)	14,015 (62.3)	14,270 (63.5)	14,690 (65.3)
	7-1/2 (191)	9,135 (40.6)	9,345 (41.6)	9,515 (42.3)	9,795 (43.6)	18,275 (81.3)	18,685 (83.1)	19,030 (84.6)	19,585 (87.1)
	12-1/2 (318)	15,230 (67.7)	15,570 (69.3)	15,860 (70.5)	16,320 (72.6)	30,455 (135.5)	31,145 (138.5)	31,715 (141.1)	32,640 (145.2)
3/4	3-1/2 (89)	3,835 (17.1)	4,285 (19.1)	4,695 (20.9)	5,425 (24.1)	7,670 (34.1)	8,575 (38.1)	9,390 (41.8)	10,845 (48.2)
	6-3/4 (171)	9,920 (44.1)	10,145 (45.1)	10,330 (46.0)	10,630 (47.3)	19,840 (88.3)	20,290 (90.2)	20,660 (91.9)	21,265 (94.6)
	9 (229)	13,225 (58.8)	13,525 (60.2)	13,775 (61.3)	14,175 (63.1)	26,455 (117.7)	27,050 (120.3)	27,550 (122.5)	28,355 (126.1)
	15 (381)	22,045 (98.1)	22,545 (100.3)	22,955 (102.1)	23,625 (105.1)	44,090 (196.1)	45,085 (200.5)	45,915 (204.2)	47,255 (210.2)
7/8	3-1/2 (89)	3,835 (17.1)	4,285 (19.1)	4,695 (20.9)	5,425 (24.1)	7,670 (34.1)	8,575 (38.1)	9,390 (41.8)	10,845 (48.2)
	7-7/8 (200)	11,430 (50.8)	11,690 (52.0)	11,905 (53.0)	12,250 (54.5)	22,860 (101.7)	23,375 (104.0)	23,810 (105.9)	24,500 (109.0)
	10-1/2 (267)	15,240 (67.8)	15,585 (69.3)	15,870 (70.6)	16,335 (72.7)	30,480 (135.6)	31,170 (138.7)	31,745 (141.2)	32,670 (145.3)
	17-1/2 (445)	25,400 (113.0)	25,975 (115.5)	26,455 (117.7)	27,225 (121.1)	50,805 (226.0)	51,950 (231.1)	52,905 (235.3)	54,450 (242.2)
1	4 (102)	4,685 (20.8)	5,240 (23.3)	5,740 (25.5)	6,625 (29.5)	9,370 (41.7)	10,475 (46.6)	11,475 (51.0)	13,250 (58.9)
	9 (229)	15,025 (66.8)	15,360 (68.3)	15,645 (69.6)	16,100 (71.6)	30,045 (133.7)	30,725 (136.7)	31,290 (139.2)	32,205 (143.2)
	12 (305)	20,030 (89.1)	20,485 (91.1)	20,860 (92.8)	21,470 (95.5)	40,060 (178.2)	40,965 (182.2)	41,720 (185.6)	42,940 (191.0)
	20 (508)	33,385 (148.5)	34,140 (151.9)	34,765 (154.6)	35,780 (159.2)	66,770 (297.0)	68,275 (303.7)	69,535 (309.3)	71,565 (318.3)
1-1/4	5 (127)	6,545 (29.1)	7,320 (32.6)	8,020 (35.7)	9,260 (41.2)	13,095 (58.2)	14,640 (65.1)	16,035 (71.3)	18,520 (82.4)
	11-1/4 (286)	22,095 (98.3)	24,155 (107.4)	24,595 (109.4)	25,315 (112.6)	44,195 (196.6)	48,305 (214.9)	49,195 (218.8)	50,630 (225.2)
	15 (381)	31,495 (140.1)	32,205 (143.2)	32,795 (145.9)	33,755 (150.1)	62,985 (280.2)	64,405 (286.5)	65,590 (291.8)	67,505 (300.3)
	25 (635)	52,490 (233.5)	53,675 (238.7)	54,660 (243.1)	56,255 (250.2)	104,975 (467.0)	107,345 (477.5)	109,320 (486.3)	112,510 (500.5)

[1] See Section 3.1.8 for explanation on development of load values.

[2] See Section 3.1.8.6 to convert design strength value to ASD value.

[3] Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

[4] Apply spacing, edge distance, and concrete thickness factors in tables 42 - 55 as necessary to the above values. Compare to the steel values in table 81. The lesser of the values is to be used for the design.

[5] Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.78.
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 3.1.8.8.

[8] Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by la 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 in tension and shear 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 3.1.8.7 for additional information on seismic applications.

Table 85 - Steel factored resistance for steel bolt/cap screw for Hilti HIS-N and HIS-RN internally threaded inserts[1,2,3]

Thread size	ASTM A193 B7			ASTM A193 Grade B8M Stainless Steel		
	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[6] $V_{sar,eq}$ lb (kN)	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Seismic Shear[6] $V_{sar,eq}$ lb (kN)
3/8-16 UNC	5,765 (25.6)	3,215 (14.3)	2,250 (10.0)	5,070 (22.6)	2,825 (12.6)	1,975 (8.8)
1/2-13 UNC	9,635 (42.9)	5,880 (26.2)	4,115 (18.3)	9,290 (41.3)	5,175 (23.0)	3,620 (16.1)
5/8-11 UNC	16,020 (71.3)	9,365 (41.7)	6,555 (29.2)	14,790 (65.8)	8,240 (36.7)	5,770 (25.7)
3/4-10 UNC	16,280 (72.4)	13,860 (61.7)	9,700 (43.1)	21,895 (97.4)	12,195 (54.2)	8,535 (38.0)

[1] See Section 3.1.8.6 to convert design strength value to ASD value.

[2] Hilti HIS-N and HIS-RN inserts with steel bolts are considered brittle steel elements.

[3] Table values are the lesser of steel failure in the HIS-N insert or inserted steel bolt.

[4] Tensile = $A_{se,N}$ ϕ_s f_{uta} R as noted in CSA A23.3-14 Annex D.

[5] Shear = $A_{se,V}$ ϕ_s 0.60 f_{uta} R as noted in CSA A23.3-14 Annex D. For 3/8-in diameter insert, shear = $A_{se,V}$ ϕ_s 0.50 f_{uta} R.

[6] Seismic Shear = $\alpha_{V,seis}$ V_{sar} : Reduction factor for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 86 - Hilti HIT-HY 200 design information with Hilti HIS-N and HIS-RN internally threaded inserts in hammer drilled holes in accordance with CSA A23.3-14 Annex D[1]

Design parameter		Symbol	Units	Nominal bolt/cap screw diameter (in.)				Ref
				3/8	1/2	5/8	3/4	A23.3-14
HIS insert outside diameter		d_a	mm	16.5	20.5	25.4	27.6	
Effective embedment[2]		h_{ef}	mm	110	125	170	205	
Minimum concrete thickness[2]		h_{min}	mm	150	170	230	270	
Critical edge distance		c_{ac}	–	see ESR-3187, section 4.1.10				
Minimum edge distance		c_{min}	mm	83	102	127	140	
Minimum anchor spacing		S_{min}	mm	83	102	127	140	
Coeff. for factored concrete breakout resistance, uncracked concrete		$k_{c,uncr}$[3]	–	10				D.6.2.2
Coeff. for factored concrete breakout resistance, cracked concrete		$k_{c,cr}$[3]	–	7				D.6.2.2
Concrete material resistance factor		ϕ_c	–	0.65				8.4.2
Resistance modification factor for tension and shear, concrete failure modes, Condition B[4]		R_{conc}	–	1.00				D.5.3 (c)
Temp range A[5]	Characteristic pullout resistance in cracked concrete[6]	τ_{cr}	psi (MPa)	940 (6.5)	950 (6.6)	805 (5.6)	805 (5.6)	D.6.5.2
	Characteristic pullout resistance in uncracked concrete[6]	τ_{uncrr}	psi (MPa)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	1,670 (11.5)	D.6.5.2
Temp range B[5]	Characteristic pullout resistance in cracked concrete[6]	τ_{cr}	psi (MPa)	865 (6.0)	870 (6.0)	740 (5.1)	740 (5.1)	D.6.5.2
	Characteristic pullout resistance in uncracked concrete[6]	τ_{uncrr}	psi (MPa)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	1,540 (10.6)	D.6.5.2
Temp range C[5]	Characteristic pullout resistance in cracked concrete[6]	τ_{cr}	psi (MPa)	740 (5.1)	745 (5.1)	635 (4.4)	635 (4.4)	D.6.5.2
	Characteristic pullout resistance in uncracked concrete[6]	τ_{uncrr}	psi (MPa)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	1,315 (9.1)	D.6.5.2
Reduction for seismic tension		$\alpha_{N,seis}$	–	0.8				
Permissible installation conditions	Resistance modification factor tension and shear, pullout failure dry concrete	Anchor category	–	1				D.5.3 (c)
		R_{dry}	–	1.00				
	Resistance modification factor tension and shear, pullout failure water-saturated concrete	Anchor category	–	2				D.5.3 (c)
		R_{ws}	–	0.85				

1 Design information in this table is taken from ICC-ES ESR-3187, dated September, 2015, tables 23 and 24, and converted for use with CSA A23.3-14 Annex D.

2 See figure 13 of this section.

3 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate coefficient for breakout resistance for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.

4 For use with the load combinations of CSA A23.3-14 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3-14 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.

5 Temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
Temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C).
Temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C).
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 Bond strength values corresponding to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^{0.1}$ [for SI: $(f'_c / 17.2)^{0.1}$].

Table 87 - Hilti HIT-HY 200 adhesive factored resistance with concrete/bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete[1,2,3,4,5,6,7,8,9]

Thread size	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8-16 UNC	4-3/8	7,540	8,430	9,235	10,450	15,080	16,860	18,470	20,895
	(110)	(33.5)	(37.5)	(41.1)	(46.5)	(67.1)	(75.0)	(82.1)	(92.9)
1/2-13 UNC	5	9,135	10,210	11,185	12,915	18,265	20,420	22,370	25,830
	(125)	(40.6)	(45.4)	(49.8)	(57.5)	(81.3)	(90.8)	(99.5)	(114.9)
5/8-11 UNC	6-3/4	14,485	16,195	17,740	20,485	28,970	32,390	35,480	40,970
	(170)	(64.4)	(72.0)	(78.9)	(91.1)	(128.9)	(144.1)	(157.8)	(182.2)
3/4-10 UNC	8-1/8	19,180	21,445	23,490	27,125	38,360	42,890	46,985	54,255
	(205)	(85.3)	(95.4)	(104.5)	(120.7)	(170.6)	(190.8)	(209.0)	(241.3)

Table 88 - Hilti HIT-HY 200 adhesive factored resistance 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 - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8-16 UNC	4-3/8	5,280	5,610	5,715	5,880	10,555	11,220	11,430	11,760
	(110)	(23.5)	(25.0)	(25.4)	(26.2)	(47.0)	(49.9)	(50.8)	(52.3)
1/2-13 UNC	5	6,395	7,150	7,830	8,415	12,785	14,295	15,660	16,830
	(125)	(28.4)	(31.8)	(34.8)	(37.4)	(56.9)	(63.6)	(69.7)	(74.9)
5/8-11 UNC	6-3/4	10,140	11,335	11,635	11,975	20,280	22,675	23,270	23,950
	(170)	(45.1)	(50.4)	(51.8)	(53.3)	(90.2)	(100.9)	(103.5)	(106.5)
3/4-10 UNC	8-1/8	13,425	15,010	15,295	15,740	26,855	30,025	30,585	31,480
	(205)	(59.7)	(66.8)	(68.0)	(70.0)	(119.5)	(133.5)	(136.0)	(140.0)

1 See Section 3.1.8 for explanation on development of load values.

2 See Section 3.1.8.6 to convert design strength value to ASD value.

3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

4 Apply spacing, edge distance, and concrete thickness factors in tables 60 - 61 as necessary to the above values. Compare to the steel values in table 85. The lesser of the values is to be used for the design.

5 Data is for temperature range A: Max. short term temperature = 130°F (55°C), max. long term temperature = 110°F (43°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above values by 0.92.
For temperature range C: Max. short term temperature = 248°F (120°C), max. long term temperature = 162°F (72°C) multiply above values by 0.78.
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 value by 0.85.

7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 3.1.8.8.

8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

9 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tabular values in tension and shear by the following reduction factors:
For all insert diameters - α_{seis} = 0.60
See section 3.1.8.7 for additional information on seismic applications.

3.2.3 HIT-HY 200 Adhesive Anchoring System

3.2.3.3 Development and Splicing of Post-Installed Reinforcement

Calculations for post-installed rebar for typical development lengths may be done according to ACI 318-14 Chapter 25 (formerly ACI 318-11 Chapter 12) and CSA A23.3-14 Chapter 12 for adhesive anchors tested and approved in accordance with AC 308. This section contains tables for the data provided in ICC Evaluation Services ESR-3187. Refer to section 3.1.8.14 and the Hilti North America Post-Installed Reinforcing Bar Guide for the design method.

Table 89 - Calculated tension development and Class B splice lengths for Grade 60 bars in walls, slabs, columns, and footings per ACI 318-14 Chapter 25 for Hilti HIT-HY 200 - SDC A and B only[3,4,5,6,7]

	System					f'_c = 2,500 psi		f'_c = 3,000 psi		f'_c = 4,000 psi		f'_c = 6,000 psi	
Rebar size	HIT-HY 200-A	HIT-HY 200-R	$\frac{c_b + K_{tr}}{d_b}$	Minimum edge dist. in.[1]	Minimum spacing in.[2]	ℓ_d in.	Class B splice in.	ℓ_d in.	Class B splice in.	ℓ_d in.	Class B splice in.	ℓ_d in.	Class B splice in.
#3	◐	◐	2.5	2-1/4	2	12	14	12	13	12	12	12	12
#4	◐	◐		2-3/4	2-1/2	14	19	13	17	12	15	12	12
#5	◐	◐		3	3-1/4	18	23	16	21	14	18	12	15
#6	■	◐		3-3/4	3-3/4	22	28	20	26	17	22	14	18
#7	■	◐		4-1/2	4-1/2	32	41	29	37	25	32	20	26
#8	■	◐		5	5	36	47	33	43	28	37	23	30
#9	■	◐		5-1/4	5-3/4	41	53	37	48	32	42	26	34
#10	■	◐		5-3/4	6-1/2	46	59	42	54	36	47	30	38

◐ Applicable for use with special installation provisions and installation temperature restrictions to account for short gel time with deep embedment depth. See the Instruction For Use (IFU), packaged with the product for special installation parameters.

■ Not recommended due to limited gel time of adhesive.

1 Edge distances are determined using the minimum cover specified by ESR-3187 with an additional 6% of the development length per suggestions for drilling without an aid per Hilti Post-Installed Reinforcing Bar Guide Section 3.3. Smaller edge distances may be possible, for which development and splice lengths may need to be recalculated. For further information on required cover see ACI 318-14, Sec. 20.6.1.3; see Sec. 2.2 for determination of c_b.

2 Spacing values represent those producing c_b =5 d_b rounded up to the nearest 1/4 in. Smaller spacing values may be possible, for which development and splice lengths may need to be recalculated. For further information on required spacing see ACI 318-14 Sec. 25.2; see Sec. 2.2 for determination of c_b.

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

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

5 ψ_s = 0.8 for #6 bars and smaller bars, 1.0 for #7 and larger bars. See ACI 318-14, Sec. 25.4.2.4.

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

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

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

Table 90 - Suggested embedment, edge distance, and spacing (see figure below) to develop 125% of f_y in Grade 60 bars based on ACI 318-14 Chapter 17 - SDC A and B only[1,2,3,4,5,6,7]

HIT-HY 200-A and HIT-HY 200-R[6]																
	f'_c = 2,500 psi				f'_c = 3,000 psi				f'_c = 4,000 psi				f'_c = 6,000 psi			
	Effective embed.	Minimum edge dist $c_{a,min}$ in.		Min. spacing	Effective embed.	Minimum edge dist $c_{a,min}$ in.		Min. spacing	Effective embed.	Minimum edge dist $c_{a,min}$ in.		Min. spacing	Effective embed.	Minimum edge dist $c_{a,min}$ in.		Min. spacing
Rebar size	h_{ef} in.	Cond. I	Cond. II	s_{min} in.	h_{ef} in.	Cond. I	Cond. II	s_{min} in.	h_{ef} in.	Cond. I	Cond. II	s_{min} in.	h_{ef} in.	Cond. I	Cond. II	s_{min} in.
#3	7	18	8	15	7	18	7	14	7	18	7	13	7	17	6	11
#4	10	25	11	22	10	25	11	21	9	24	10	19	9	24	9	17
#5	12	31	15	29	12	31	14	28	12	30	13	25	11	29	11	22
#6	14	37	19	37	14	36	18	35	14	36	16	32	13	35	14	28
#7	17	43	23	45	16	42	22	43	16	41	20	39	15	40	17	34
#8	**19**	49	27	54	19	49	26	51	18	48	23	47	18	47	21	41
#9	**21**	55	32	63	**21**	54	30	60	20	54	27	54	20	52	24	48
#10	**25**	65	37	74	**24**	62	35	70	23	60	32	64	22	59	28	56

1 For additional information see May-June 2013 issue of the ACI Structural Journal, “Recommended Procedures for Development and Splicing of Post-Installed Bonded Reinforcing Bars in Concrete Structures” by Charney, Pal and Silva.

2 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.3 to develop 125% of nominal bar yield. Bond stresses may include adjustments for sustained loads. Additional reductions per ACI 318-14, 17.3.1.2 are not included, however, and as such these embedments are not intended for sustained tension load applications. Shaded embedment values exceed 20 bar diameters. The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the unbolded and bolded tabulated hef values by 0.80 and 0.86, respectively. Reduction factors for non-sustained loading and no bar overstrength may be combined.

3 c_a and s are the minimum edge distance and bar spacing (from bar centerline) associated with the tabulated embedments. Refer to sec. 3.1.14.3 for applicability of edge distance “Condition I” and “Condition II.”

4 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

5 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187 Tables 12 and 13 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

6 Values are for normal weight concrete. For lightweight concrete contact Hilti.

7 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.

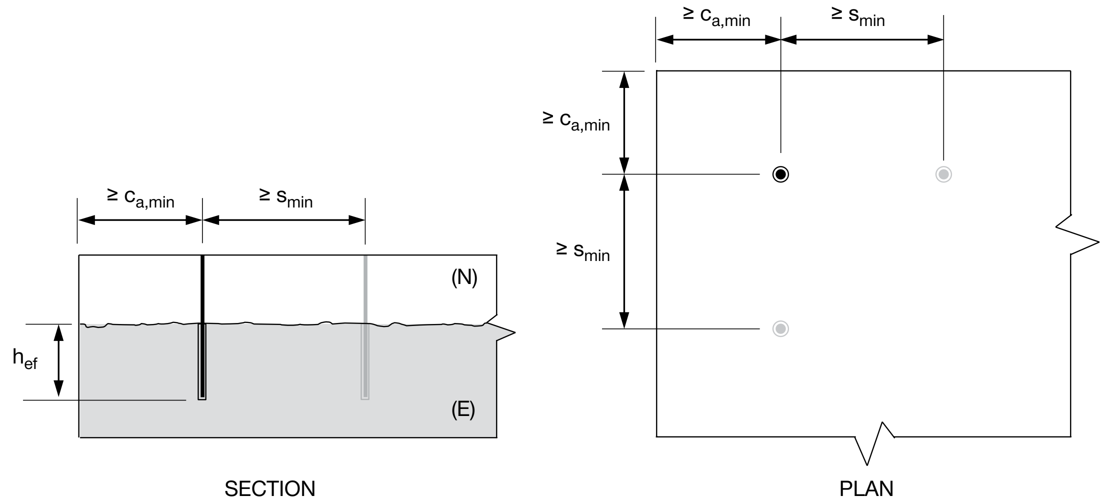


Illustration of Table 90 dimensions

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 91 - Suggested embedment and edge distance (see figure below) based on ACI 318-14 Chapter 17 to develop 125% of f_y in Grade 60 wall/column starter bars in a linear array with bar spacing = 24 inches - SDC A and B only[1,2,3,4,5,6]

HIT-HY 200-A and HIT-HY 200-R[5]													
		f'_c = 2,500 psi			f'_c = 3,000 psi			f'_c = 4,000 psi			f'_c = 6,000 psi		
Rebar size	Linear spacing s in.	Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.		Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.		Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.		Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.	
			Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II
#3	24	7	18	8	7	18	7	7	18	7	7	17	6
#4		10	25	12	10	25	11	9	24	10	9	24	9
#5		13	33	19	12	31	17	12	30	15	11	29	12
#6		21	55	32	19	49	28	15	40	23	13	35	18
#7		32	83	47	28	28	42	23	62	35	18	48	26

1 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.4 to develop 125% of nominal bar yield. Shaded embedment values exceed 20 bar diameters. For non-tabulated rebar sizes, design per development length provisions is recommended. The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the tabulated h_{ef} values by 0.86.

2 c_a is the minimum edge distance (from bar centerline) associated with the tabulated embedments and s = 24 in. Refer to sec. 3.1.14.3 for applicability of edge distance “Condition I” and “Condition II.”

3 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

4 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187 Tables 12 and 13 assuming dry concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

5 Values are for normal weight concrete. For lightweight concrete contact Hilti.

6 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for detailed explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.

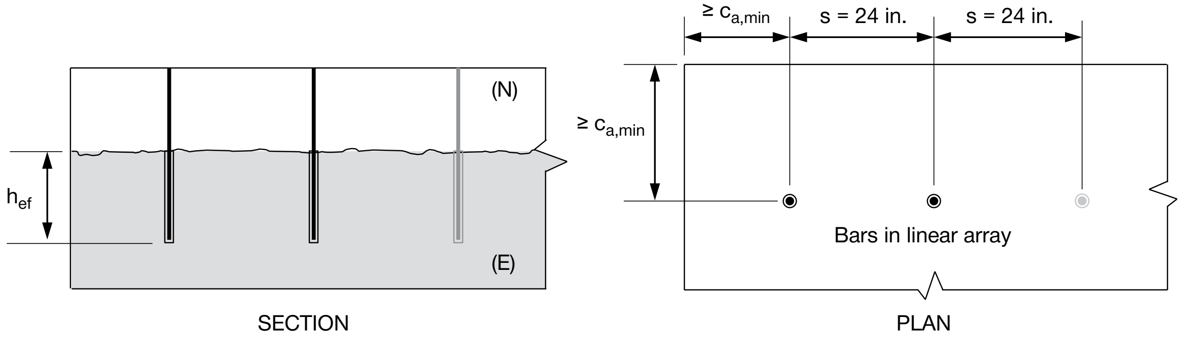


Illustration of Table 91 dimensions

Table 92 - Suggested embedment and edge distance (see figure below) based on ACI 318-14 Chapter 17 to develop 125% of f_y in Grade 60 wall/column starter bars in a linear array with bar spacing = 18 inches - SDC A and B only[1,2,3,4,5,6]

HIT-HY 200-A and HIT-HY 200-R[5]													
		f'_c = 2,500 psi			f'_c = 3,000 psi			f'_c = 4,000 psi			f'_c = 6,000 psi		
Rebar size	Linear spacing s in.	Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.		Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.		Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.		Effective embed. h_{ef} in.	Minimum edge dist $c_{a,min}$ in.	
			Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II
#3	18	7	18	8	7	18	7	7	18	7	7	17	6
#4		10	25	14	10	25	13	9	24	12	9	24	10
#5		18	47	27	16	41	24	13	34	19	11	29	15

1 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.4 to develop 125% of nominal bar yield. Shaded embedment values exceed 20 bar diameters. For non-tabulated rebar sizes, design per development length provisions is recommended. The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the tabulated h_{ef} values by 0.86.

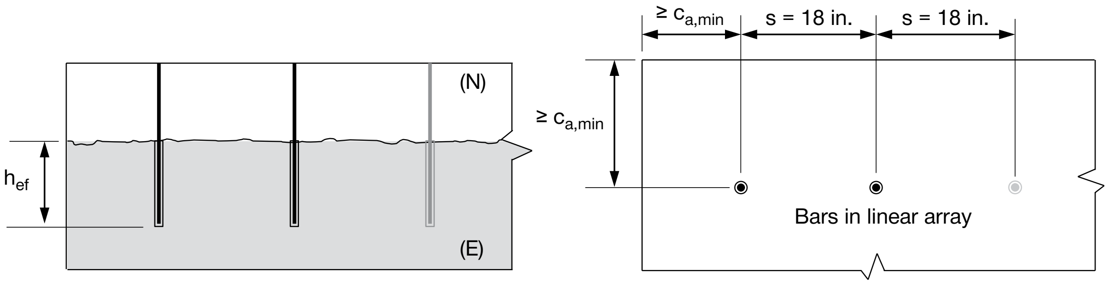
2 c_a is the minimum edge distance (from bar centerline) associated with the tabulated embedments and s = 18 in. Refer to sec. 3.1.14.3 for applicability of edge distance “Condition I” and “Condition II.”

3 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

4 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187, Tables 12 and 13 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

5 Values are for normal weight concrete. For lightweight concrete contact Hilti.

6 Refer to the Hilti North America



SECTION PLAN

Illustration of Table 92 dimensions

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 93 - Suggested embedment and edge distance (see figure below) based on ACI 318-14 Chapter 17 to develop 125% of f_y in Grade 60 wall/column starter bars in a linear array with bar spacing = 12 inches - SDC A and B only[1,2,3,4,5,6]

		HIT-HY 200-A and HIT-HY 200-R[5]											
		f'_c = 2,500 psi			f'_c = 3,000 psi			f'_c = 4,000 psi			f'_c = 6,000 psi		
		Effective embed.	Minimum edge dist $c_{a,min}$ in.		Effective embed.	Minimum edge dist $c_{a,min}$ in.		Effective embed.	Minimum edge dist $c_{a,min}$ in.		Effective embed.	Minimum edge dist $c_{a,min}$ in.	
Rebar size	Linear spacing s in.	h_{ef} in.	Cond. I	Cond. II	h_{ef} in.	Cond. I	Cond. II	h_{ef} in.	Cond. I	Cond. II	h_{ef} in.	Cond. I	Cond. II
#3	12	7	18	10	7	18	9	7	18	8	7	17	7
#4		–	–	–	13	35	20	11	29	16	9	24	13

1 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.4 to develop 125% of nominal bar yield. Shaded embedment values exceed 20 bar diameters. For non-tabulated rebar sizes, design per development length provisions is recommended. The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the tabulated h_{ef} values by 0.86.

2 c_a is the minimum edge distance (from bar centerline) associated with the tabulated embedments and s = 12 in. Refer to sec. 3.1.14.3 for applicability of edge distance "Condition I" and "Condition II."

3 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

4 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187, Tables 12 and 13 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

5 Values are for normal weight concrete. For lightweight concrete contact Hilti.

6 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.

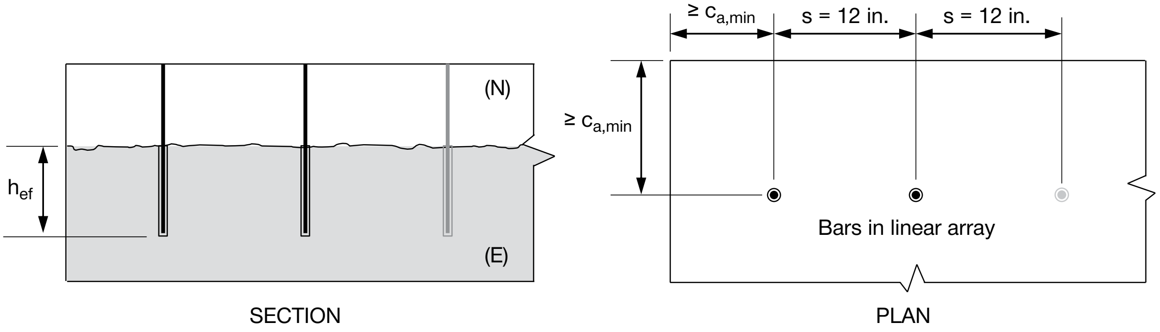


Illustration of Table 93 dimensions

Table 94 - Calculated tension development and splice lengths for Canadian 400 MPa bars in walls, slabs, columns, and footings per CSA A23.3-14 for Hilti HIT-HY 200 - non-seismic design only[3,4,5,6,7,8]

	System					f'_c = 20 MPa		f'_c = 25 MPa		f'_c = 30 MPa		f'_c = 40 MPa	
Rebar size	HIT-HY 200-A	HIT-HY 200-R	d_{cs} + K_{tr}	Minimum edge dist. mm[1]	Minimum spacing mm[2]	ℓ_d mm	Class B splice mm	ℓ_d mm	Class B splice mm	ℓ_d mm	Class B splice mm	ℓ_d mm	Class B splice mm
10M	◐	◐	2.5d_b	60	50	300	380	300	340	300	310	300	300
15M	◐	◐		70	75	410	540	370	480	340	440	300	380
20M	◐	◐		80	100	510	660	450	590	410	540	360	460
25M	■	◐		120	125	820	1,060	730	950	670	870	580	750
30M	■	◐		130	150	960	1,250	860	1,120	790	1,020	680	890

◐ Applicable for use with special installation provisions and installation temperature restrictions to account for short gel time with deep embedment depth. See Instructions for Use (IFU) for special installation parameters.

■ Not recommended due to limited gel time of adhesive.

1 Edge distances are determined using the minimum cover specified by ESR-3187 with an additional 6% of the development length per suggestions for drilling without an aid per Hilti Post-Installed Reinforcing Bar Guide Section 3.3. Smaller edge distances may be possible, for which development and splice lengths may need to be recalculated. For further information on required cover see CSA A23.1-14 Table 17; see Sec. 3.2 for determination of d_{cs}.

2 Spacing values represent those producing c_b $5d_b$. Smaller spacing values may be possible, for which development and splice lengths may need to be recalculated. For further information on required spacing see CSA A23.1 Sec. 6.6.5.2; see Sec. 3.2 for determination of d_{cs}.

3 k_1 and k_2 as defined by CSA A23.3-14 12.2.4 (a) and (b), are taken as 1.0 for post-installed reinforcing bars. For additional information see May-June 2013 issue of the ACI Structural Journal, “Recommended Procedures for Development and Splicing of Post-Installed Bonded Reinforcing Bars in Concrete Structures” by Charney, Pal and Silva.

4 k_4 = 0.8 for 20M bars and smaller bars, 1.0 for 25M and larger bars. See CSA A23.3-14 12.2.4 (d).

5 K_{tr} is assumed to equal zero.

6 Values are for normal weight concrete. For lightweight concrete, multiply development and splice lengths by 1.3.

7 Development and splice length values are for static design. For tension development and splice lengths of bars in joints, see CSA A23.3-14 21.3.3.5. For further information about reinforcement in seismic design, see CSA A23.3-14 Ch. 21.

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

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 95 - Suggested embedment, edge distance, and spacing (see figure below) to develop 125% of f_y in Canadian 400 MPa bars based on CSA A23.3-14 Annex D - non-seismic design only[1,2,3,4,5,6,7]

	HIT-HY 200-A and HIT-HY 200-R[6]															
	f'_c = 20 MPa				f'_c = 25 MPa				f'_c = 30 MPa				f'_c = 40 MPa			
	Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Min. spacing s_{min} mm	Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Min. spacing s_{min} mm	Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Min. spacing s_{min} mm	Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Min. spacing s_{min} mm
Rebar size		Cond. I	Cond. II			Cond. I	Cond. II			Cond. I	Cond. II			Cond. I	Cond. II	
10M	200	520	220	440	200	510	200	400	200	510	190	380	190	500	180	350
15M	280	740	350	690	280	730	320	640	270	720	300	600	270	710	280	550
20M	350	910	450	900	340	890	420	840	330	880	400	790	320	870	360	720
25M	**450**	1,170	630	1,260	440	1,150	590	1,170	430	1,140	560	1,110	420	1,120	500	1,000
30M	**530**	1,390	790	1,580	**520**	1,360	740	1,470	510	1,350	690	1,380	490	1,320	630	1,260

[1] For additional information see May-June 2013 issue of the ACI Structural Journal, “Recommended Procedures for Development and Splicing of Post-Installed Bonded Reinforcing Bars in Concrete Structures” by Charney, Pal and Silva.

[2] h_{ef} is the calculated bar embedment uncracked based on bond and concrete breakout strengths using equations in section 3.1.14.3 to develop 125% of nominal bar yield. Bond stresses may include adjustments for sustained loads. Additional reductions per ACI 318-14 17.3.1.2 are not included, however, and as such these embedments are not intended for sustained tension load applications. Shaded embedment values exceed 20 bar diameters. The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to bond strengths that have not been adjusted for sustained loading, multiply the tabulated hef values by 0.87. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the unbolded and bolded tabulated h_{ef} values by 0.80 and 0.86, respectively.

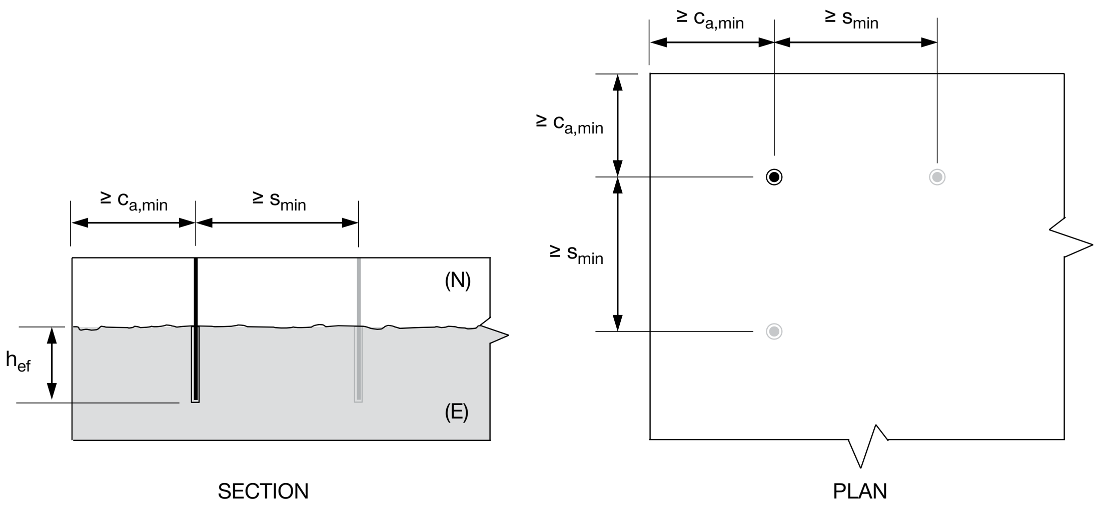
[3] c_a and s are the minimum edge distance and bar spacing (from bar centerline) associated with the tabulated embedments. Refer to sec. 3.1.14.3 for applicability of edge distance “Condition I” and “Condition II.”

[4] Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

[5] Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187 Tables 20 and 21 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

[6] Values are for normal weight concrete. For lightweight concrete contact Hilti.

[7] Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.



SECTION PLAN

Illustration of Table 95 dimensions

Table 96 - Suggested embedment and edge distance (see figure below) based on CSA A23.3-14 Annex D to develop 125% of f_y in Canadian 400 MPa wall/column starter bars in a linear array with bar spacing = 600 millimeters - non-seismic design only[1,2,3,4,5,6]

HIT-HY 200-A and HIT-HY 200-R[5]													
		f'_c = 20 MPa			f'_c = 25 MPa			f'_c = 30 MPa			f'_c = 40 MPa		
		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm	
Rebar size	Linear spacing s mm		Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II
10M	600	200	520	220	200	510	200	200	510	190	190	500	180
15M		280	740	420	280	730	350	270	720	300	270	710	280
20M		510	1,340	760	430	1,150	650	380	1,010	570	320	870	460

1 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.4 to develop 125% of nominal bar yield. Shaded embedment values exceed 20 bar diameters. For non-tabulated rebar sizes, design per development length provisions is recommended.
The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the tabulated h_{ef} values by 0.86.

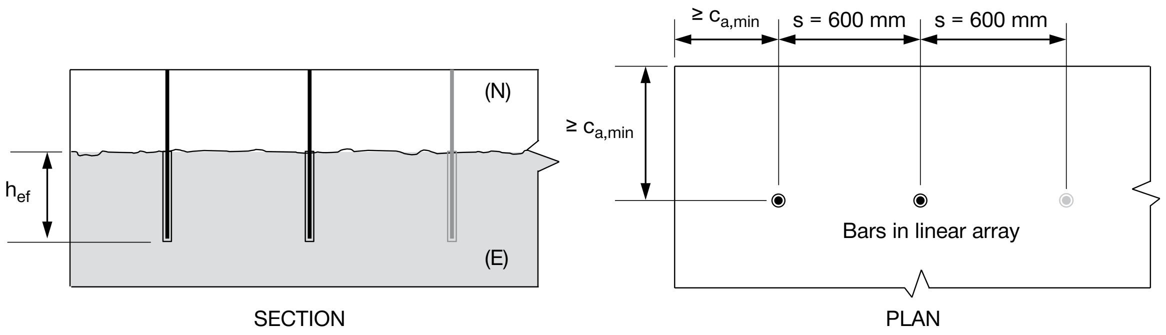
2 c_a is the minimum edge distance (from bar centerline) associated with the tabulated embedments and s = 600 mm. Refer to sec. 3.1.14.3 for applicability of edge distance "Condition I" and "Condition II."

3 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

4 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187, Tables 12 and 13 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

5 Values are for normal weight concrete. For lightweight concrete contact Hilti.

6 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.



SECTION PLAN

Illustration of Table 96 dimensions

3.2.3 HIT-HY 200 Adhesive Anchoring System

Table 97 - Suggested embedment and edge distance (see figure below) based on CSA A23.3-14 Annex D to develop 125% of f_y in Canadian 400 MPa wall/column starter bars in a linear array with bar spacing = 450 millimeters - non-seismic design only[1,2,3,4,5,6]

HIT-HY 200-A and HIT-HY 200-R[5]													
		f'_c = 20 MPa			f'_c = 25 MPa			f'_c = 30 MPa			f'_c = 40 MPa		
			Minimum edge dist $c_{a,min}$ mm			Minimum edge dist $c_{a,min}$ mm			Minimum edge dist $c_{a,min}$ mm			Minimum edge dist $c_{a,min}$ mm	
Rebar size	Linear spacing s mm	Effective embed. h_{ef} mm	Cond. I	Cond. II	Effective embed. h_{ef} mm	Cond. I	Cond. II	Effective embed. h_{ef} mm	Cond. I	Cond. II	Effective embed. h_{ef} mm	Cond. I	Cond. II
10M	450	200	520	220	200	510	200	200	510	190	190	500	180
15M		390	1,040	590	340	890	500	300	790	440	270	710	360

1 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.4 to develop 125% of nominal bar yield. Shaded embedment values exceed 20 bar diameters. For non-tabulated rebar sizes, design per development length provisions is recommended.
The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the tabulated h_{ef} values by 0.86.

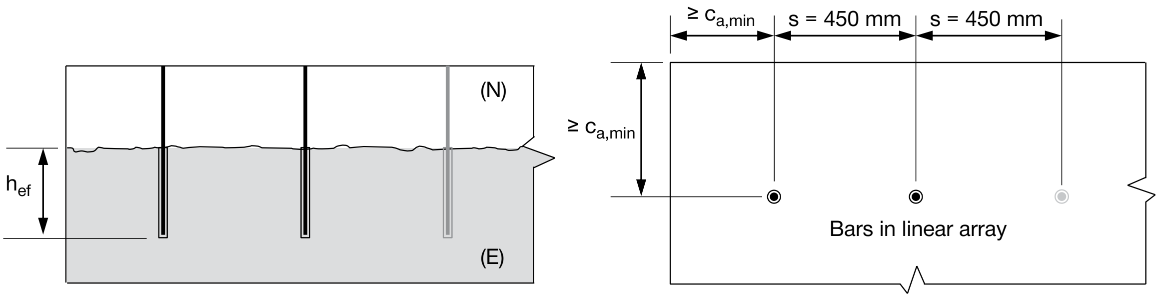
2 c_a is the minimum edge distance (from bar centerline) associated with the tabulated embedments and s = 450 mm. Refer to sec. 3.1.14.3 for applicability of edge distance “Condition I” and “Condition II.”

3 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

4 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187 Tables 12 and 13 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

5 Values are for normal weight concrete. For lightweight concrete contact Hilti.

6 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.



SECTION PLAN

Illustration of Table 97 dimensions

Table 98 - Suggested embedment and edge distance (see figure below) based on CSA A23.3-14 Annex D to develop 125% of f_y in Canadian 400 MPa wall/column starter bars in a linear array with bar spacing = 300 millimeters - non-seismic design only[1,2,3,4,5,6]

HIT-HY 200-A and HIT-HY 200-R[5]													
		f'_c = 20 MPa			f'_c = 25 MPa			f'_c = 30 MPa			f'_c = 40 MPa		
	Linear spacing s mm	Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm		Effective embed. h_{ef} mm	Minimum edge dist $c_{a,min}$ mm	
Rebar size			Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II		Cond. I	Cond. II
10M	300	240	610	350	200	520	300	200	510	260	190	500	210

1 h_{ef} is the calculated bar embedment based on uncracked bond and concrete breakout strengths using equations in section 3.1.14.4 to develop 125% of nominal bar yield. Shaded embedment values exceed 20 bar diameters. For non-tabulated rebar sizes, design per development length provisions is recommended. The particular assumptions used for the application of anchor theory to bar development (e.g., bar yield and bond strength values) are a matter of engineering judgment and will in part depend on the specific circumstances of the design. For embedments corresponding to nominal yield (i.e., no overstrength) multiply the tabulated hef values by 0.86.

2 c_a is the minimum edge distance (from bar centerline) associated with the tabulated embedments and s = 300 mm. Refer to sec. 3.1.14.3 for applicability of edge distance “Condition I” and “Condition II.”

3 Applicable for hammer-drilled holes. For rock-drilled and core-drilled holes, contact Hilti.

4 Values determined with bond stresses, k-factors and strength reduction factors taken from ESR-3187 Tables 12 and 13 assuming dry, uncracked concrete conditions where concrete temperatures will not exceed a maximum short-term temperature of 130°F (55°C) and long-term temperature of 110°F (43°C). Bond stresses are for static (non-seismic) loading conditions.

5 Values are for normal weight concrete. For lightweight concrete contact Hilti.

6 Refer to the Hilti North America Post-Installed Reinforcing Bar Guide for further explanation, background information, and design examples. See Hilti Instructions for Use (IFU) for specific installation requirements.

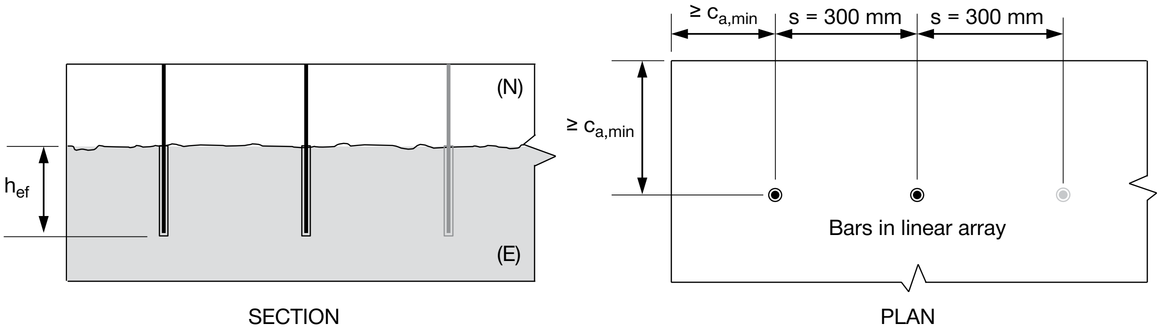


Illustration of Table 98 dimensions

3.2.3 HIT-HY 200 Adhesive Anchoring System

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 (approx.)

HIT-HY 200-A					
		HAS HIS-N Rebar		HIT-Z[1]	
[°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[1]	
[°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

[1] It is permitted to install Hilti HIT-HY 200 with HIT-Z anchor rod down to 14° F (-10° C) provided the drilled hole has the drilling dust fully removed. This can be done with Hilti TE-CD or TE-YD hollow drill bit or with cleaning procedures used with standard threaded rod.

Resistance of cured Hilti HIT-HY 200 to chemicals

Chemical		Behavior
Acetic acid	10%	+
Acetone		•
Ammonia	5%	+
Benzyl alcohol		–
Hydrochloric 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.

3.2.3.5 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)	

For ordering information on anchor rods and inserts, dispensers, hole cleaning equipment and other accessories, see section 3.2.9.