EVERYDAY SOLUTION FOR FAST-CURE CHEMICAL ANCHORING

HIT-HY 100 Adhesive Anchor

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Hybrid Adhesive HIT-HY 100

Hilti HIT-HY 100 is the everyday fast-cure mortar that provides the quality you've come to expect from Hilti at an economical price. HIT-HY 100 has approvals for cracked and un-cracked concrete and grout filled CMU, making HIT-HY 100 more versatile for rebar doweling and anchoring.

Take reliability, safety, and productivity to a new level with HIT-HY 100 and SafeSet technology by eliminating the manual hole cleaning step. With the TE-CD and TE-YD hollow bits and the VC 150 and VC 300 series vacuums, you can increase productivity up to 60% while achieving correct hole preparation and OSHA 1926.1153 Table 1 compliance.

APPLICATIONS AND ADVANTAGES

- Suitable for use in un-cracked concrete and cracked concrete with all anchor rods and rebar per ICC-ES approval (International Code Council — Evaluation Service)
- Suitable for use in grout-filled CMU for anchor rods per IAPMO-UES (IAPMO-UES (International Association of Plumbing and Mechanical Officials Uniform Evaluation Service)
- Anchoring light structural steel connections (e.g. steel columns, beams)
- Rebar doweling / connection of secondary post-installed rebar
- Easy and accurate dispensing with HDE 500-A22 battery dispenser
- SafeSet technology — automatic hole cleaning with TE-CD / TE-YD hollow drill bits and VC 150/300 vacuum

2015 IBC®
Compliant Anchor

HILTI

Technical data

Product	Hybrid Urethane Methacrylate
Base material temperature	14° F to 104° F (-10° C to 40° C)
Diameter range	3/8" to 1-1/4"
Package volume	• Volume of HIT-HY 100 11.1 fl oz/330 ml foil pack is 20.1 in³ • Volume of HIT-HY 100 16.9 fl oz/500 ml foil pack is 30.5 in³

Description	Qty of foil packs	Item number
HIT-HY 100 (11.1oz/330ml)	1	2078494
HIT-HY 100 Master Carton (11.1oz/330ml)	25	3510989
HIT-HY 100 Master Carton (11.1oz/330ml) + HDM 500	25	3510991
HIT-HY 100 Master Carton (16.9oz/500ml)	20	2078495
(2) HIT-HY 100 Master Cartons (16.9oz/500ml) + HDM 500	40	3511063
(2) HIT-HY 100 Master Cartons (16.9oz/500ml) + HDE 500 Kit	40	3511064
HY 100 TE 50 AVR SafeSet Pack	40	3582040

Accessories

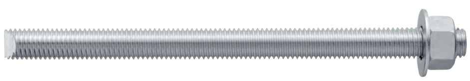
Description	Item number
HDM 500 Manual Dispenser	3498241
HDE 500-A22 Starter Package	3540270

PRODUCT DESCRIPTION

HIT-HY 100 with Threaded Rod, Rebar, and HIS-N/RN Inserts

Mortar system

Hilti HIT-HY 100 Cartridge



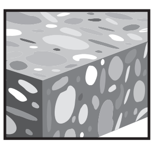
Threaded Rod
HAS
HIT-V

Rebar

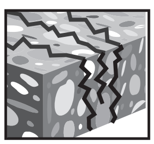
Hilti HIS-N

Features and Benefits

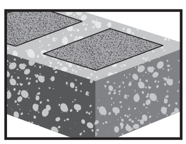
- No additional hole cleaning required after drilling when installed SafeSet™ hollow drill bit technology
- ICC-ES approved for cracked concrete and seismic service
- IAPMO approved for grout-filled concrete masonry
- Anchoring light structural steel connections (e.g. steel columns, beams)
- Anchoring secondary steel elements
- Rebar doweling and connecting secondary post-installed rebar
- Complete anchor system available, including HAS rods, HIT-V rods and HIS-N inserts
- Easy and accurate dispensing with battery dispenser



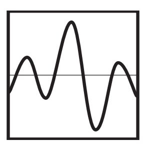
Uncracked concrete



Cracked concrete



Grout-filled concrete masonry



Seismic Design Categories A-F

SAFESET

SafeSet System with Hollow Drill Bit

PROFIS Anchor design software

Approvals/Listings

ICC-ES (International Code Council Evaluation Service)	ESR-3574 (for concrete)
IAPMO-UES (International Association of Plumbing and Mechanical Officials Uniform Evaluation Service)	ER-547 (for grout-filled CMU)
NSF/ANSI Std 61	Certification for use in potable water
City of Los Angeles	LABC Supplement in ESR-3574
U.S. Green Building Council	LEED® Credit 4.1-Low Emitting Materials
Department of Transportation	Contact Hilti for various states

ICC ES™ UES™ CITY LA DBS DEPARTMENT OF BUILDING AND SAFETY NSF® U.S. GREEN BUILDING COUNCIL LEED USGBC

DESIGN DATA IN CONCRETE PER ACI 318

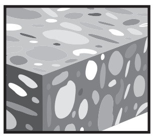
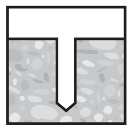
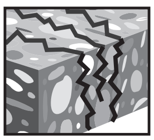
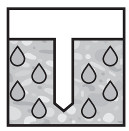
ACI 318-14 Chapter 17 design

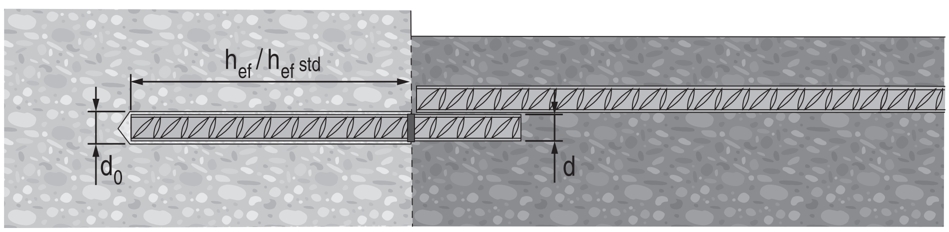
The technical data contained in this section are Hilti Simplified Design Tables. The load values were developed using the Strength Design parameters developed through testing per ACI 355.4 and the equations within ACI 318-14 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to of the Hilti North American Product Technical Guide, Volume 2: Anchor Fastening Technical Guide, Edition 17.

For additional information or technical assistance, contact Hilti at 800-879-5000 (US) or 800-363-4459 (CA)

Hilti HIT-HY 100 Adhesive with Deformed Reinforcing Bars (Rebar)

Rebar installation conditions

Permissible Base Materials					Permissible Drilling Method		
		Uncracked concrete		Dry Concrete			Hammer Drilling with Carbide Tipped Drill Bit
		Cracked concrete		Water Saturated Concrete			Hollow Drill Bit



US rebar installation specifications

Rebar Size	Drill Bit Dia. d_0 in	Standard Embed. Depth $h_{ef\,std}$ in (mm)	Embed. Depth Range h_{ef} in (mm)	Minimum Base Material Thickness h_{min} in (mm)
#3	1/2	3-3/8 (86)	2-3/8 – 7-1/2 (60 – 191)	h_{ef} + 1-1/4 (h_{ef} + 30)
#4	5/8	4-1/2 (114)	2-3/4 – 10 (70 – 254)	
#5	3/4	5-5/8 (143)	3-1/8 – 12-1/2 (79 – 318)	$h_{ef} + 2d_0$
#6	7/8	6-3/4 (171)	3-1/2 – 15 (89 – 381)	
#7	1	7-7/8 (200)	3-1/2 – 17-1/2 (89 – 445)	
#8	1-1/8	9 (229)	4 – 20 (102 – 508)	
#9	1-3/8	10-1/8 (257)	4-1/2 – 22-1/2 (114 – 572)	
#10	1-1/2	11-1/4 (286)	5 – 25 (127 – 635)	

Canadian rebar installation specifications

Rebar Size	Drill Bit Dia. d_0 in	Standard Embed. Depth $h_{ef\,std}$ mm	Embed. Depth Range h_{ef} mm	Minimum Base Material Thickness h_{min} mm
10 M	9/16	115	70 – 226	h_{ef} + 30
15 M	3/4	145	80 – 320	$h_{ef} + 2d_0$
20 M	1	200	90 – 390	
25 M	1-1/4	230	101 – 504	
30 M	1-1/2	260	120 – 598	

Table 1 — Hilti HIT-HY 100 adhesive design strength with concrete / bond failure for US rebar in uncracked concrete [1,2,3,4,5,6,7,8]

Rebar size	Effective embedment in. (mm)	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
#3	3-3/8 (86)	3,295 (14.7)	3,355 (14.9)	3,455 (15.4)	3,595 (16.0)	7,095 (31.6)	7,230 (32.2)	7,440 (33.1)	7,745 (34.5)
	4-1/2 (114)	4,395 (19.5)	4,475 (19.9)	4,605 (20.5)	4,795 (21.3)	9,465 (42.1)	9,635 (42.9)	9,920 (44.1)	10,330 (45.9)
	7-1/2 (191)	7,325 (32.6)	7,455 (33.2)	7,675 (34.1)	7,995 (35.6)	15,770 (70.1)	16,060 (71.4)	16,530 (73.5)	17,215 (76.6)
#4	4-1/2 (114)	5,810 (25.8)	5,920 (26.3)	6,090 (27.1)	6,345 (28.2)	12,520 (55.7)	12,750 (56.7)	13,120 (58.4)	13,665 (60.8)
	6 (152)	7,750 (34.5)	7,890 (35.1)	8,120 (36.1)	8,460 (37.6)	16,690 (74.2)	17,000 (75.6)	17,495 (77.8)	18,220 (81.0)
	10 (254)	12,915 (57.4)	13,155 (58.5)	13,535 (60.2)	14,100 (62.7)	27,820 (123.7)	28,330 (126.0)	29,160 (129.7)	30,365 (135.1)
#5	5-5/8 (143)	8,995 (40.0)	9,160 (40.7)	9,430 (41.9)	9,820 (43.7)	19,375 (86.2)	19,730 (87.8)	20,305 (90.3)	21,145 (94.1)
	7-1/2 (191)	11,995 (53.4)	12,215 (54.3)	12,570 (55.9)	13,090 (58.2)	25,835 (114.9)	26,310 (117.0)	27,075 (120.4)	28,195 (125.4)
	12-1/2 (318)	19,990 (88.9)	20,355 (90.5)	20,950 (93.2)	21,820 (97.1)	43,055 (191.5)	43,845 (195.0)	45,125 (200.7)	46,995 (209.0)
#6	6-3/4 (171)	12,820 (57.0)	13,055 (58.1)	13,435 (59.8)	13,990 (62.2)	27,610 (122.8)	28,120 (125.1)	28,940 (128.7)	30,135 (134.0)
	9 (229)	17,090 (76.0)	17,405 (77.4)	17,915 (79.7)	18,655 (83.0)	36,815 (163.8)	37,490 (166.8)	38,585 (171.6)	40,180 (178.7)
	15 (381)	28,485 (126.7)	29,010 (129.0)	29,855 (132.8)	31,095 (138.3)	61,355 (272.9)	62,485 (277.9)	64,310 (286.1)	66,970 (297.9)
#7	7-7/8 (200)	17,235 (76.7)	17,625 (78.4)	18,140 (80.7)	18,890 (84.0)	37,125 (165.1)	37,965 (168.9)	39,070 (173.8)	40,690 (181.0)
	10-1/2 (267)	23,075 (102.6)	23,500 (104.5)	24,185 (107.6)	25,190 (112.1)	49,705 (221.1)	50,615 (225.1)	52,095 (231.7)	54,250 (241.3)
	17-1/2 (445)	38,460 (171.1)	39,170 (174.2)	40,310 (179.3)	41,980 (186.7)	82,840 (368.5)	84,360 (375.3)	86,825 (386.2)	90,415 (402.2)
#8	9 (229)	21,060 (93.7)	22,835 (101.6)	23,500 (104.5)	24,475 (108.9)	45,360 (201.8)	49,180 (218.8)	50,615 (225.1)	52,710 (234.5)
	12 (305)	29,895 (133.0)	30,445 (135.4)	31,335 (139.4)	32,630 (145.1)	64,390 (286.4)	65,575 (291.7)	67,490 (300.2)	70,280 (312.6)
	20 (508)	49,825 (221.6)	50,740 (225.7)	52,225 (232.3)	54,385 (241.9)	107,315 (477.4)	109,290 (486.1)	112,480 (500.3)	117,135 (521.0)
#9	10-1/8 (257)	22,635 (100.7)	23,050 (102.5)	23,725 (105.5)	24,705 (109.9)	54,125 (240.8)	58,675 (261.0)	60,385 (268.6)	62,885 (279.7)
	13-1/2 (343)	30,180 (134.2)	30,735 (136.7)	31,630 (140.7)	32,940 (146.5)	76,820 (341.7)	78,230 (348.0)	80,515 (358.1)	83,845 (373.0)
	22-1/2 (572)	50,295 (223.7)	51,225 (227.9)	52,720 (234.5)	54,900 (244.2)	128,030 (569.5)	130,385 (580.0)	134,190 (596.9)	139,745 (621.6)
#10	11-1/4 (286)	25,025 (111.3)	25,490 (113.4)	26,230 (116.7)	27,315 (121.5)	63,395 (282.0)	64,880 (288.6)	66,770 (297.0)	69,535 (309.3)
	15 (381)	33,370 (148.4)	33,985 (151.2)	34,975 (155.6)	36,425 (162.0)	84,940 (377.8)	86,505 (384.8)	89,030 (396.0)	92,710 (412.4)
	25 (635)	55,615 (247.4)	56,640 (251.9)	58,290 (259.3)	60,705 (270.0)	141,570 (629.7)	144,175 (641.3)	148,380 (660.0)	154,520 (687.3)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Load values are for a single anchor with no spacing, edge distance, or concrete thickness factors. Apply spacing, edge distance, and concrete thickness factors in tables 4-19 as necessary. Compare to the steel values in table 3. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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.

Table 2 — Hilti HIT-HY 100 adhesive design strength with concrete / bond failure for US rebar in cracked concrete [1,2,3,4,5,6,7,8]

Rebar size	Effective embedment in. (mm)	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
#3	3-3/8 (86)	1,575 (7.0)	1,605 (7.1)	1,650 (7.3)	1,720 (7.7)	3,395 (15.1)	3,460 (15.4)	3,560 (15.8)	3,705 (16.5)
	4-1/2 (114)	2,100 (9.3)	2,140 (9.5)	2,205 (9.8)	2,295 (10.2)	4,525 (20.1)	4,610 (20.5)	4,745 (21.1)	4,940 (22.0)
	7-1/2 (191)	3,505 (15.6)	3,570 (15.9)	3,670 (16.3)	3,825 (17.0)	7,545 (33.6)	7,685 (34.2)	7,910 (35.2)	8,235 (36.6)
#4	4-1/2 (114)	3,080 (13.7)	3,135 (13.9)	3,225 (14.3)	3,360 (14.9)	6,630 (29.5)	6,750 (30.0)	6,950 (30.9)	7,235 (32.2)
	6 (152)	4,105 (18.3)	4,180 (18.6)	4,300 (19.1)	4,480 (19.9)	8,840 (39.3)	9,005 (40.1)	9,265 (41.2)	9,650 (42.9)
	10 (254)	6,840 (30.4)	6,965 (31.0)	7,170 (31.9)	7,465 (33.2)	14,735 (65.5)	15,005 (66.7)	15,445 (68.7)	16,080 (71.5)
#5	5-5/8 (143)	5,205 (23.2)	5,300 (23.6)	5,455 (24.3)	5,680 (25.3)	11,210 (49.9)	11,415 (50.8)	11,750 (52.3)	12,235 (54.4)
	7-1/2 (191)	6,940 (30.9)	7,065 (31.4)	7,275 (32.4)	7,575 (33.7)	14,945 (66.5)	15,220 (67.7)	15,665 (69.7)	16,315 (72.6)
	12-1/2 (318)	11,565 (51.4)	11,780 (52.4)	12,125 (53.9)	12,625 (56.2)	24,910 (110.8)	25,370 (112.9)	26,110 (116.1)	27,190 (120.9)
#6	6-3/4 (171)	8,010 (35.6)	8,160 (36.3)	8,395 (37.3)	8,745 (38.9)	17,255 (76.8)	17,575 (78.2)	18,085 (80.4)	18,835 (83.8)
	9 (229)	10,680 (47.5)	10,880 (48.4)	11,195 (49.8)	11,660 (51.9)	23,010 (102.4)	23,430 (104.2)	24,115 (107.3)	25,115 (111.7)
	15 (381)	17,805 (79.2)	18,130 (80.6)	18,660 (83.0)	19,435 (86.5)	38,345 (170.6)	39,055 (173.7)	40,190 (178.8)	41,855 (186.2)
#7	7-7/8 (200)	10,975 (48.8)	11,175 (49.7)	11,505 (51.2)	11,980 (53.3)	23,640 (105.2)	24,075 (107.1)	24,775 (110.2)	25,800 (114.8)
	10-1/2 (267)	14,635 (65.1)	14,905 (66.3)	15,340 (68.2)	15,975 (71.1)	31,520 (140.2)	32,100 (142.8)	33,035 (146.9)	34,405 (153.0)
	17-1/2 (445)	24,390 (108.5)	24,840 (110.5)	25,565 (113.7)	26,620 (118.4)	52,530 (233.7)	53,500 (238.0)	55,060 (244.9)	57,340 (255.1)
#8	9 (229)	14,520 (64.6)	14,785 (65.8)	15,220 (67.7)	15,845 (70.5)	31,270 (139.1)	31,845 (141.7)	32,775 (145.8)	34,135 (151.8)
	12 (305)	19,360 (86.1)	19,715 (87.7)	20,290 (90.3)	21,130 (94.0)	41,695 (185.5)	42,460 (188.9)	43,700 (194.4)	45,510 (202.4)
	20 (508)	32,265 (143.5)	32,860 (146.2)	33,815 (150.4)	35,215 (156.6)	69,490 (309.1)	70,770 (314.8)	72,835 (324.0)	75,850 (337.4)
#9	10-1/8 (257)	15,645 (69.6)	15,935 (70.9)	16,400 (73.0)	17,080 (76.0)	38,340 (170.5)	40,560 (180.4)	41,745 (185.7)	43,470 (193.4)
	13-1/2 (343)	20,860 (92.8)	21,245 (94.5)	21,865 (97.3)	22,770 (101.3)	53,105 (236.2)	54,080 (240.6)	55,660 (247.6)	57,965 (257.8)
	22-1/2 (572)	34,770 (154.7)	35,410 (157.5)	36,445 (162.1)	37,950 (168.8)	88,510 (393.7)	90,135 (400.9)	92,765 (412.6)	96,605 (429.7)
#10	11-1/4 (286)	19,560 (87.0)	19,920 (88.6)	20,500 (91.2)	21,350 (95.0)	44,905 (199.7)	49,190 (218.8)	52,185 (232.1)	54,345 (241.7)
	15 (381)	26,080 (116.0)	26,560 (118.1)	27,335 (121.6)	28,465 (126.6)	66,385 (295.3)	67,605 (300.7)	69,580 (309.5)	72,460 (322.3)
	25 (635)	43,465 (192.1)	44,265 (195.7)	45,560 (201.4)	47,445 (209.7)	110,645 (489.1)	112,680 (498.1)	115,965 (512.6)	120,765 (533.9)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Load values are for a single anchor with no spacing, edge distance, or concrete thickness factors. Apply spacing, edge distance, and concrete thickness factors in tables 4-19 as necessary. Compare to the steel values in table 3. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 104°F (40°C), max. long term temperature = 75°F (24°C).
For temperature range B: Max. short term temperature = 176°F (80°C), max. long term temperature = 110°F (43°C) multiply above value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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 α_{seis} = 0.75
See section 3.1.8.7 (2017 PTG) for additional information on seismic applications.

Table 3 — Steel design strength for US rebar [1,2]

Rebar size	ASTM A 615 Grade 40			ASTM A 615 Grade 60			ASTM A 706 Grade 60		
	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)	Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic Shear[5] $\phi V_{sa,eq}$ 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 (13.5)	11,700 (52.0)	6,480 (28.8)	4,535 (20.2)	12,000 (53.4)	6,240 (27.8)	4,370 (19.4)
#5	12,090 (53.8)	6,695 (29.8)	4,685 (20.8)	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 (42.7)
#7	23,400 (104.1)	12,960 (57.6)	9,070 (40.3)	35,100 (156.1)	19,440 (86.5)	13,610 (60.5)	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 (76.8)
#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 (97.1)
#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 (2017 PTG) to convert design strength value to ASD value.
2 ASTM A706 Grade 60 rebar are considered ductile steel elements. ASTM A 615 Grade 40 and 60 rebar are considered brittle steel elements.
3 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17
4 Shear = ϕ 0.60 $A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17
5 Seismic Shear = $\alpha_{V,seis} \phi V_{sa}$: Reduction for seismic shear only. See section 3.1.8.7 (2017 PTG) for additional information on seismic applications.

Table 4 — 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	0.32	0.23	0.13	n/a	n/a	n/a	0.10	0.08	0.05	0.21	0.16	0.09	n/a	n/a	n/a
1-7/8	(48)	0.59	0.57	0.54	0.33	0.24	0.14	0.54	0.53	0.52	0.12	0.09	0.05	0.23	0.17	0.10	n/a	n/a	n/a
2	(51)	0.60	0.57	0.54	0.34	0.25	0.14	0.54	0.53	0.52	0.13	0.10	0.06	0.25	0.19	0.11	n/a	n/a	n/a
3	(76)	0.65	0.61	0.57	0.42	0.31	0.18	0.56	0.55	0.54	0.23	0.17	0.10	0.42	0.31	0.18	n/a	n/a	n/a
4	(102)	0.70	0.65	0.59	0.52	0.38	0.22	0.58	0.57	0.55	0.36	0.27	0.16	0.52	0.38	0.22	n/a	n/a	n/a
4-5/8	(117)	0.73	0.67	0.60	0.60	0.43	0.25	0.60	0.58	0.56	0.45	0.33	0.20	0.60	0.43	0.25	0.62	n/a	n/a
5	(127)	0.75	0.69	0.61	0.64	0.47	0.27	0.61	0.59	0.56	0.50	0.38	0.23	0.64	0.47	0.27	0.65	n/a	n/a
5-3/4	(146)	0.78	0.71	0.63	0.74	0.54	0.31	0.62	0.60	0.57	0.62	0.46	0.28	0.74	0.54	0.31	0.70	0.63	n/a
6	(152)	0.80	0.72	0.63	0.77	0.56	0.33	0.63	0.60	0.57	0.66	0.49	0.30	0.77	0.56	0.33	0.71	0.65	n/a
7	(178)	0.85	0.76	0.66	0.90	0.66	0.38	0.65	0.62	0.59	0.83	0.62	0.37	0.90	0.66	0.38	0.77	0.70	n/a
8	(203)	0.90	0.80	0.68	1.00	0.75	0.43	0.67	0.64	0.60	1.00	0.76	0.46	1.00	0.75	0.43	0.82	0.75	n/a
8-3/4	(222)	0.93	0.82	0.69		0.82	0.48	0.68	0.65	0.61		0.87	0.52		0.82	0.48	0.86	0.78	0.66
9	(229)	0.94	0.83	0.70		0.84	0.49	0.69	0.66	0.61		0.91	0.55		0.84	0.49	0.87	0.79	0.67
10	(254)	0.99	0.87	0.72		0.94	0.54	0.71	0.67	0.62		1.00	0.64		0.94	0.54	0.92	0.83	0.70
11	(279)	1.00	0.91	0.74		1.00	0.60	0.73	0.69	0.64			0.74		1.00	0.60	0.96	0.87	0.74
12	(305)		0.94	0.77			0.65	0.75	0.71	0.65			0.84			0.65	1.00	0.91	0.77
14	(356)		1.00	0.81			0.76	0.79	0.74	0.67			1.00			0.76		0.99	0.83
16	(406)			0.86			0.87	0.84	0.78	0.70						0.87		1.00	0.89
18	(457)			0.90			0.98	0.88	0.81	0.72						0.98			0.94
24	(610)			1.00			1.00	1.00	0.92	0.80						1.00			1.00
30	(762)								1.00	0.87									
36	(914)									0.94									
> 48	(1219)									1.00									

Table 5 — 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	0.10	0.07	0.04	0.20	0.15	0.09	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	0.11	0.08	0.05	0.22	0.17	0.10	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	0.12	0.09	0.05	0.24	0.18	0.11	n/a	n/a	n/a
3	(76)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.54	0.22	0.17	0.10	0.45	0.34	0.20	n/a	n/a	n/a
4	(102)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.57	0.55	0.34	0.26	0.15	0.69	0.52	0.31	n/a	n/a	n/a
4-5/8	(117)	0.73	0.67	0.60	0.93	0.76	0.58	0.59	0.58	0.56	0.43	0.32	0.19	0.86	0.64	0.38	0.62	n/a	n/a
5	(127)	0.75	0.69	0.61	0.99	0.80	0.60	0.60	0.58	0.56	0.48	0.36	0.22	0.96	0.72	0.43	0.64	n/a	n/a
5-3/4	(146)	0.78	0.71	0.63	1.00	0.88	0.64	0.62	0.60	0.57	0.59	0.44	0.27	1.00	0.88	0.53	0.69	0.62	n/a
6	(152)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.47	0.28		0.91	0.57	0.70	0.64	n/a
7	(178)	0.85	0.76	0.66		1.00	0.72	0.64	0.62	0.58	0.80	0.60	0.36		1.00	0.72	0.76	0.69	n/a
8	(203)	0.90	0.80	0.68			0.78	0.66	0.64	0.60	0.97	0.73	0.44			0.78	0.81	0.74	n/a
8-3/4	(222)	0.93	0.82	0.69			0.83	0.68	0.65	0.61	1.00	0.83	0.50			0.83	0.85	0.77	0.65
9	(229)	0.94	0.83	0.70			0.85	0.68	0.65	0.61		0.87	0.52			0.85	0.86	0.78	0.66
10	(254)	0.99	0.87	0.72			0.91	0.70	0.67	0.62		1.00	0.61			0.91	0.90	0.82	0.69
11	(279)	1.00	0.91	0.74			0.98	0.73	0.69	0.63			0.71			0.98	0.95	0.86	0.73
12	(305)		0.94	0.77			1.00	0.75	0.70	0.64			0.80			1.00	0.99	0.90	0.76
14	(356)		1.00	0.81			1.00	0.79	0.74	0.67			1.00				1.00	0.97	0.82
16	(406)			0.86				0.83	0.77	0.69								1.00	0.88
18	(457)			0.90				0.87	0.80	0.72									0.93
24	(610)			1.00				0.99	0.91	0.79									1.00
30	(762)							1.00	1.00	0.86									
36	(914)									0.93									
> 48	(1219)									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 ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3 * h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3 * h_{ef}$. If $c_a \geq 3 * h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3 * h_{ef}$. If $c_a \geq 3 * h_{ef}$, then $f_{HV} = 1.0$.

Table 6 — Load adjustment factors for #4 rebar in uncracked concrete [1,2,3]

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

Table 7 — Load adjustment factors for #4 rebar in cracked concrete [1,2,3]

#4 Cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear [4] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Embedment h_{ef} in (mm)		4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)	4-1/2 (114)	6 (152)	10 (254)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm)	1-3/4 (44)	n/a	n/a	n/a	0.49	0.45	0.41	n/a	n/a	n/a	0.06	0.05	0.03	0.13	0.10	0.06	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	0.11	0.08	0.05	0.22	0.17	0.10	n/a	n/a	n/a
	3 (76)	0.61	0.58	0.55	0.60	0.53	0.46	0.55	0.54	0.53	0.15	0.11	0.07	0.29	0.22	0.13	n/a	n/a	n/a
	4 (102)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.54	0.22	0.17	0.10	0.45	0.34	0.20	n/a	n/a	n/a
	5 (127)	0.69	0.64	0.58	0.80	0.67	0.53	0.58	0.56	0.55	0.31	0.23	0.14	0.62	0.47	0.28	n/a	n/a	n/a
	5-3/4 (146)	0.71	0.66	0.60	0.88	0.73	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
	6 (152)	0.72	0.67	0.60	0.91	0.75	0.57	0.59	0.58	0.55	0.41	0.31	0.18	0.82	0.62	0.37	0.61	n/a	n/a
	7 (178)	0.76	0.69	0.62	1.00	0.83	0.62	0.61	0.59	0.56	0.52	0.39	0.23	1.00	0.78	0.47	0.66	n/a	n/a
	7-1/4 (184)	0.77	0.70	0.62		0.85	0.63	0.61	0.59	0.57	0.55	0.41	0.25		0.82	0.49	0.67	0.61	n/a
	8 (203)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.47	0.28		0.91	0.57	0.70	0.64	n/a
	9 (229)	0.83	0.75	0.65		1.00	0.70	0.64	0.61	0.58	0.75	0.57	0.34		1.00	0.68	0.74	0.68	n/a
	10 (254)	0.87	0.78	0.67			0.75	0.65	0.63	0.59	0.88	0.66	0.40			0.75	0.78	0.71	n/a
	11-1/4 (286)	0.92	0.81	0.69			0.81	0.67	0.64	0.60	1.00	0.79	0.47			0.81	0.83	0.75	0.64
	12 (305)	0.94	0.83	0.70			0.85	0.68	0.65	0.61		0.87	0.52			0.85	0.86	0.78	0.66
	14 (356)	1.00	0.89	0.73			0.95	0.71	0.68	0.63		1.00	0.66			0.95	0.93	0.84	0.71
	16 (406)		0.94	0.77			1.00	0.75	0.70	0.64			0.80			1.00	0.99	0.90	0.76
	18 (457)		1.00	0.80				0.78	0.73	0.66			0.96				1.00	0.95	0.81
	20 (508)			0.83				0.81	0.75	0.68			1.00					1.00	0.85
	22 (559)			0.87				0.84	0.78	0.70									0.89
	24 (610)			0.90				0.87	0.80	0.72									0.93
	30 (762)			1.00				0.96	0.88	0.77									1.00
	36 (914)							1.00	0.96	0.82									
	> 48 (1219)								1.00	0.93									

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 ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 8 — Load adjustment factors for #5 rebar in uncracked concrete [1,2,3]

#5 Uncracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear [4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Embedment h_{ef} in (mm)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm)																		
1-3/4 (44)	n/a	n/a	n/a	0.25	0.19	0.11	n/a	n/a	n/a	0.05	0.04	0.02	0.10	0.07	0.04	n/a	n/a	n/a
2-1/2 (64)	0.59	0.57	0.54	0.32	0.23	0.14	0.54	0.53	0.52	0.12	0.09	0.05	0.23	0.18	0.11	n/a	n/a	n/a
3 (76)	0.62	0.59	0.55	0.36	0.26	0.15	0.55	0.54	0.53	0.17	0.13	0.08	0.34	0.25	0.15	n/a	n/a	n/a
4 (102)	0.65	0.61	0.57	0.41	0.30	0.18	0.56	0.55	0.54	0.24	0.18	0.11	0.41	0.30	0.18	n/a	n/a	n/a
5 (127)	0.68	0.63	0.58	0.47	0.34	0.20	0.58	0.56	0.55	0.31	0.23	0.14	0.47	0.34	0.20	n/a	n/a	n/a
5-3/4 (146)	0.71	0.66	0.59	0.53	0.39	0.23	0.59	0.57	0.55	0.39	0.29	0.18	0.53	0.39	0.23	n/a	n/a	n/a
6 (152)	0.71	0.66	0.60	0.54	0.39	0.23	0.59	0.58	0.55	0.40	0.30	0.18	0.54	0.39	0.23	0.60	n/a	n/a
7 (178)	0.74	0.68	0.61	0.60	0.44	0.26	0.60	0.58	0.56	0.48	0.36	0.22	0.60	0.44	0.26	0.64	n/a	n/a
7-1/4 (184)	0.77	0.70	0.62	0.68	0.50	0.29	0.61	0.59	0.57	0.57	0.43	0.26	0.68	0.50	0.29	0.68	0.62	n/a
8 (203)	0.80	0.72	0.63	0.75	0.55	0.32	0.63	0.61	0.58	0.67	0.50	0.30	0.75	0.55	0.32	0.71	0.65	n/a
9 (229)	0.83	0.74	0.65	0.83	0.61	0.36	0.64	0.62	0.58	0.77	0.58	0.35	0.83	0.61	0.36	0.75	0.68	n/a
10 (254)	0.86	0.77	0.66	0.90	0.66	0.39	0.65	0.63	0.59	0.88	0.66	0.40	0.90	0.66	0.39	0.78	0.71	n/a
11-1/4 (286)	0.91	0.81	0.69	1.00	0.77	0.45	0.68	0.65	0.61	1.00	0.83	0.50	1.00	0.77	0.45	0.85	0.77	0.65
12 (305)	0.97	0.86	0.71		0.88	0.52	0.70	0.67	0.62		1.00	0.61		0.88	0.52	0.90	0.82	0.69
14 (356)	1.00	0.90	0.74		0.99	0.58	0.73	0.69	0.64			0.73		0.99	0.58	0.96	0.87	0.73
16 (406)		0.94	0.77		1.00	0.65	0.76	0.71	0.65			0.85		1.00	0.65	1.00	0.92	0.77
18 (457)		0.99	0.79			0.71	0.78	0.73	0.67			0.99			0.71		0.96	0.81
20 (508)		1.00	0.82			0.78	0.81	0.75	0.68			1.00			0.78		1.00	0.85
22 (559)			0.85			0.84	0.83	0.77	0.70						0.84			0.88
24 (610)			0.87			0.91	0.86	0.80	0.71						0.91			0.92
30 (762)			0.90			0.97	0.88	0.82	0.73						0.97			0.95
36 (914)			0.98			1.00	0.96	0.88	0.77						1.00			1.00
> 48 (1219)			1.00				1.00	1.00	0.86									

Table 9 — Load adjustment factors for #5 rebar in cracked concrete [1,2,3]

#5 Cracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear [4] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ‖ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Embedment h_{ef} in (mm)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)	5-5/8 (143)	7-1/2 (191)	12-1/2 (318)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm)																		
1-3/4 (44)	n/a	n/a	n/a	0.46	0.43	0.40	n/a	n/a	n/a	0.05	0.03	0.02	0.09	0.07	0.04	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	0.11	0.08	0.05	0.22	0.17	0.10	n/a	n/a	n/a
3 (76)	0.62	0.59	0.55	0.62	0.55	0.46	0.55	0.54	0.53	0.16	0.12	0.07	0.32	0.24	0.14	n/a	n/a	n/a
4 (102)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.54	0.22	0.17	0.10	0.45	0.34	0.20	n/a	n/a	n/a
5 (127)	0.68	0.63	0.58	0.78	0.66	0.53	0.57	0.56	0.54	0.29	0.22	0.13	0.59	0.44	0.26	n/a	n/a	n/a
5-3/4 (146)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.57	0.55	0.37	0.28	0.17	0.74	0.56	0.33	n/a	n/a	n/a
6 (152)	0.71	0.66	0.60	0.88	0.73	0.56	0.59	0.57	0.55	0.38	0.29	0.17	0.76	0.57	0.34	0.59	n/a	n/a
7 (178)	0.74	0.68	0.61	0.96	0.78	0.59	0.60	0.58	0.56	0.45	0.34	0.20	0.90	0.68	0.41	0.63	n/a	n/a
7-1/4 (184)	0.77	0.70	0.62	1.00	0.85	0.62	0.61	0.59	0.56	0.54	0.40	0.24	1.00	0.81	0.49	0.66	0.60	n/a
8 (203)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.47	0.28		0.91	0.57	0.70	0.64	n/a
9 (229)	0.83	0.74	0.65		0.98	0.69	0.64	0.61	0.58	0.73	0.55	0.33		0.98	0.66	0.73	0.67	n/a
10 (254)	0.86	0.77	0.66		1.00	0.73	0.65	0.62	0.59	0.83	0.62	0.37		1.00	0.73	0.77	0.70	n/a
11-1/4 (286)	0.91	0.81	0.69			0.81	0.67	0.64	0.60	1.00	0.79	0.47			0.81	0.83	0.75	0.64
12 (305)	0.97	0.86	0.71			0.89	0.70	0.66	0.62		0.96	0.58			0.89	0.89	0.81	0.68
14 (356)	1.00	0.90	0.74			0.97	0.72	0.68	0.63		1.00	0.69			0.97	0.94	0.85	0.72
16 (406)		0.94	0.77			1.00	0.75	0.70	0.64			0.80			1.00	0.99	0.90	0.76
18 (457)		0.99	0.79				0.77	0.72	0.66			0.93				1.00	0.94	0.80
20 (508)		1.00	0.82				0.79	0.74	0.67			1.00					0.99	0.83
22 (559)			0.85				0.82	0.76	0.69								1.00	0.87
24 (610)			0.87				0.84	0.78	0.70									0.90
30 (762)			0.90				0.87	0.80	0.72									0.93
36 (914)			0.98				0.94	0.86	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 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 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3^*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3^*h_{ef}$. If $c_a \geq 3^*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3^*h_{ef}$. If $c_a \geq 3^*h_{ef}$, then $f_{HV} = 1.0$.

Table 10 — 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	0.04	0.03	0.02	0.07	0.06	0.03	n/a	n/a	n/a
3-3/4	(95)	0.59	0.57	0.54	0.32	0.23	0.14	0.54	0.53	0.52	0.12	0.09	0.05	0.23	0.17	0.10	n/a	n/a	n/a
4	(102)	0.60	0.57	0.54	0.33	0.24	0.14	0.54	0.53	0.52	0.13	0.10	0.06	0.26	0.19	0.12	n/a	n/a	n/a
5	(127)	0.62	0.59	0.56	0.37	0.27	0.16	0.55	0.54	0.53	0.18	0.13	0.08	0.36	0.27	0.16	n/a	n/a	n/a
6	(152)	0.65	0.61	0.57	0.41	0.30	0.18	0.56	0.55	0.54	0.23	0.18	0.11	0.41	0.30	0.18	n/a	n/a	n/a
8	(203)	0.70	0.65	0.59	0.51	0.37	0.22	0.58	0.57	0.55	0.36	0.27	0.16	0.51	0.37	0.22	n/a	n/a	n/a
8-1/2	(216)	0.71	0.66	0.59	0.53	0.39	0.23	0.59	0.57	0.55	0.40	0.30	0.18	0.53	0.39	0.23	0.60	n/a	n/a
10	(254)	0.75	0.69	0.61	0.63	0.46	0.27	0.61	0.59	0.56	0.51	0.38	0.23	0.63	0.46	0.27	0.65	n/a	n/a
10-3/4	(273)	0.77	0.70	0.62	0.68	0.50	0.29	0.61	0.59	0.57	0.56	0.42	0.25	0.68	0.50	0.29	0.67	0.61	n/a
12	(305)	0.80	0.72	0.63	0.75	0.55	0.32	0.63	0.60	0.57	0.66	0.50	0.30	0.75	0.55	0.32	0.71	0.65	n/a
14	(356)	0.85	0.76	0.66	0.88	0.65	0.38	0.65	0.62	0.59	0.84	0.63	0.38	0.88	0.65	0.38	0.77	0.70	n/a
16	(406)	0.90	0.80	0.68	1.00	0.74	0.43	0.67	0.64	0.60	1.00	0.77	0.46	1.00	0.74	0.43	0.82	0.75	n/a
16-3/4	(425)	0.91	0.81	0.69		0.77	0.45	0.68	0.65	0.60		0.82	0.49		0.77	0.45	0.84	0.76	0.64
18	(457)	0.94	0.83	0.70		0.83	0.49	0.69	0.66	0.61		0.91	0.55		0.83	0.49	0.87	0.79	0.67
20	(508)	0.99	0.87	0.72		0.92	0.54	0.71	0.67	0.62		1.00	0.64		0.92	0.54	0.92	0.84	0.70
22	(559)	1.00	0.91	0.74		1.00	0.59	0.73	0.69	0.64			0.74		1.00	0.59	0.96	0.88	0.74
24	(610)		0.94	0.77			0.65	0.75	0.71	0.65			0.85			0.65	1.00	0.92	0.77
26	(660)		0.98	0.79			0.70	0.77	0.73	0.66			0.95			0.70		0.95	0.80
28	(711)		1.00	0.81			0.76	0.80	0.74	0.67			1.00			0.76		0.99	0.83
30	(762)			0.83			0.81	0.82	0.76	0.69						0.81		1.00	0.86
36	(914)			0.90			0.97	0.88	0.81	0.72						0.97			0.95
> 48	(1219)			1.00			1.00	1.00	0.92	0.80						1.00			1.00

Table 11 — 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	0.03	0.02	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	0.08	0.05	0.22	0.16	0.10	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	0.09	0.05	0.24	0.18	0.11	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	0.12	0.07	0.34	0.25	0.15	n/a	n/a	n/a
6	(152)	0.65	0.61	0.57	0.70	0.60	0.49	0.56	0.55	0.54	0.22	0.16	0.10	0.44	0.33	0.20	n/a	n/a	n/a
8	(203)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.57	0.55	0.34	0.25	0.15	0.68	0.51	0.30	n/a	n/a	n/a
8-1/2	(216)	0.71	0.66	0.59	0.88	0.72	0.56	0.59	0.57	0.55	0.37	0.28	0.17	0.75	0.55	0.33	0.59	n/a	n/a
10	(254)	0.75	0.69	0.61	0.99	0.80	0.60	0.60	0.58	0.56	0.48	0.35	0.21	0.95	0.71	0.42	0.64	n/a	n/a
10-3/4	(273)	0.77	0.70	0.62	1.00	0.84	0.62	0.61	0.59	0.56	0.53	0.39	0.24	1.00	0.79	0.47	0.66	0.60	n/a
12	(305)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.46	0.28		0.91	0.56	0.70	0.63	n/a
14	(356)	0.85	0.76	0.66		1.00	0.72	0.64	0.62	0.58	0.79	0.59	0.35		1.00	0.70	0.76	0.68	n/a
16	(406)	0.90	0.80	0.68			0.78	0.66	0.63	0.59	0.97	0.71	0.43			0.78	0.81	0.73	n/a
16-3/4	(425)	0.91	0.81	0.69			0.81	0.67	0.64	0.60	1.00	0.77	0.46			0.81	0.83	0.75	0.63
18	(457)	0.94	0.83	0.70			0.85	0.68	0.65	0.61		0.85	0.51			0.85	0.86	0.77	0.65
20	(508)	0.99	0.87	0.72			0.91	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	0.72	0.68	0.63			0.69			0.98	0.95	0.86	0.72
24	(610)		0.94	0.77			1.00	0.74	0.70	0.64			0.79			1.00	0.99	0.89	0.75
26	(660)		0.98	0.79				0.76	0.72	0.65			0.89				1.00	0.93	0.78
28	(711)		1.00	0.81				0.79	0.73	0.67			0.99					0.97	0.81
30	(762)			0.83				0.81	0.75	0.68			1.00					1.00	0.84
36	(914)			0.90				0.87	0.80	0.71									0.92
> 48	(1219)			1.00				0.99	0.90	0.78									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 ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3 \cdot h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3 \cdot h_{ef}$. If $c_a \geq 3 \cdot h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3 \cdot h_{ef}$. If $c_a \geq 3 \cdot h_{ef}$, then $f_{HV} = 1.0$.

Table 12 — 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	0.32	0.23	0.14	0.54	0.53	0.52	0.11	0.08	0.05	0.22	0.16	0.10	n/a	n/a	n/a
	5 (127)	0.61	0.58	0.55	0.34	0.25	0.15	0.54	0.54	0.53	0.13	0.10	0.06	0.27	0.20	0.12	n/a	n/a	n/a
	6 (152)	0.63	0.60	0.56	0.37	0.28	0.16	0.55	0.54	0.53	0.17	0.13	0.08	0.35	0.26	0.16	n/a	n/a	n/a
	7 (178)	0.65	0.61	0.57	0.41	0.30	0.18	0.56	0.55	0.54	0.22	0.16	0.10	0.41	0.30	0.18	n/a	n/a	n/a
	8 (203)	0.67	0.63	0.58	0.45	0.33	0.19	0.57	0.56	0.54	0.27	0.20	0.12	0.45	0.33	0.19	n/a	n/a	n/a
	9-7/8 (251)	0.71	0.66	0.59	0.53	0.39	0.23	0.59	0.57	0.55	0.37	0.28	0.17	0.53	0.39	0.23	0.59	n/a	n/a
	10 (254)	0.71	0.66	0.60	0.54	0.40	0.23	0.59	0.57	0.55	0.38	0.28	0.17	0.54	0.40	0.23	0.59	n/a	n/a
	12 (305)	0.75	0.69	0.61	0.65	0.48	0.28	0.60	0.59	0.56	0.49	0.37	0.22	0.65	0.48	0.28	0.65	n/a	n/a
	12-1/2 (318)	0.76	0.70	0.62	0.67	0.50	0.29	0.61	0.59	0.56	0.52	0.39	0.24	0.67	0.50	0.29	0.66	0.60	n/a
	14 (356)	0.80	0.72	0.63	0.75	0.55	0.33	0.62	0.60	0.57	0.62	0.46	0.28	0.75	0.55	0.33	0.70	0.63	n/a
	16 (406)	0.84	0.75	0.65	0.86	0.63	0.37	0.64	0.61	0.58	0.76	0.57	0.34	0.86	0.63	0.37	0.75	0.68	n/a
	18 (457)	0.88	0.79	0.67	0.97	0.71	0.42	0.66	0.63	0.59	0.91	0.68	0.41	0.97	0.71	0.42	0.79	0.72	n/a
	19-1/2 (495)	0.91	0.81	0.69	1.00	0.77	0.45	0.67	0.64	0.60	1.00	0.76	0.46	1.00	0.77	0.45	0.82	0.75	0.63
	20 (508)	0.92	0.82	0.69		0.79	0.46	0.67	0.64	0.60		0.79	0.48		0.79	0.46	0.83	0.76	0.64
	22 (559)	0.97	0.85	0.71		0.87	0.51	0.69	0.66	0.61		0.92	0.55		0.87	0.51	0.87	0.79	0.67
	24 (610)	1.00	0.88	0.73		0.95	0.56	0.71	0.67	0.62		1.00	0.63		0.95	0.56	0.91	0.83	0.70
	26 (660)		0.91	0.75		1.00	0.60	0.73	0.69	0.63			0.71		1.00	0.60	0.95	0.86	0.73
	28 (711)		0.94	0.77			0.65	0.74	0.70	0.64			0.79			0.65	0.99	0.89	0.75
	30 (762)		0.98	0.79			0.70	0.76	0.71	0.65			0.87			0.70	1.00	0.93	0.78
	36 (914)		1.00	0.84			0.84	0.81	0.76	0.68			1.00			0.84		1.00	0.86
	> 48 (1219)			0.96			1.00	0.92	0.84	0.74						1.00			0.99

Table 13 — 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	0.05	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	0.12	0.09	0.05	0.24	0.18	0.11	n/a	n/a	n/a
	5 (127)	0.61	0.58	0.55	0.59	0.52	0.45	0.55	0.54	0.53	0.15	0.11	0.07	0.29	0.22	0.13	n/a	n/a	n/a
	6 (152)	0.63	0.60	0.56	0.64	0.56	0.47	0.56	0.55	0.53	0.19	0.14	0.09	0.38	0.29	0.17	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	0.24	0.18	0.11	0.48	0.36	0.22	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	0.29	0.22	0.13	0.59	0.44	0.26	n/a	n/a	n/a
	9-7/8 (251)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.58	0.55	0.40	0.30	0.18	0.81	0.60	0.36	0.60	n/a	n/a
	10 (254)	0.71	0.66	0.60	0.88	0.73	0.56	0.59	0.58	0.55	0.41	0.31	0.18	0.82	0.62	0.37	0.61	n/a	n/a
	12 (305)	0.75	0.69	0.61	1.00	0.82	0.61	0.61	0.59	0.56	0.54	0.41	0.24	1.00	0.81	0.49	0.66	n/a	n/a
	12-1/2 (318)	0.76	0.70	0.62		0.84	0.62	0.62	0.60	0.57	0.57	0.43	0.26	1.00	0.84	0.52	0.68	0.62	n/a
	14 (356)	0.80	0.72	0.63		0.91	0.66	0.63	0.61	0.58	0.68	0.51	0.31		0.91	0.61	0.72	0.65	n/a
	16 (406)	0.84	0.75	0.65		1.00	0.71	0.65	0.62	0.59	0.83	0.62	0.37		1.00	0.71	0.77	0.70	n/a
	18 (457)	0.88	0.79	0.67			0.76	0.67	0.64	0.60	0.99	0.74	0.45			0.76	0.81	0.74	n/a
	19-1/2 (495)	0.91	0.81	0.69			0.80	0.68	0.65	0.61	1.00	0.84	0.50			0.80	0.85	0.77	0.65
	20 (508)	0.92	0.82	0.69			0.82	0.68	0.65	0.61		0.87	0.52			0.82	0.86	0.78	0.66
	22 (559)	0.97	0.85	0.71			0.87	0.70	0.67	0.62		1.00	0.60			0.87	0.90	0.82	0.69
	24 (610)	1.00	0.88	0.73			0.93	0.72	0.68	0.63			0.69			0.93	0.94	0.85	0.72
	26 (660)		0.91	0.75			0.99	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 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 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 14 — Load adjustment factors for #8 rebar in uncracked concrete [1,2,3]

#8 Uncracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear [4] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ∥ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm) — 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)
1-3/4 (44)	n/a	n/a	n/a	0.23	0.17	0.10	n/a	n/a	n/a	0.02	0.02	0.01	0.05	0.03	0.02	n/a	n/a	n/a
5 (127)	0.59	0.57	0.54	0.32	0.23	0.14	0.54	0.53	0.52	0.11	0.08	0.05	0.22	0.15	0.09	n/a	n/a	n/a
6 (152)	0.61	0.58	0.55	0.35	0.26	0.15	0.55	0.54	0.53	0.14	0.10	0.06	0.29	0.20	0.12	n/a	n/a	n/a
7 (178)	0.63	0.60	0.56	0.38	0.28	0.16	0.55	0.54	0.53	0.18	0.13	0.08	0.36	0.25	0.15	n/a	n/a	n/a
8 (203)	0.65	0.61	0.57	0.41	0.30	0.18	0.56	0.55	0.53	0.22	0.15	0.09	0.41	0.30	0.18	n/a	n/a	n/a
9 (229)	0.67	0.63	0.58	0.45	0.33	0.19	0.57	0.55	0.54	0.26	0.18	0.11	0.45	0.33	0.19	n/a	n/a	n/a
10 (254)	0.69	0.64	0.58	0.48	0.36	0.21	0.58	0.56	0.54	0.31	0.22	0.13	0.48	0.36	0.21	n/a	n/a	n/a
11-1/4 (286)	0.71	0.66	0.59	0.53	0.39	0.23	0.59	0.57	0.55	0.37	0.26	0.16	0.53	0.39	0.23	0.58	n/a	n/a
12 (305)	0.72	0.67	0.60	0.57	0.42	0.24	0.59	0.57	0.55	0.40	0.28	0.17	0.57	0.42	0.24	0.60	n/a	n/a
14 (356)	0.76	0.69	0.62	0.66	0.49	0.29	0.61	0.58	0.56	0.51	0.36	0.22	0.66	0.49	0.29	0.65	n/a	n/a
14-1/4 (362)	0.76	0.70	0.62	0.67	0.50	0.29	0.61	0.59	0.56	0.52	0.37	0.22	0.67	0.50	0.29	0.66	0.59	n/a
16 (406)	0.80	0.72	0.63	0.76	0.56	0.33	0.62	0.60	0.57	0.62	0.44	0.26	0.76	0.56	0.33	0.70	0.62	n/a
18 (457)	0.83	0.75	0.65	0.85	0.63	0.37	0.64	0.61	0.58	0.74	0.52	0.31	0.85	0.63	0.37	0.74	0.66	n/a
20 (508)	0.87	0.78	0.67	0.95	0.70	0.41	0.65	0.62	0.59	0.87	0.61	0.37	0.95	0.70	0.41	0.78	0.69	n/a
22 (559)	0.91	0.81	0.68	1.00	0.76	0.45	0.67	0.63	0.59	1.00	0.71	0.42	1.00	0.76	0.45	0.82	0.73	n/a
22-1/4 (565)	0.91	0.81	0.69		0.77	0.45	0.67	0.63	0.60		0.72	0.43		0.77	0.45	0.82	0.73	0.62
24 (610)	0.94	0.83	0.70		0.83	0.49	0.68	0.64	0.60		0.81	0.48		0.83	0.49	0.85	0.76	0.64
26 (660)	0.98	0.86	0.72		0.90	0.53	0.70	0.66	0.61		0.91	0.54		0.90	0.53	0.89	0.79	0.67
28 (711)	1.00	0.89	0.73		0.97	0.57	0.71	0.67	0.62		1.00	0.61		0.97	0.57	0.92	0.82	0.69
30 (762)		0.92	0.75		1.00	0.61	0.73	0.68	0.63			0.68		1.00	0.61	0.95	0.85	0.72
36 (914)		1.00	0.80			0.73	0.77	0.72	0.65			0.89			0.73	1.00	0.93	0.78
> 48 (1219)			0.90			0.98	0.86	0.79	0.71			1.00			0.98		1.00	0.91

Table 15 — Load adjustment factors for #8 rebar in cracked concrete [1,2,3]

#8 Cracked concrete	Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear [4] f_{AV}			Edge distance in shear ⊥ Toward edge f_{RV}			Edge distance in shear ∥ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm) — 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)
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	0.17	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	0.15	0.11	0.07	0.29	0.22	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	0.14	0.08	0.37	0.28	0.17	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	0.23	0.17	0.10	0.45	0.34	0.20	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	0.27	0.20	0.12	0.54	0.40	0.24	n/a	n/a	n/a
10 (254)	0.69	0.64	0.58	0.80	0.67	0.53	0.58	0.56	0.55	0.31	0.24	0.14	0.63	0.47	0.28	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	0.38	0.28	0.17	0.75	0.56	0.34	0.59	n/a	n/a
12 (305)	0.72	0.67	0.60	0.91	0.75	0.57	0.59	0.58	0.55	0.41	0.31	0.19	0.83	0.62	0.37	0.61	n/a	n/a
14 (356)	0.76	0.69	0.62	1.00	0.83	0.62	0.61	0.59	0.56	0.52	0.39	0.23	1.00	0.78	0.47	0.66	n/a	n/a
14-1/4 (362)	0.76	0.70	0.62		0.84	0.62	0.61	0.59	0.56	0.54	0.40	0.24		0.80	0.48	0.66	0.60	n/a
16 (406)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.64	0.48	0.29		0.91	0.57	0.70	0.64	n/a
18 (457)	0.83	0.75	0.65		1.00	0.70	0.64	0.61	0.58	0.76	0.57	0.34		1.00	0.68	0.75	0.68	n/a
20 (508)	0.87	0.78	0.67			0.75	0.65	0.63	0.59	0.89	0.67	0.40			0.75	0.79	0.71	n/a
22 (559)	0.91	0.81	0.68			0.80	0.67	0.64	0.60	1.00	0.77	0.46			0.80	0.82	0.75	n/a
22-1/4 (565)	0.91	0.81	0.69			0.80	0.67	0.64	0.60		0.78	0.47			0.80	0.83	0.75	0.63
24 (610)	0.94	0.83	0.70			0.85	0.69	0.65	0.61		0.88	0.53			0.85	0.86	0.78	0.66
26 (660)	0.98	0.86	0.72			0.90	0.70	0.67	0.62		0.99	0.59			0.90	0.90	0.81	0.69
28 (711)	1.00	0.89	0.73			0.95	0.72	0.68	0.63		1.00	0.66			0.95	0.93	0.84	0.71
30 (762)		0.92	0.75			1.00	0.73	0.69	0.64			0.74			1.00	0.96	0.87	0.74
36 (914)		1.00	0.80				0.78	0.73	0.66			0.97				1.00	0.96	0.81
> 48 (1219)			0.90				0.87	0.81	0.72			1.00					1.00	0.93

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 ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 16 — 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 ‖ 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	0.03	0.02	n/a	n/a	n/a
5-5/8 (143)	0.59	0.57	0.54	0.32	0.24	0.14	0.54	0.53	0.52	0.11	0.08	0.05	0.22	0.15	0.09	n/a	n/a	n/a
6 (152)	0.60	0.57	0.54	0.33	0.24	0.14	0.54	0.53	0.52	0.12	0.08	0.05	0.24	0.17	0.10	n/a	n/a	n/a
7 (178)	0.62	0.59	0.55	0.36	0.26	0.15	0.55	0.54	0.53	0.15	0.11	0.06	0.30	0.21	0.13	n/a	n/a	n/a
8 (203)	0.63	0.60	0.56	0.39	0.29	0.17	0.55	0.54	0.53	0.18	0.13	0.08	0.37	0.26	0.16	n/a	n/a	n/a
9 (229)	0.65	0.61	0.57	0.42	0.31	0.18	0.56	0.55	0.53	0.22	0.16	0.09	0.42	0.31	0.18	n/a	n/a	n/a
10 (254)	0.66	0.62	0.57	0.45	0.33	0.19	0.57	0.55	0.54	0.26	0.18	0.11	0.45	0.33	0.19	n/a	n/a	n/a
12 (305)	0.70	0.65	0.59	0.52	0.38	0.22	0.58	0.56	0.55	0.34	0.24	0.14	0.52	0.38	0.22	n/a	n/a	n/a
12-7/8 (327)	0.71	0.66	0.60	0.56	0.41	0.24	0.59	0.57	0.55	0.38	0.27	0.16	0.56	0.41	0.24	0.59	n/a	n/a
14 (356)	0.73	0.67	0.60	0.61	0.45	0.26	0.59	0.57	0.55	0.43	0.30	0.18	0.61	0.45	0.26	0.61	n/a	n/a
16 (406)	0.76	0.70	0.62	0.69	0.51	0.30	0.61	0.59	0.56	0.52	0.37	0.22	0.69	0.51	0.30	0.66	n/a	n/a
16-1/4 (413)	0.77	0.70	0.62	0.70	0.52	0.30	0.61	0.59	0.56	0.53	0.38	0.23	0.70	0.52	0.30	0.66	0.59	n/a
18 (457)	0.80	0.72	0.63	0.78	0.57	0.33	0.62	0.60	0.57	0.62	0.44	0.26	0.78	0.57	0.33	0.70	0.62	n/a
20 (508)	0.83	0.75	0.65	0.87	0.64	0.37	0.63	0.61	0.58	0.73	0.51	0.31	0.87	0.64	0.37	0.73	0.65	n/a
22 (559)	0.86	0.77	0.66	0.95	0.70	0.41	0.65	0.62	0.58	0.84	0.59	0.36	0.95	0.70	0.41	0.77	0.69	n/a
24 (610)	0.90	0.80	0.68	1.00	0.76	0.45	0.66	0.63	0.59	0.96	0.67	0.40	1.00	0.76	0.45	0.80	0.72	n/a
25-1/4 (641)	0.92	0.81	0.69		0.80	0.47	0.67	0.63	0.60	1.00	0.73	0.44		0.80	0.47	0.83	0.73	0.62
26 (660)	0.93	0.82	0.69		0.83	0.48	0.68	0.64	0.60		0.76	0.46		0.83	0.48	0.84	0.75	0.63
28 (711)	0.96	0.85	0.71		0.89	0.52	0.69	0.65	0.61		0.85	0.51		0.89	0.52	0.87	0.77	0.65
30 (762)	0.99	0.87	0.72		0.95	0.56	0.70	0.66	0.61		0.94	0.57		0.95	0.56	0.90	0.80	0.68
36 (914)	1.00	0.94	0.77		1.00	0.67	0.74	0.69	0.64		1.00	0.74		1.00	0.67	0.99	0.88	0.74
> 48 (1219)		1.00	0.86		1.00	0.89	0.82	0.76	0.68			1.00			0.89	1.00	1.00	0.85

Table 17 — 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 ‖ 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	0.08	0.05	0.22	0.16	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	0.09	0.05	0.24	0.17	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	0.11	0.07	0.30	0.22	0.13	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	0.27	0.16	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	0.16	0.10	0.44	0.32	0.19	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	0.19	0.11	0.52	0.37	0.22	n/a	n/a	n/a
12 (305)	0.70	0.65	0.59	0.84	0.70	0.55	0.58	0.57	0.55	0.34	0.25	0.15	0.68	0.49	0.29	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	0.27	0.16	0.76	0.54	0.33	0.59	n/a	n/a
14 (356)	0.73	0.67	0.60	0.94	0.77	0.58	0.60	0.58	0.55	0.43	0.31	0.19	0.86	0.62	0.37	0.62	n/a	n/a
16 (406)	0.76	0.70	0.62	1.00	0.84	0.62	0.61	0.59	0.56	0.53	0.38	0.23	1.00	0.75	0.45	0.66	n/a	n/a
16-1/4 (413)	0.77	0.70	0.62		0.85	0.63	0.61	0.59	0.56	0.54	0.39	0.23		0.77	0.46	0.66	0.59	n/a
18 (457)	0.80	0.72	0.63		0.91	0.66	0.62	0.60	0.57	0.63	0.45	0.27		0.90	0.54	0.70	0.63	n/a
20 (508)	0.83	0.75	0.65		0.99	0.70	0.64	0.61	0.58	0.73	0.53	0.32		0.99	0.63	0.74	0.66	n/a
22 (559)	0.86	0.77	0.66		1.00	0.74	0.65	0.62	0.59	0.85	0.61	0.36		1.00	0.73	0.77	0.69	n/a
24 (610)	0.90	0.80	0.68			0.78	0.66	0.63	0.59	0.97	0.69	0.42			0.78	0.81	0.72	n/a
25-1/4 (641)	0.92	0.81	0.69			0.81	0.67	0.64	0.60	1.00	0.75	0.45			0.81	0.83	0.74	0.63
26 (660)	0.93	0.82	0.69			0.82	0.68	0.64	0.60		0.78	0.47			0.82	0.84	0.75	0.63
28 (711)	0.96	0.85	0.71			0.87	0.69	0.65	0.61		0.87	0.52			0.87	0.87	0.78	0.66
30 (762)	0.99	0.87	0.72			0.91	0.70	0.66	0.62		0.97	0.58			0.91	0.90	0.81	0.68
36 (914)	1.00	0.94	0.77			1.00	0.74	0.70	0.64		1.00	0.76			1.00	0.99	0.88	0.75
> 48 (1219)		1.00	0.86				0.83	0.76	0.69			1.00				1.00	1.00	0.86

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 ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 18 — 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 ⊥ 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)		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	0.01	0.03	0.02	0.01	n/a	n/a	n/a
6-1/4	(159)	0.59	0.57	0.54	0.33	0.24	0.14	0.54	0.53	0.52	0.11	0.08	0.05	0.22	0.16	0.10	n/a	n/a	n/a
7	(178)	0.60	0.58	0.55	0.35	0.25	0.15	0.54	0.53	0.52	0.13	0.10	0.06	0.26	0.19	0.12	n/a	n/a	n/a
8	(203)	0.62	0.59	0.55	0.37	0.27	0.16	0.55	0.54	0.53	0.16	0.12	0.07	0.31	0.23	0.14	n/a	n/a	n/a
9	(229)	0.63	0.60	0.56	0.40	0.30	0.17	0.55	0.54	0.53	0.19	0.14	0.08	0.38	0.28	0.17	n/a	n/a	n/a
10	(254)	0.65	0.61	0.57	0.43	0.32	0.19	0.56	0.55	0.54	0.22	0.16	0.10	0.43	0.32	0.19	n/a	n/a	n/a
11	(279)	0.66	0.62	0.57	0.46	0.34	0.20	0.57	0.55	0.54	0.25	0.19	0.11	0.46	0.34	0.20	n/a	n/a	n/a
12	(305)	0.68	0.63	0.58	0.49	0.36	0.21	0.57	0.56	0.54	0.29	0.22	0.13	0.49	0.36	0.21	n/a	n/a	n/a
14	(356)	0.71	0.66	0.59	0.57	0.42	0.24	0.59	0.57	0.55	0.36	0.27	0.16	0.57	0.42	0.24	n/a	n/a	n/a
14-1/4	(362)	0.71	0.66	0.60	0.58	0.43	0.25	0.59	0.57	0.55	0.37	0.28	0.17	0.58	0.43	0.25	0.59	n/a	n/a
16	(406)	0.74	0.68	0.61	0.65	0.48	0.28	0.60	0.58	0.56	0.45	0.33	0.20	0.65	0.48	0.28	0.62	n/a	n/a
17	(432)	0.75	0.69	0.61	0.69	0.51	0.30	0.60	0.58	0.56	0.49	0.36	0.22	0.69	0.51	0.30	0.64	n/a	n/a
18	(457)	0.77	0.70	0.62	0.73	0.54	0.31	0.61	0.59	0.56	0.53	0.40	0.24	0.73	0.54	0.31	0.66	0.60	n/a
20	(508)	0.80	0.72	0.63	0.81	0.60	0.35	0.62	0.60	0.57	0.62	0.46	0.28	0.81	0.60	0.35	0.70	0.63	n/a
22	(559)	0.83	0.74	0.65	0.89	0.66	0.38	0.63	0.61	0.58	0.72	0.54	0.32	0.89	0.66	0.38	0.73	0.66	n/a
24	(610)	0.86	0.77	0.66	0.98	0.72	0.42	0.65	0.62	0.59	0.82	0.61	0.37	0.98	0.72	0.42	0.76	0.69	n/a
26	(660)	0.89	0.79	0.67	1.00	0.78	0.45	0.66	0.63	0.59	0.92	0.69	0.41	1.00	0.78	0.45	0.79	0.72	n/a
28	(711)	0.91	0.81	0.69		0.84	0.49	0.67	0.64	0.60	1.00	0.77	0.46		0.84	0.49	0.82	0.75	0.63
30	(762)	0.94	0.83	0.70		0.90	0.52	0.68	0.65	0.61		0.85	0.51		0.90	0.52	0.85	0.77	0.65
36	(914)	1.00	0.90	0.74		1.00	0.63	0.72	0.68	0.63		1.00	0.67		1.00	0.63	0.94	0.85	0.72
> 48	(1219)		1.00	0.82			0.84	0.79	0.74	0.67			1.00			0.84	1.00	0.98	0.83

Table 19 — 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 ⊥ 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)		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	0.15	0.09	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	0.09	0.05	0.26	0.18	0.11	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	0.11	0.06	0.32	0.22	0.13	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	0.13	0.08	0.38	0.26	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	0.15	0.09	0.44	0.30	0.18	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	0.35	0.21	n/a	n/a	n/a
12	(305)	0.68	0.63	0.58	0.78	0.66	0.53	0.57	0.56	0.54	0.29	0.20	0.12	0.58	0.40	0.24	n/a	n/a	n/a
14	(356)	0.71	0.66	0.59	0.87	0.72	0.56	0.59	0.57	0.55	0.37	0.25	0.15	0.73	0.50	0.30	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	0.26	0.15	0.75	0.51	0.31	0.59	n/a	n/a
16	(406)	0.74	0.68	0.61	0.96	0.78	0.59	0.60	0.58	0.55	0.45	0.31	0.18	0.90	0.61	0.37	0.63	n/a	n/a
17	(432)	0.75	0.69	0.61	1.00	0.81	0.61	0.60	0.58	0.56	0.49	0.33	0.20	0.98	0.67	0.40	0.64	n/a	n/a
18	(457)	0.77	0.70	0.62		0.85	0.62	0.61	0.59	0.56	0.54	0.36	0.22	1.00	0.73	0.44	0.66	0.58	n/a
20	(508)	0.80	0.72	0.63		0.91	0.66	0.62	0.59	0.57	0.63	0.43	0.26		0.85	0.51	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	0.49	0.30		0.98	0.59	0.73	0.64	n/a
24	(610)	0.86	0.77	0.66		1.00	0.73	0.65	0.61	0.58	0.82	0.56	0.34		1.00	0.67	0.77	0.67	n/a
26	(660)	0.89	0.79	0.67			0.77	0.66	0.62	0.59	0.93	0.63	0.38			0.76	0.80	0.70	n/a
28	(711)	0.91	0.81	0.69			0.81	0.67	0.63	0.59	1.00	0.71	0.42			0.81	0.83	0.73	0.61
30	(762)	0.94	0.83	0.70			0.85	0.68	0.64	0.60		0.78	0.47			0.85	0.86	0.75	0.64
36	(914)	1.00	0.90	0.74			0.97	0.72	0.67	0.62		1.00	0.62			0.97	0.94	0.82	0.70
> 48	(1219)		1.00	0.82			1.00	0.79	0.73	0.66			0.95			1.00	1.00	0.95	0.80

1 Linear interpolation not permitted

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

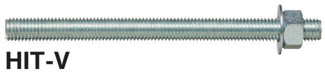
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Chapter 17.

4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.

5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

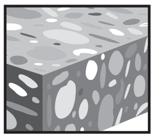
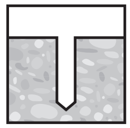
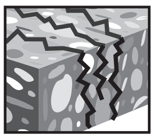
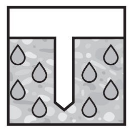
Hilti HIT-HY 100 adhesive with Hilti HAS threaded rod

HAS



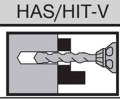
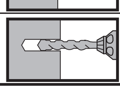
HIT-V

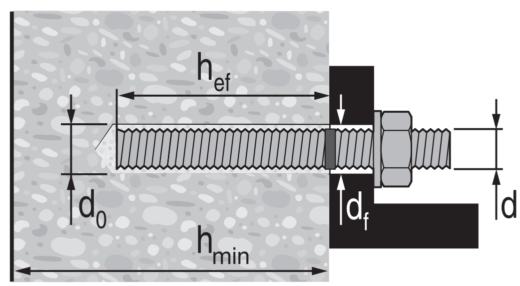
Hilti HAS / HIT-V threaded rod installation conditions

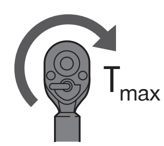
Permissible Base Materials					Permissible Drilling Method		
		Uncracked concrete		Dry Concrete			Hammer Drilling with Carbide Tipped Drill Bit
		Cracked concrete		Water Saturated Concrete			Hollow Drill Bit

Hilti HAS/HIT-V threaded rod installation specifications

Nominal Rod Diameter	Drill Bit Diameter	Embedment Depth Range	Maximum Installation Torque	Minimum Base Material Thickness
d in (mm)	d_0 in	h_{ef} in (mm)	T_{max} ft-lb (Nm)	h_{min} in (mm)
3/8 (9.5)	7/16	2-3/8 – 7-1/2 (60 – 191)	15 (20)	h_{ef} + 1-1/4 (h_{ef} + 30)
1/2 (12.7)	9/16	2-3/4 – 10 (70 – 254)	30 (41)	
5/8 (15.9)	3/4	3-1/8 – 12-1/2 (79 – 318)	60 (81)	h_{ef} + 2d_0
3/4 (19.1)	7/8	3-1/2 – 15 (89 – 381)	100 (136)	
7/8 (22.2)	1	3-1/2 – 17-1/2 (89 – 445)	125 (169)	
1 (25.4)	1-1/8	4 – 20 (102 – 508)	150 (203)	
1-1/4 (31.8)	1-3/8	5 – 25 (127 – 635)	200 (271)	

d_f	HAS/HIT-V	3/8	1/2	5/8	3/4	7/8	1	1-1/4
$d_{f,1}$		1/2	5/8	13/16*	15/16*	1-1/8*	1-1/4*	1-1/2*
$d_{f,2}$		7/16	9/16	11/16	13/16	15/16	1-1/8*	1-3/8





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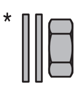


* Use two washers

Table 20 — Hilti HIT-HY 100 adhesive design strength with concrete / bond failure for threaded rod in uncracked concrete [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — ϕN_n				Shear — ϕV_n			
		f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	2,710 (12.1)	2,760 (12.3)	2,840 (12.6)	2,960 (13.2)	2,920 (13.0)	2,970 (13.2)	3,060 (13.6)	3,185 (14.2)
	3-3/8 (86)	3,850 (17.1)	3,920 (17.4)	4,035 (17.9)	4,205 (18.7)	8,295 (36.9)	8,445 (37.6)	8,695 (38.7)	9,055 (40.3)
	4-1/2 (114)	5,135 (22.8)	5,230 (23.3)	5,380 (23.9)	5,605 (24.9)	11,060 (49.2)	11,260 (50.1)	11,590 (51.6)	12,070 (53.7)
	7-1/2 (191)	8,555 (38.1)	8,715 (38.8)	8,970 (39.9)	9,340 (41.5)	18,430 (82.0)	18,770 (83.5)	19,320 (85.9)	20,120 (89.5)
1/2	2-3/4 (70)	3,555 (15.8)	3,895 (17.3)	4,385 (19.5)	4,565 (20.3)	7,660 (34.1)	8,395 (37.3)	9,445 (42.0)	9,835 (43.7)
	4-1/2 (114)	6,845 (30.4)	6,970 (31.0)	7,175 (31.9)	7,470 (33.2)	14,745 (65.6)	15,015 (66.8)	15,455 (68.7)	16,095 (71.6)
	6 (152)	9,130 (40.6)	9,295 (41.3)	9,565 (42.5)	9,965 (44.3)	19,660 (87.5)	20,020 (89.1)	20,605 (91.7)	21,460 (95.5)
	10 (254)	15,215 (67.7)	15,495 (68.9)	15,945 (70.9)	16,605 (73.9)	32,765 (145.7)	33,370 (148.4)	34,345 (152.8)	35,765 (159.1)
5/8	3-1/8 (79)	4,310 (19.2)	4,720 (21.0)	5,450 (24.2)	6,485 (28.8)	9,280 (41.3)	10,165 (45.2)	11,740 (52.2)	13,970 (62.1)
	5-5/8 (143)	10,405 (46.3)	10,895 (48.5)	11,210 (49.9)	11,675 (51.9)	22,415 (99.7)	23,465 (104.4)	24,150 (107.4)	25,145 (111.9)
	7-1/2 (191)	14,260 (63.4)	14,525 (64.6)	14,950 (66.5)	15,565 (69.2)	30,720 (136.6)	31,285 (139.2)	32,195 (143.2)	33,530 (149.1)
	12-1/2 (318)	23,770 (105.7)	24,210 (107.7)	24,915 (110.8)	25,945 (115.4)	51,200 (227.7)	52,140 (231.9)	53,660 (238.7)	55,880 (248.6)
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)	16,145 (71.8)	16,815 (74.8)	29,460 (131.0)	32,275 (143.6)	34,775 (154.7)	36,210 (161.1)
	9 (229)	20,540 (91.4)	20,915 (93.0)	21,525 (95.7)	22,415 (99.7)	44,235 (196.8)	45,050 (200.4)	46,365 (206.2)	48,280 (214.8)
	15 (381)	34,230 (152.3)	34,860 (155.1)	35,875 (159.6)	37,360 (166.2)	73,725 (327.9)	75,080 (334.0)	77,275 (343.7)	80,470 (357.9)
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)	20,500 (91.2)	21,350 (95.0)	37,125 (165.1)	40,670 (180.9)	44,155 (196.4)	45,980 (204.5)
	10-1/2 (267)	26,080 (116.0)	26,560 (118.1)	27,335 (121.6)	28,465 (126.6)	56,170 (249.9)	57,200 (254.4)	58,870 (261.9)	61,305 (272.7)
	17-1/2 (445)	43,465 (193.3)	44,265 (196.9)	45,555 (202.6)	47,440 (211.0)	93,615 (416.4)	95,335 (424.1)	98,120 (436.5)	102,180 (454.5)
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)	24,465 (108.8)	25,475 (113.3)	45,360 (201.8)	49,690 (221.0)	52,690 (234.4)	54,870 (244.1)
	12 (305)	31,120 (138.4)	31,695 (141.0)	32,620 (145.1)	33,970 (151.1)	67,030 (298.2)	68,260 (303.6)	70,255 (312.5)	73,160 (325.4)
	20 (508)	51,870 (230.7)	52,820 (235.0)	54,365 (241.8)	56,615 (251.8)	111,715 (496.9)	113,770 (506.1)	117,090 (520.8)	121,935 (542.4)
1-1/4	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	12,140 (54.0)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	11-1/4 (286)	25,025 (111.3)	25,490 (113.4)	26,230 (116.7)	27,315 (121.5)	63,395 (282.0)	64,880 (288.6)	66,770 (297.0)	69,535 (309.3)
	15 (381)	33,370 (148.4)	33,985 (151.2)	34,975 (155.6)	36,425 (162.0)	84,940 (377.8)	86,505 (384.8)	89,030 (396.0)	92,710 (412.4)
	25 (635)	55,615 (247.4)	56,640 (251.9)	58,290 (259.3)	60,705 (270.0)	141,570 (629.7)	144,175 (641.3)	148,380 (660.0)	154,520 (687.3)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Load values are for a single anchor with no spacing, edge distance, or concrete thickness factors. Apply spacing, edge distance, and concrete thickness factors in tables 23-35 as necessary. Compare to the steel values in table 22. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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.

Table 21 — Hilti HIT-HY 100 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 = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)	f'_c = 2500 psi (17.2 Mpa) lb (kN)	f'_c = 3000 psi (20.7 Mpa) lb (kN)	f'_c = 4000 psi (27.6 Mpa) lb (kN)	f'_c = 6000 psi (41.4 Mpa) lb (kN)
3/8	2-3/8 (60)	1,120 (5.0)	1,140 (5.1)	1,170 (5.2)	1,220 (5.4)	1,205 (5.4)	1,225 (5.4)	1,260 (5.6)	1,315 (5.8)
	3-3/8 (86)	1,590 (7.1)	1,620 (7.2)	1,665 (7.4)	1,735 (7.7)	3,425 (15.2)	3,485 (15.5)	3,590 (16.0)	3,735 (16.6)
	4-1/2 (114)	2,120 (9.4)	2,160 (9.6)	2,220 (9.9)	2,315 (10.3)	4,565 (20.3)	4,650 (20.7)	4,785 (21.3)	4,980 (22.2)
	7-1/2 (191)	3,530 (15.7)	3,595 (16.0)	3,700 (16.5)	3,855 (17.1)	7,610 (33.9)	7,750 (34.5)	7,975 (35.5)	8,305 (36.9)
1/2	2-3/4 (70)	1,880 (8.4)	1,915 (8.5)	1,970 (8.8)	2,055 (9.1)	4,050 (18.0)	4,125 (18.3)	4,245 (18.9)	4,425 (19.7)
	4-1/2 (114)	3,080 (13.7)	3,135 (13.9)	3,225 (14.3)	3,360 (14.9)	6,630 (29.5)	6,750 (30.0)	6,950 (30.9)	7,235 (32.2)
	6 (152)	4,105 (18.3)	4,180 (18.6)	4,300 (19.1)	4,480 (19.9)	8,840 (39.3)	9,005 (40.1)	9,265 (41.2)	9,650 (42.9)
	10 (254)	6,840 (30.4)	6,965 (31.0)	7,170 (31.9)	7,465 (33.2)	14,735 (65.5)	15,005 (66.7)	15,445 (68.7)	16,080 (71.5)
5/8	3-1/8 (79)	2,890 (12.9)	2,945 (13.1)	3,030 (13.5)	3,155 (14.0)	6,230 (27.7)	6,345 (28.2)	6,530 (29.0)	6,800 (30.2)
	5-5/8 (143)	5,205 (23.2)	5,300 (23.6)	5,455 (24.3)	5,680 (25.3)	11,210 (49.9)	11,415 (50.8)	11,750 (52.3)	12,235 (54.4)
	7-1/2 (191)	6,940 (30.9)	7,065 (31.4)	7,275 (32.4)	7,575 (33.7)	14,945 (66.5)	15,220 (67.7)	15,665 (69.7)	16,315 (72.6)
	12-1/2 (318)	11,565 (51.4)	11,780 (52.4)	12,125 (53.9)	12,625 (56.2)	24,910 (110.8)	25,370 (112.9)	26,110 (116.1)	27,190 (120.9)
3/4	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,355 (19.4)	4,535 (20.2)	7,790 (34.7)	8,535 (38.0)	9,380 (41.7)	9,765 (43.4)
	6-3/4 (171)	8,010 (35.6)	8,160 (36.3)	8,395 (37.3)	8,745 (38.9)	17,255 (76.8)	17,575 (78.2)	18,085 (80.4)	18,835 (83.8)
	9 (229)	10,680 (47.5)	10,880 (48.4)	11,195 (49.8)	11,660 (51.9)	23,010 (102.4)	23,430 (104.2)	24,115 (107.3)	25,115 (111.7)
	15 (381)	17,805 (79.2)	18,130 (80.6)	18,660 (83.0)	19,435 (86.5)	38,345 (170.6)	39,055 (173.7)	40,190 (178.8)	41,855 (186.2)
7/8	3-1/2 (89)	3,620 (16.1)	3,965 (17.6)	4,575 (20.4)	5,325 (23.7)	7,790 (34.7)	8,535 (38.0)	9,855 (43.8)	11,470 (51.0)
	7-7/8 (200)	10,975 (48.8)	11,175 (49.7)	11,505 (51.2)	11,980 (53.3)	23,640 (105.2)	24,075 (107.1)	24,775 (110.2)	25,800 (114.8)
	10-1/2 (267)	14,635 (65.1)	14,905 (66.3)	15,340 (68.2)	15,975 (71.1)	31,520 (140.2)	32,100 (142.8)	33,035 (146.9)	34,405 (153.0)
	17-1/2 (445)	24,390 (108.5)	24,840 (110.5)	25,565 (113.7)	26,620 (118.4)	52,530 (233.7)	53,500 (238.0)	55,060 (244.9)	57,340 (255.1)
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)	14,520 (64.6)	14,785 (65.8)	15,220 (67.7)	15,845 (70.5)	31,270 (139.1)	31,845 (141.7)	32,775 (145.8)	34,135 (151.8)
	12 (305)	19,360 (86.1)	19,715 (87.7)	20,290 (90.3)	21,130 (94.0)	41,695 (185.5)	42,460 (188.9)	43,700 (194.4)	45,510 (202.4)
	(508)	32,265 (143.5)	32,860 (146.2)	33,815 (150.4)	35,215 (156.6)	69,490 (309.1)	70,770 (314.8)	72,835 (324.0)	75,850 (337.4)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) to convert design strength value to ASD value.
3 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
4 Load values are for a single anchor with no spacing, edge distance, or concrete thickness factors. Apply spacing, edge distance, and concrete thickness factors in tables 23-35 as necessary. Compare to the steel values in table 22. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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 α_{seis} = 0.75

Table 22 — Steel design strength HAS and HIT-V anchor threaded rods for use with ACI 318-14 Ch. 17

Nominal anchor diameter in.	HIT-V ASTM A307 Grade A [4]			HAS-E ISO 898 Class 5.8 [4]			HAS-E-B and HAS-E-B HDG ASTM A193 B7 and ASTM F 1554 Gr. 105 [5]		
	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)
3/8	3,025 (13.5)	1,675 (7.5)	1,175 (5.2)	3,655 (16.3)	2,020 (9.0)	1,415 (6.3)	7,265 (32.3)	3,780 (16.8)	2,645 (11.8)
1/2	5,535 (24.6)	3,065 (13.6)	2,145 (9.5)	6,690 (29.5)	3,705 (16.5)	2,595 (11.5)	13,300 (59.2)	6,915 (30.8)	4,840 (21.5)
5/8	8,815 (39.2)	4,880 (21.6)	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)
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)
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)
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)
1-1/4	- -	- -	- -	45,670 (200.3)	25,295 (112.5)	17,705 (78.8)	90,850 (404.1)	47,240 (210.1)	33,070 (147.1)

1 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 17.4.1.2
2 Shear = ϕ 0.60 $A_{se,V} f_{uta}$ as noted in ACI 318-14 17.5.1.2b.
3 Seismic Shear = $\alpha_{V,seis} \phi V_{sa}$: Reduction factor for seismic shear only. See ACI 318 for additional information on seismic applications.
4 HIT-V and HAS-E 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.
5 HAS-E-B and HAS-E-B HDG rods are considered ductile steel elements.

Table 22 (Continued) — Steel design strength for Hilti HAS threaded rods for use with ACI 318 Chapter 17

Nominal anchor diameter in.	HAS-V / HAS-V HDG ASTM F1554 Gr. 36 [4,6]			HAS-E / HAS-E HDG ASTM F1554 Gr. 55 [4,6]			HAS-B and HAS-B HDG ASTM A193 B7 and ASTM F 1554 Gr. 105 [4,6]			HAS-R Stainless Steel ASTM F593 (3/8-in to 1-in) [5] ASTM A193 (1-1/8-in to 1-1/4-in)[4]		
	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)	Tensile[1] ϕN_{sa} lb (kN)	Shear[2] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)	Tensile[1] ϕN_{sa} lb (kN)	Shear[6] ϕV_{sa} lb (kN)	Seismic Shear[3] $\phi V_{sa,eq}$ lb (kN)
3/8	3,370 (15.0)	1,750 (7.8)	1,050 (4.7)	4,360 (19.4)	2,270 (10.1)	1,590 (7.1)	7,270 (32.3)	3,780 (16.8)	2,645 (11.8)	5,040 (22.4)	2,790 (12.4)	1,955 (8.7)
1/2	6,175 (27.5)	3,210 (14.3)	1,925 (8.6)	7,985 (35.5)	4,150 (18.5)	2,905 (12.9)	13,305 (59.2)	6,920 (30.8)	4,845 (21.6)	9,225 (41.0)	5,110 (22.7)	3,575 (15.9)
5/8	9,835 (43.7)	5,110 (22.7)	3,065 (13.6)	12,715 (56.6)	6,610 (29.4)	4,625 (20.6)	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	14,550 (64.7)	7,565 (33.7)	4,540 (20.2)	18,820 (83.7)	9,785 (43.5)	6,850 (30.5)	31,360 (139.5)	16,310 (72.6)	11,415 (50.8)	18,485 (82.2)	10,235 (45.5)	7,165 (31.9)
7/8	20,085 (89.3)	10,445 (46.5)	6,265 (27.9)	25,975 (115.5)	13,505 (60.1)	9,455 (42.1)	43,285 (192.5)	22,510 (100.1)	15,755 (70.1)	25,510 (113.5)	14,125 (62.8)	9,890 (44.0)
1	26,350 (117.2)	13,700 (60.9)	8,220 (36.6)	34,075 (151.6)	17,720 (78.8)	12,405 (55.2)	56,785 (252.6)	29,530 (131.4)	20,670 (91.9)	33,465 (148.9)	18,535 (82.4)	12,975 (57.7)
1-1/4	42,160 (187.5)	21,920 (97.5)	13,150 (58.5)	54,515 (242.5)	28,345 (126.1)	19,840 (88.3)	90,855 (404.1)	47,245 (210.2)	33,070 (147.1)	41,430 (184.3)	21,545 (95.8)	12,925 (57.5)

1 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318-14 17.4.1.2
2 Shear = ϕ 0.60 $A_{se,V} f_{uta}$ as noted in ACI 318-14 17.5.1.2b.
3 Seismic Shear = $\alpha_{V,seis} \phi V_{sa}$: Reduction factor for seismic shear only. See ACI 318 for additional information on seismic applications.
4 HAS-V, HAS-E, HAS-B, and HAS-R (Class 1; 1-1/8-in to 1-1/4-in) threaded rods are considered ductile steel elements (included HDG rods).5 HAS-E-B and HAS-E-B HDG rods are considered ductile steel elements.
5 HAS-R (CW1 and CW2; 3/8-in to 1-in) threaded rods are considered brittle steel elements (including HDG rods).
6 3/8-inch dia. threaded rods are not included in the ASTM F1554 standard. Hilti 3/8-inch dia. HAS-V, HAS-E, and HAS-E-B (incl. HDG) threaded rods meet the chemical composition and mechanical property requirements of ASTM F1554.

Table 23 — 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) / Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.41	0.31	0.23	0.13	n/a	n/a	n/a	n/a	0.24	0.09	0.07	0.04	0.41	0.18	0.13	0.08	n/a	n/a	n/a	n/a
1-7/8 (48)	0.60	0.59	0.57	0.54	0.42	0.32	0.23	0.14	0.57	0.54	0.53	0.52	0.27	0.10	0.07	0.04	0.42	0.20	0.15	0.09	n/a	n/a	n/a	n/a
2 (51)	0.61	0.60	0.57	0.54	0.44	0.33	0.24	0.14	0.57	0.54	0.53	0.52	0.29	0.11	0.08	0.05	0.44	0.22	0.16	0.10	n/a	n/a	n/a	n/a
3 (76)	0.67	0.65	0.61	0.57	0.57	0.41	0.30	0.17	0.61	0.56	0.55	0.53	0.54	0.20	0.15	0.09	0.57	0.40	0.30	0.17	n/a	n/a	n/a	n/a
3-5/8 (92)	0.70	0.68	0.63	0.58	0.66	0.46	0.34	0.20	0.63	0.57	0.56	0.54	0.72	0.27	0.20	0.12	0.66	0.46	0.34	0.20	0.73	n/a	n/a	n/a
4 (102)	0.72	0.70	0.65	0.59	0.72	0.50	0.36	0.21	0.65	0.58	0.56	0.55	0.83	0.31	0.23	0.14	0.72	0.50	0.36	0.21	0.77	n/a	n/a	n/a
4-5/8 (117)	0.75	0.73	0.67	0.60	0.84	0.56	0.41	0.24	0.67	0.59	0.57	0.55	1.00	0.38	0.29	0.17	0.84	0.56	0.41	0.24	0.83	0.59	n/a	n/a
5 (127)	0.77	0.75	0.69	0.61	0.91	0.61	0.44	0.26	0.68	0.60	0.58	0.56		0.43	0.32	0.19	0.91	0.61	0.44	0.26	0.86	0.62	n/a	n/a
5-3/4 (146)	0.82	0.78	0.71	0.63	1.00	0.70	0.51	0.29	0.71	0.61	0.59	0.56		0.53	0.40	0.24	1.00	0.70	0.51	0.29	0.92	0.66	0.60	n/a
6 (152)	0.83	0.80	0.72	0.63		0.73	0.53	0.31	0.72	0.61	0.59	0.57		0.56	0.42	0.25		0.73	0.53	0.31	0.94	0.68	0.61	n/a
8 (203)	0.94	0.90	0.80	0.68		0.97	0.70	0.41	0.80	0.65	0.63	0.59		0.87	0.65	0.39		0.97	0.70	0.41		0.78	0.71	n/a
8-3/4 (222)	0.98	0.93	0.82	0.69		1.00	0.77	0.45	0.82	0.67	0.64	0.60		0.99	0.75	0.45		1.00	0.77	0.45		0.82	0.74	0.62
10 (254)	1.00	0.99	0.87	0.72			0.88	0.51	0.87	0.69	0.66	0.61		1.00	0.91	0.55			0.88	0.51		0.87	0.79	0.67
11 (279)		1.00	0.91	0.74			0.97	0.56	0.91	0.71	0.67	0.62			1.00	0.63			0.97	0.56		0.91	0.83	0.70
12 (305)			0.94	0.77			1.00	0.61	0.94	0.73	0.69	0.63				0.72				0.61		0.95	0.87	0.73
14 (356)			1.00	0.81				0.71	1.00	0.77	0.72	0.66				0.91				0.71		1.00	0.94	0.79
16 (406)				0.86				0.82		0.80	0.75	0.68				1.00				0.82			1.00	0.84
18 (457)				0.90				0.92		0.84	0.78	0.70								0.92				0.90
24 (610)				1.00				1.00		0.96	0.88	0.77								1.00				1.00
30 (762)										1.00	0.97	0.83												
36 (914)											1.00	0.90												
> 48 (1219)												1.00												

Table 24 — 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) / Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
1-3/4 (44)	n/a	n/a	n/a	n/a	0.56	0.54	0.49	0.43	n/a	n/a	n/a	n/a	0.34	0.13	0.09	0.06	0.56	0.25	0.19	0.11	n/a	n/a	n/a	n/a
1-7/8 (48)	0.60	0.59	0.57	0.54	0.58	0.56	0.50	0.44	0.59	0.55	0.54	0.53	0.38	0.14	0.10	0.06	0.58	0.28	0.21	0.13	n/a	n/a	n/a	n/a
2 (51)	0.61	0.60	0.57	0.54	0.60	0.57	0.51	0.44	0.59	0.55	0.54	0.53	0.42	0.15	0.12	0.07	0.60	0.31	0.23	0.14	n/a	n/a	n/a	n/a
3 (76)	0.67	0.65	0.61	0.57	0.74	0.70	0.60	0.49	0.64	0.57	0.56	0.54	0.76	0.28	0.21	0.13	0.74	0.56	0.42	0.25	n/a	n/a	n/a	n/a
3-5/8 (92)	0.70	0.68	0.63	0.58	0.84	0.79	0.66	0.53	0.67	0.59	0.57	0.55	1.00	0.37	0.28	0.17	0.84	0.75	0.56	0.34	0.82	n/a	n/a	n/a
4 (102)	0.72	0.70	0.65	0.59	0.90	0.84	0.70	0.55	0.69	0.60	0.58	0.56		0.43	0.33	0.20	0.90	0.84	0.65	0.39	0.86	n/a	n/a	n/a
4-5/8 (117)	0.75	0.73	0.67	0.60	1.00	0.93	0.76	0.58	0.71	0.61	0.59	0.57		0.54	0.40	0.24	1.00	0.93	0.76	0.48	0.93	0.66	n/a	n/a
5 (127)	0.77	0.75	0.69	0.61		0.99	0.80	0.60	0.73	0.62	0.60	0.57		0.61	0.45	0.27		0.99	0.80	0.54	0.96	0.69	n/a	n/a
5-3/4 (146)	0.82	0.78	0.71	0.63		1.00	0.89	0.65	0.77	0.64	0.61	0.58		0.75	0.56	0.34		1.00	0.89	0.65	1.00	0.74	0.67	n/a
6 (152)	0.83	0.80	0.72	0.63			0.91	0.66	0.78	0.64	0.62	0.58		0.80	0.60	0.36			0.91	0.66		0.76	0.69	n/a
8 (203)	0.94	0.90	0.80	0.68			1.00	0.78	0.87	0.69	0.66	0.61		1.00	0.92	0.55			1.00	0.78		0.87	0.79	n/a
8-3/4 (222)	0.98	0.93	0.82	0.69				0.83	0.91	0.71	0.67	0.62			1.00	0.63				0.83		0.91	0.83	0.70
10 (254)	1.00	0.99	0.87	0.72				0.91	0.96	0.74	0.70	0.64				0.77				0.91		0.98	0.89	0.75
11 (279)		1.00	0.91	0.74				0.98	1.00	0.76	0.72	0.65				0.89				0.98		1.00	0.93	0.79
12 (305)			0.94	0.77				1.00		0.79	0.74	0.67				1.00				1.00			0.97	0.82
14 (356)			1.00	0.81						0.83	0.78	0.70											1.00	0.89
16 (406)				0.86						0.88	0.82	0.72												0.95
18 (457)				0.90						0.93	0.85	0.75												1.00
24 (610)				1.00						1.00	0.97	0.84												
30 (762)											1.00	0.92												
36 (914)												1.00												
> 48 (1219)																								

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 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 25 — 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	0.37	0.27	0.20	0.12	n/a	n/a	n/a	n/a	0.10	0.06	0.04	0.03	0.21	0.12	0.09	0.05	n/a	n/a	n/a	n/a
2-1/2 (64)	0.60	0.59	0.57	0.54	0.45	0.31	0.23	0.13	0.55	0.54	0.53	0.52	0.18	0.10	0.07	0.04	0.35	0.20	0.15	0.09	n/a	n/a	n/a	n/a
3 (76)	0.62	0.61	0.58	0.55	0.50	0.34	0.25	0.15	0.56	0.54	0.54	0.53	0.23	0.13	0.10	0.06	0.46	0.26	0.19	0.12	n/a	n/a	n/a	n/a
4 (102)	0.67	0.65	0.61	0.57	0.61	0.40	0.29	0.17	0.58	0.56	0.55	0.53	0.36	0.20	0.15	0.09	0.61	0.40	0.29	0.17	0.58	n/a	n/a	n/a
5-3/4 (146)	0.74	0.71	0.66	0.60	0.88	0.51	0.38	0.22	0.62	0.58	0.57	0.55	0.61	0.34	0.26	0.16	0.88	0.51	0.38	0.22	0.69	0.57	n/a	n/a
6 (152)	0.75	0.72	0.67	0.60	0.92	0.53	0.39	0.23	0.63	0.59	0.57	0.55	0.65	0.37	0.28	0.17	0.92	0.53	0.39	0.23	0.71	0.58	n/a	n/a
7 (178)	0.79	0.76	0.69	0.62	1.00	0.62	0.45	0.26	0.65	0.60	0.58	0.56	0.82	0.46	0.35	0.21	1.00	0.62	0.45	0.26	0.77	0.63	n/a	n/a
7-1/4 (184)	0.80	0.77	0.70	0.62		0.64	0.47	0.27	0.65	0.60	0.59	0.56	0.87	0.49	0.37	0.22		0.64	0.47	0.27	0.78	0.64	0.58	n/a
8 (203)	0.83	0.80	0.72	0.63		0.70	0.52	0.30	0.67	0.61	0.59	0.57	1.00	0.56	0.42	0.25		0.70	0.52	0.30	0.82	0.68	0.61	n/a
10 (254)	0.91	0.87	0.78	0.67		0.88	0.65	0.38	0.71	0.64	0.62	0.58		0.79	0.59	0.36		0.88	0.65	0.38	0.92	0.75	0.69	n/a
11-1/4 (286)	0.96	0.92	0.81	0.69		0.99	0.73	0.43	0.74	0.66	0.63	0.59		0.94	0.71	0.42		0.99	0.73	0.43	0.97	0.80	0.73	0.61
12 (305)	0.99	0.94	0.83	0.70		1.00	0.78	0.45	0.75	0.67	0.64	0.60		1.00	0.78	0.47		1.00	0.78	0.45	1.00	0.83	0.75	0.63
14 (356)	1.00	1.00	0.89	0.73			0.90	0.53	0.79	0.70	0.66	0.62			0.98	0.59			0.90	0.53		0.89	0.81	0.68
16 (406)			0.94	0.77			1.00	0.61	0.84	0.73	0.69	0.63			1.00	0.72			1.00	0.61		0.95	0.87	0.73
18 (457)			1.00	0.80				0.68	0.88	0.76	0.71	0.65				0.86				0.68		1.00	0.92	0.78
20 (508)				0.83				0.76	0.92	0.78	0.74	0.67				1.00				0.76			0.97	0.82
22 (559)				0.87				0.83	0.96	0.81	0.76	0.68								0.83			1.00	0.86
24 (610)				0.90				0.91	1.00	0.84	0.78	0.70								0.91				0.90
30 (762)				1.00				1.00		0.93	0.85	0.75								1.00				1.00
36 (914)										1.00	0.92	0.80												
> 48 (1219)											1.00	0.90												

Table 26 — 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	0.51	0.49	0.45	0.41	n/a	n/a	n/a	n/a	0.12	0.08	0.06	0.04	0.24	0.16	0.12	0.07	n/a	n/a	n/a	n/a
2-1/2 (64)	0.60	0.59	0.57	0.54	0.58	0.56	0.50	0.44	0.56	0.54	0.54	0.53	0.21	0.14	0.10	0.06	0.42	0.27	0.21	0.12	n/a	n/a	n/a	n/a
3 (76)	0.62	0.61	0.58	0.55	0.63	0.60	0.53	0.46	0.57	0.55	0.54	0.53	0.27	0.18	0.14	0.08	0.55	0.36	0.27	0.16	n/a	n/a	n/a	n/a
4 (102)	0.67	0.65	0.61	0.57	0.74	0.70	0.60	0.49	0.59	0.57	0.56	0.54	0.42	0.28	0.21	0.13	0.74	0.56	0.42	0.25	0.61	n/a	n/a	n/a
5-3/4 (146)	0.74	0.71	0.66	0.60	0.96	0.89	0.73	0.56	0.64	0.60	0.58	0.56	0.73	0.48	0.36	0.22	0.96	0.89	0.72	0.43	0.73	0.64	n/a	n/a
6 (152)	0.75	0.72	0.67	0.60	0.99	0.91	0.75	0.57	0.64	0.61	0.59	0.56	0.77	0.51	0.38	0.23	0.99	0.91	0.75	0.46	0.75	0.65	n/a	n/a
7 (178)	0.79	0.76	0.69	0.62	1.00	1.00	0.83	0.62	0.66	0.62	0.60	0.57	0.98	0.64	0.48	0.29	1.00	1.00	0.83	0.58	0.81	0.71	n/a	n/a
7-1/4 (184)	0.80	0.77	0.70	0.62			0.85	0.63	0.67	0.63	0.61	0.58	1.00	0.68	0.51	0.31			0.85	0.61	0.82	0.72	0.65	n/a
8 (203)	0.83	0.80	0.72	0.63			0.91	0.66	0.69	0.64	0.62	0.58		0.79	0.59	0.35			0.91	0.66	0.87	0.75	0.68	n/a
10 (254)	0.91	0.87	0.78	0.67			1.00	0.75	0.73	0.68	0.65	0.60		1.00	0.82	0.49			1.00	0.75	0.97	0.84	0.77	n/a
11-1/4 (286)	0.96	0.92	0.81	0.69				0.81	0.76	0.70	0.67	0.62			0.98	0.59				0.81	1.00	0.89	0.81	0.68
12 (305)	0.99	0.94	0.83	0.70				0.85	0.78	0.71	0.68	0.63			1.00	0.65				0.85		0.92	0.84	0.71
14 (356)	1.00	1.00	0.89	0.73				0.95	0.83	0.75	0.71	0.65				0.82				0.95		1.00	0.91	0.76
16 (406)			0.94	0.77				1.00	0.88	0.78	0.73	0.67				1.00				1.00		1.00	0.97	0.82
18 (457)			1.00	0.80					0.92	0.82	0.76	0.69				1.00							1.00	0.87
20 (508)				0.83					0.97	0.86	0.79	0.71												0.91
22 (559)				0.87					1.00	0.89	0.82	0.73												0.96
24 (610)				0.90						0.93	0.85	0.75												1.00
30 (762)				1.00						1.00	0.94	0.81												
36 (914)											1.00	0.88												
> 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 Chapter 17.

4 Spacing factor reduction in shear applicable when $c_a < 3{*}h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3{*}h_{ef}$. If $c_a \geq 3{*}h_{ef}$, then $f_{AV} = f_{AN}$.

5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3{*}h_{ef}$. If $c_a \geq 3{*}h_{ef}$, then $f_{HV} = 1.0$.

Table 27 — Load adjustment factors for 5/8-in. diameter threaded rods in uncracked concrete [1,2,3]

5/8-in. Uncracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear ⊥ Toward edge f_{RV}				Edge distance in shear ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} in (mm)		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	0.19	0.11	n/a	n/a	n/a	n/a	0.09	0.04	0.03	0.02	0.19	0.09	0.06	0.04	n/a	n/a	n/a	n/a
	3-1/8 (79)	0.60	0.59	0.57	0.54	0.48	0.31	0.23	0.13	0.56	0.54	0.53	0.52	0.22	0.10	0.07	0.04	0.45	0.20	0.15	0.09	n/a	n/a	n/a	n/a
	4 (102)	0.63	0.62	0.59	0.55	0.56	0.35	0.26	0.15	0.58	0.55	0.54	0.53	0.32	0.15	0.11	0.06	0.56	0.29	0.21	0.13	n/a	n/a	n/a	n/a
	4-5/8 (117)	0.65	0.64	0.60	0.56	0.63	0.38	0.28	0.16	0.59	0.55	0.54	0.53	0.40	0.18	0.13	0.08	0.63	0.37	0.27	0.16	0.60	n/a	n/a	n/a
	5 (127)	0.67	0.65	0.61	0.57	0.68	0.40	0.29	0.17	0.60	0.56	0.55	0.53	0.45	0.21	0.15	0.09	0.68	0.40	0.29	0.17	0.63	n/a	n/a	n/a
	6 (152)	0.70	0.68	0.63	0.58	0.81	0.45	0.33	0.19	0.62	0.57	0.56	0.54	0.59	0.27	0.20	0.12	0.81	0.45	0.33	0.19	0.69	n/a	n/a	n/a
	7-1/8 (181)	0.73	0.71	0.66	0.60	0.95	0.51	0.37	0.22	0.64	0.58	0.57	0.55	0.77	0.35	0.25	0.15	0.95	0.51	0.37	0.22	0.75	0.58	n/a	n/a
	8 (203)	0.76	0.74	0.68	0.61	1.00	0.56	0.41	0.24	0.66	0.59	0.58	0.55	0.91	0.42	0.30	0.18	1.00	0.56	0.41	0.24	0.79	0.61	n/a	n/a
	10 (254)	0.83	0.80	0.72	0.63		0.70	0.52	0.30	0.70	0.62	0.59	0.57	1.00	0.58	0.42	0.25		0.70	0.52	0.30	0.89	0.68	0.61	n/a
	11 (279)	0.86	0.83	0.74	0.65		0.77	0.57	0.33	0.72	0.63	0.60	0.57		0.67	0.49	0.29		0.77	0.57	0.33	0.93	0.71	0.64	n/a
	12 (305)	0.90	0.86	0.77	0.66		0.84	0.62	0.36	0.74	0.64	0.61	0.58		0.76	0.56	0.33		0.84	0.62	0.36	0.97	0.75	0.67	n/a
	14 (356)	0.96	0.92	0.81	0.69		0.98	0.72	0.42	0.77	0.66	0.63	0.59		0.96	0.70	0.42		0.98	0.72	0.42	1.00	0.81	0.73	0.61
	16 (406)	1.00	0.97	0.86	0.71		1.00	0.83	0.48	0.81	0.69	0.65	0.61		1.00	0.86	0.51		1.00	0.83	0.48		0.86	0.78	0.65
	18 (457)		1.00	0.90	0.74			0.93	0.54	0.85	0.71	0.67	0.62			1.00	0.61			0.93	0.54		0.91	0.82	0.69
	20 (508)			0.94	0.77			1.00	0.60	0.89	0.73	0.69	0.63				0.72			1.00	0.60		0.96	0.87	0.73
	22 (559)			0.99	0.79				0.66	0.93	0.76	0.71	0.65				0.83				0.66		1.00	0.91	0.77
	24 (610)			1.00	0.82				0.72	0.97	0.78	0.73	0.66				0.94				0.72			0.95	0.80
	26 (660)				0.85				0.79	1.00	0.80	0.74	0.67				1.00				0.79			0.99	0.83
	28 (711)				0.87				0.85		0.83	0.76	0.69								0.85			1.00	0.87
	30 (762)				0.90				0.91		0.85	0.78	0.70								0.91				0.90
	36 (914)				0.98				1.00		0.92	0.84	0.74								1.00				0.98
	> 48 (1219)				1.00						1.00	0.95	0.82												1.00

Table 28 — Load adjustment factors for 5/8-in. diameter threaded rods in cracked concrete [1,2,3]

5/8-in. Cracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear ⊥ Toward edge f_{RV}				Edge distance in shear ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} in (mm)		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	0.06	0.04	0.03	0.19	0.11	0.09	0.05	n/a	n/a	n/a	n/a
	3-1/8 (79)	0.60	0.59	0.57	0.54	0.58	0.56	0.50	0.44	0.56	0.54	0.54	0.53	0.23	0.14	0.10	0.06	0.45	0.27	0.20	0.12	n/a	n/a	n/a	n/a
	4 (102)	0.63	0.62	0.59	0.55	0.66	0.62	0.55	0.46	0.58	0.56	0.55	0.53	0.33	0.20	0.15	0.09	0.65	0.40	0.30	0.18	n/a	n/a	n/a	n/a
	4-5/8 (117)	0.65	0.64	0.60	0.56	0.71	0.67	0.58	0.48	0.59	0.57	0.55	0.54	0.40	0.25	0.18	0.11	0.71	0.49	0.37	0.22	0.60	n/a	n/a	n/a
	5 (127)	0.67	0.65	0.61	0.57	0.74	0.70	0.60	0.49	0.60	0.57	0.56	0.54	0.45	0.28	0.21	0.12	0.74	0.55	0.41	0.25	0.63	n/a	n/a	n/a
	6 (152)	0.70	0.68	0.63	0.58	0.84	0.78	0.66	0.53	0.62	0.59	0.57	0.55	0.60	0.36	0.27	0.16	0.84	0.73	0.54	0.33	0.69	n/a	n/a	n/a
	7-1/8 (181)	0.73	0.71	0.66	0.60	0.95	0.88	0.73	0.56	0.64	0.60	0.58	0.56	0.77	0.47	0.35	0.21	0.95	0.88	0.70	0.42	0.75	0.63	n/a	n/a
	8 (203)	0.76	0.74	0.68	0.61	1.00	0.96	0.78	0.59	0.66	0.61	0.59	0.57	0.92	0.56	0.42	0.25	1.00	0.96	0.78	0.50	0.79	0.67	n/a	n/a
	10 (254)	0.83	0.80	0.72	0.63		1.00	0.91	0.66	0.70	0.64	0.62	0.58	1.00	0.78	0.59	0.35		1.00	0.91	0.66	0.89	0.75	0.68	n/a
	11 (279)	0.86	0.83	0.74	0.65			0.98	0.70	0.72	0.66	0.63	0.59		0.90	0.68	0.41			0.98	0.70	0.93	0.79	0.72	n/a
	12 (305)	0.90	0.86	0.77	0.66			1.00	0.73	0.74	0.67	0.64	0.60		1.00	0.77	0.46			1.00	0.73	0.97	0.82	0.75	n/a
	14 (356)	0.96	0.92	0.81	0.69				0.81	0.78	0.70	0.66	0.62			0.97	0.58				0.81	1.00	0.89	0.81	0.68
	16 (406)	1.00	0.97	0.86	0.71				0.89	0.82	0.73	0.69	0.63			1.00	0.71				0.89		0.95	0.86	0.73
	18 (457)		1.00	0.90	0.74				0.97	0.86	0.75	0.71	0.65				0.85				0.97		1.00	0.92	0.77
	20 (508)			0.94	0.77				1.00	0.89	0.78	0.73	0.67				0.99				1.00			0.97	0.81
	22 (559)			0.99	0.79					0.93	0.81	0.76	0.68				1.00							1.00	0.85
	24 (610)			1.00	0.82					0.97	0.84	0.78	0.70												0.89
	26 (660)				0.85					1.00	0.87	0.80	0.72												0.93
	28 (711)				0.87						0.90	0.83	0.73												0.96
	30 (762)				0.90						0.92	0.85	0.75												1.00
	36 (914)				0.98						1.00	0.92	0.80												1.00
	> 48 (1219)				1.00							1.00	0.90												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 29 — Load adjustment factors for 3/4-in. diameter threaded rods in uncracked concrete [1,2,3]

3/4-in. Uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear, ⊥ Toward edge f_{RV}				Edge distance in shear, ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} in (mm)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)
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	0.04	0.02	0.01	0.17	0.07	0.05	0.03	n/a	n/a	n/a	n/a
3-3/4 (95)	0.60	0.59	0.57	0.54	0.52	0.31	0.23	0.13	0.57	0.54	0.53	0.52	0.27	0.11	0.07	0.04	0.52	0.22	0.15	0.09	n/a	n/a	n/a	n/a
4 (102)	0.61	0.60	0.57	0.54	0.54	0.32	0.23	0.14	0.57	0.54	0.53	0.52	0.29	0.12	0.08	0.05	0.54	0.24	0.16	0.10	n/a	n/a	n/a	n/a
5-1/4 (133)	0.64	0.63	0.60	0.56	0.66	0.37	0.27	0.16	0.60	0.55	0.54	0.53	0.44	0.18	0.12	0.07	0.66	0.36	0.24	0.14	0.62	n/a	n/a	n/a
6 (152)	0.67	0.65	0.61	0.57	0.74	0.40	0.29	0.17	0.61	0.56	0.55	0.53	0.54	0.22	0.15	0.09	0.74	0.40	0.29	0.17	0.67	n/a	n/a	n/a
8 (203)	0.72	0.70	0.65	0.59	0.90	0.48	0.35	0.21	0.65	0.58	0.56	0.54	0.83	0.34	0.23	0.14	0.90	0.48	0.35	0.21	0.77	n/a	n/a	n/a
8-1/2 (216)	0.73	0.71	0.66	0.59	0.95	0.50	0.37	0.22	0.66	0.59	0.57	0.55	0.91	0.37	0.25	0.15	0.95	0.50	0.37	0.22	0.79	0.59	n/a	n/a
10 (254)	0.77	0.75	0.69	0.61	1.00	0.58	0.43	0.25	0.68	0.60	0.58	0.56	1.00	0.47	0.32	0.19	1.00	0.58	0.43	0.25	0.86	0.64	n/a	n/a
10-3/4 (273)	0.80	0.77	0.70	0.62		0.63	0.46	0.27	0.70	0.61	0.58	0.56		0.53	0.35	0.21		0.63	0.46	0.27	0.89	0.66	0.58	n/a
12 (305)	0.83	0.80	0.72	0.63		0.70	0.52	0.30	0.72	0.62	0.59	0.57		0.62	0.41	0.25		0.70	0.52	0.30	0.94	0.70	0.61	n/a
14 (356)	0.88	0.85	0.76	0.66		0.82	0.60	0.35	0.76	0.64	0.61	0.58		0.78	0.52	0.31		0.82	0.60	0.35	1.00	0.75	0.66	n/a
16 (406)	0.94	0.90	0.80	0.68		0.93	0.69	0.40	0.80	0.66	0.62	0.59		0.96	0.64	0.38		0.93	0.69	0.40		0.81	0.70	n/a
16-3/4 (425)	0.96	0.91	0.81	0.69		0.98	0.72	0.42	0.81	0.67	0.63	0.59		1.00	0.68	0.41		0.98	0.72	0.42		0.82	0.72	0.61
18 (457)	0.99	0.94	0.83	0.70		1.00	0.77	0.45	0.83	0.68	0.64	0.60			0.76	0.46		1.00	0.77	0.45		0.85	0.75	0.63
20 (508)	1.00	0.99	0.87	0.72			0.86	0.50	0.87	0.70	0.65	0.61			0.89	0.54			0.86	0.50		0.90	0.79	0.66
22 (559)		1.00	0.91	0.74			0.94	0.55	0.91	0.72	0.67	0.62			1.00	0.62			0.94	0.55		0.94	0.82	0.70
24 (610)			0.94	0.77			1.00	0.60	0.94	0.74	0.69	0.63				0.70			1.00	0.60		0.99	0.86	0.73
26 (660)			0.98	0.79				0.65	0.98	0.76	0.70	0.64				0.79				0.65		1.00	0.90	0.76
28 (711)			1.00	0.81				0.70	1.00	0.78	0.72	0.65				0.89				0.70			0.93	0.78
30 (762)				0.83				0.75		0.80	0.73	0.67				0.98				0.75			0.96	0.81
36 (914)				0.90				0.91		0.86	0.78	0.70				1.00				0.91			1.00	0.89
> 48 (1219)				1.00				1.00		0.99	0.87	0.76								1.00				1.00

Table 30 — Load adjustment factors for 3/4-in. diameter threaded rods in cracked concrete [1,2,3]

3/4-in. Cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear, ⊥ Toward edge f_{RV}				Edge distance in shear, ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} in (mm)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)	3-1/2 (89)	6-3/4 (171)	9 (229)	15 (381)
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	0.04	0.03	0.02	0.17	0.09	0.06	0.04	n/a	n/a	n/a	n/a
3-3/4 (95)	0.60	0.59	0.57	0.54	0.58	0.56	0.50	0.44	0.57	0.54	0.54	0.53	0.27	0.13	0.10	0.06	0.54	0.27	0.20	0.12	n/a	n/a	n/a	n/a
4 (102)	0.61	0.60	0.57	0.54	0.60	0.57	0.51	0.44	0.57	0.55	0.54	0.53	0.30	0.15	0.11	0.07	0.59	0.29	0.22	0.13	n/a	n/a	n/a	n/a
5-1/4 (133)	0.64	0.63	0.60	0.56	0.69	0.65	0.57	0.48	0.60	0.56	0.55	0.54	0.45	0.22	0.17	0.10	0.69	0.44	0.33	0.20	0.62	n/a	n/a	n/a
6 (152)	0.67	0.65	0.61	0.57	0.74	0.70	0.60	0.49	0.61	0.57	0.56	0.54	0.55	0.27	0.20	0.12	0.74	0.54	0.40	0.24	0.67	n/a	n/a	n/a
8 (203)	0.72	0.70	0.65	0.59	0.90	0.84	0.70	0.55	0.65	0.59	0.58	0.55	0.84	0.41	0.31	0.19	0.90	0.83	0.62	0.37	0.77	n/a	n/a	n/a
8-1/2 (216)	0.73	0.71	0.66	0.59	0.95	0.88	0.72	0.56	0.66	0.60	0.58	0.56	0.92	0.45	0.34	0.20	0.95	0.88	0.68	0.41	0.79	0.63	n/a	n/a
10 (254)	0.77	0.75	0.69	0.61	1.00	0.99	0.80	0.60	0.69	0.62	0.60	0.57	1.00	0.58	0.43	0.26	1.00	0.99	0.80	0.52	0.86	0.68	n/a	n/a
10-3/4 (273)	0.80	0.77	0.70	0.62		1.00	0.84	0.62	0.70	0.62	0.60	0.57		0.64	0.48	0.29		1.00	0.84	0.58	0.89	0.71	0.64	n/a
12 (305)	0.83	0.80	0.72	0.63			0.91	0.66	0.72	0.64	0.61	0.58		0.76	0.57	0.34			0.91	0.66	0.94	0.75	0.68	n/a
14 (356)	0.88	0.85	0.76	0.66			1.00	0.72	0.76	0.66	0.63	0.60		0.96	0.72	0.43			1.00	0.72	1.00	0.80	0.73	n/a
16 (406)	0.94	0.90	0.80	0.68				0.78	0.80	0.69	0.65	0.61		1.00	0.88	0.53				0.78		0.86	0.78	n/a
16-3/4 (425)	0.96	0.91	0.81	0.69				0.81	0.81	0.69	0.66	0.61			0.94	0.56				0.81		0.88	0.80	0.67
18 (457)	0.99	0.94	0.83	0.70				0.85	0.83	0.71	0.67	0.62			1.00	0.63				0.85		0.91	0.83	0.70
20 (508)	1.00	0.99	0.87	0.72				0.91	0.87	0.73	0.69	0.64				0.74				0.91		0.96	0.87	0.74
22 (559)		1.00	0.91	0.74				0.98	0.91	0.75	0.71	0.65				0.85				0.98		1.00	0.92	0.77
24 (610)			0.94	0.77				1.00	0.95	0.78	0.73	0.66				0.97				1.00			0.96	0.81
26 (660)			0.98	0.79					0.98	0.80	0.75	0.68				1.00							1.00	0.84
28 (711)			1.00	0.81					1.00	0.82	0.77	0.69											1.00	0.87
30 (762)				0.83						0.85	0.79	0.70												0.90
36 (914)				0.90						0.92	0.84	0.74												0.99
> 48 (1219)				1.00						1.00	0.96	0.83												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 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3 \cdot h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3 \cdot h_{ef}$. If $c_a \geq 3 \cdot h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3 \cdot h_{ef}$. If $c_a \geq 3 \cdot h_{ef}$, then $f_{HV} = 1.0$.

Table 31 — 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	0.06	0.04	0.02	n/a	n/a	n/a	n/a
4-3/8 (111)	0.61	0.59	0.57	0.54	0.59	0.31	0.23	0.13	0.58	0.54	0.53	0.52	0.35	0.11	0.07	0.04	0.59	0.22	0.14	0.09	n/a	n/a	n/a	n/a
5 (127)	0.62	0.61	0.58	0.55	0.63	0.33	0.24	0.14	0.60	0.54	0.53	0.52	0.43	0.13	0.09	0.05	0.63	0.27	0.18	0.11	n/a	n/a	n/a	n/a
5-1/2 (140)	0.63	0.62	0.59	0.55	0.66	0.35	0.26	0.15	0.60	0.55	0.54	0.53	0.50	0.15	0.10	0.06	0.66	0.31	0.20	0.12	0.65	n/a	n/a	n/a
6 (152)	0.65	0.63	0.60	0.56	0.69	0.37	0.27	0.16	0.61	0.55	0.54	0.53	0.57	0.18	0.12	0.07	0.69	0.35	0.23	0.14	0.68	n/a	n/a	n/a
8 (203)	0.70	0.67	0.63	0.58	0.83	0.44	0.32	0.19	0.65	0.57	0.55	0.54	0.87	0.27	0.18	0.11	0.83	0.44	0.32	0.19	0.78	n/a	n/a	n/a
9-7/8 (251)	0.74	0.71	0.66	0.59	0.97	0.51	0.38	0.22	0.69	0.59	0.57	0.55	1.00	0.37	0.24	0.15	0.97	0.51	0.38	0.22	0.87	0.59	n/a	n/a
10 (254)	0.74	0.71	0.66	0.60	0.98	0.52	0.38	0.22	0.69	0.59	0.57	0.55		0.38	0.25	0.15	0.98	0.52	0.38	0.22	0.87	0.59	n/a	n/a
12 (305)	0.79	0.75	0.69	0.61		0.62	0.45	0.27	0.73	0.60	0.58	0.56		0.49	0.33	0.20		0.62	0.45	0.27	0.96	0.65	n/a	n/a
12-1/2 (318)	0.80	0.77	0.70	0.62		0.64	0.47	0.28	0.74	0.61	0.58	0.56		0.53	0.35	0.21		0.64	0.47	0.28	0.98	0.66	0.57	n/a
14 (356)	0.84	0.80	0.72	0.63		0.72	0.53	0.31	0.77	0.62	0.59	0.57		0.62	0.41	0.25		0.72	0.53	0.31	1.00	0.70	0.61	n/a
16 (406)	0.89	0.84	0.75	0.65		0.82	0.60	0.35	0.80	0.64	0.61	0.58		0.76	0.50	0.30		0.82	0.60	0.35		0.75	0.65	n/a
18 (457)	0.94	0.88	0.79	0.67		0.92	0.68	0.40	0.84	0.66	0.62	0.58		0.91	0.60	0.36		0.92	0.68	0.40		0.79	0.69	n/a
19-1/2 (495)	0.98	0.91	0.81	0.69		1.00	0.74	0.43	0.87	0.67	0.63	0.59		1.00	0.68	0.41		1.00	0.74	0.43		0.82	0.72	0.60
20 (508)	0.99	0.92	0.82	0.69			0.76	0.44	0.88	0.67	0.63	0.59			0.70	0.42			0.76	0.44		0.83	0.73	0.61
22 (559)	1.00	0.97	0.85	0.71			0.83	0.49	0.92	0.69	0.65	0.60			0.81	0.49			0.83	0.49		0.87	0.76	0.64
24 (610)		1.00	0.88	0.73			0.91	0.53	0.96	0.71	0.66	0.61			0.92	0.55			0.91	0.53		0.91	0.80	0.67
26 (660)			0.91	0.75			0.98	0.58	0.99	0.73	0.67	0.62			1.00	0.63			0.98	0.58		0.95	0.83	0.70
28 (711)			0.94	0.77			1.00	0.62	1.00	0.74	0.68	0.63				0.70			1.00	0.62		0.99	0.86	0.72
30 (762)			0.98	0.79				0.66	1.00	0.76	0.70	0.64				0.77				0.66		1.00	0.89	0.75
36 (914)			1.00	0.84				0.80		0.81	0.74	0.67				1.00				0.80			0.97	0.82
> 48 (1219)				0.96				1.00		0.92	0.82	0.73								1.00			1.00	0.95

Table 32 — 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	0.44	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)	0.61	0.59	0.57	0.54	0.59	0.56	0.50	0.44	0.58	0.54	0.53	0.52	0.36	0.12	0.09	0.06	0.59	0.24	0.18	0.11	n/a	n/a	n/a	n/a
5 (127)	0.62	0.61	0.58	0.55	0.63	0.59	0.52	0.45	0.60	0.55	0.54	0.53	0.43	0.15	0.11	0.07	0.63	0.30	0.22	0.13	n/a	n/a	n/a	n/a
5-1/2 (140)	0.63	0.62	0.59	0.55	0.66	0.62	0.54	0.46	0.61	0.55	0.54	0.53	0.50	0.17	0.13	0.08	0.66	0.34	0.26	0.16	0.65	n/a	n/a	n/a
6 (152)	0.65	0.63	0.60	0.56	0.69	0.64	0.56	0.47	0.62	0.56	0.55	0.53	0.57	0.20	0.15	0.09	0.69	0.39	0.29	0.18	0.68	n/a	n/a	n/a
8 (203)	0.70	0.67	0.63	0.58	0.83	0.76	0.64	0.52	0.65	0.58	0.56	0.54	0.88	0.30	0.23	0.14	0.83	0.60	0.45	0.27	0.78	n/a	n/a	n/a
9-7/8 (251)	0.74	0.71	0.66	0.59	0.97	0.87	0.72	0.56	0.69	0.59	0.58	0.55	1.00	0.41	0.31	0.19	0.97	0.83	0.62	0.37	0.87	0.61	n/a	n/a
10 (254)	0.74	0.71	0.66	0.60	0.98	0.88	0.73	0.56	0.69	0.59	0.58	0.56		0.42	0.32	0.19	0.98	0.84	0.63	0.38	0.87	0.61	n/a	n/a
12 (305)	0.79	0.75	0.69	0.61		1.00	0.82	0.61	0.73	0.61	0.59	0.57		0.55	0.42	0.25		1.00	0.82	0.50	0.96	0.67	n/a	n/a
12-1/2 (318)	0.80	0.77	0.70	0.62			0.84	0.62	0.74	0.62	0.60	0.57		0.59	0.44	0.27			0.84	0.53	0.98	0.68	0.62	n/a
14 (356)	0.84	0.80	0.72	0.63			0.91	0.66	0.77	0.63	0.61	0.58		0.70	0.52	0.31			0.91	0.63	1.00	0.72	0.66	n/a
16 (406)	0.89	0.84	0.75	0.65			1.00	0.71	0.81	0.65	0.62	0.59		0.85	0.64	0.38			1.00	0.71		0.77	0.70	n/a
18 (457)	0.94	0.88	0.79	0.67				0.76	0.84	0.67	0.64	0.60		1.00	0.76	0.46				0.76		0.82	0.75	n/a
19-1/2 (495)	0.98	0.91	0.81	0.69				0.80	0.87	0.68	0.65	0.61			0.86	0.52				0.80		0.86	0.78	0.66
20 (508)	0.99	0.92	0.82	0.69				0.82	0.88	0.69	0.66	0.61			0.89	0.54				0.82		0.87	0.79	0.66
22 (559)	1.00	0.97	0.85	0.71				0.87	0.92	0.71	0.67	0.62			1.00	0.62				0.87		0.91	0.83	0.70
24 (610)		1.00	0.88	0.73				0.93	0.96	0.73	0.69	0.63				0.71				0.93		0.95	0.86	0.73
26 (660)			0.91	0.75				0.99	1.00	0.74	0.70	0.64				0.80				0.99		0.99	0.90	0.76
28 (711)			0.94	0.77				1.00	1.00	0.76	0.72	0.65				0.89				1.00		1.00	0.93	0.79
30 (762)			0.98	0.79						0.78	0.73	0.67				0.99							0.96	0.81
36 (914)			1.00	0.84						0.84	0.78	0.70				1.00							1.00	0.89
> 48 (1219)				0.96						0.95	0.87	0.76												1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 33 — Load adjustment factors for 1-in. diameter threaded rods in uncracked concrete [1,2,3]

1-in. Uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear ⊥ Toward edge f_{RV}				Edge distance in shear ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} in (mm)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm): 1-3/4 (44)	n/a	n/a	n/a	n/a	0.38	0.23	0.17	0.10	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)	0.61	0.59	0.57	0.54	0.60	0.32	0.23	0.14	0.59	0.54	0.53	0.52	0.37	0.11	0.07	0.04	0.60	0.22	0.15	0.09	n/a	n/a	n/a	n/a
6 (152)	0.63	0.61	0.58	0.55	0.66	0.35	0.25	0.15	0.60	0.55	0.54	0.53	0.48	0.14	0.10	0.06	0.66	0.29	0.19	0.12	n/a	n/a	n/a	n/a
6-1/4 (159)	0.64	0.62	0.59	0.55	0.68	0.35	0.26	0.15	0.61	0.55	0.54	0.53	0.51	0.15	0.10	0.06	0.68	0.30	0.21	0.12	0.65	n/a	n/a	n/a
7 (178)	0.66	0.63	0.60	0.56	0.72	0.38	0.28	0.16	0.62	0.55	0.54	0.53	0.61	0.18	0.12	0.07	0.72	0.36	0.24	0.15	0.69	n/a	n/a	n/a
8 (203)	0.68	0.65	0.61	0.57	0.78	0.41	0.30	0.18	0.64	0.56	0.55	0.53	0.74	0.22	0.15	0.09	0.78	0.41	0.30	0.18	0.74	n/a	n/a	n/a
10 (254)	0.72	0.69	0.64	0.58	0.92	0.48	0.35	0.21	0.67	0.58	0.56	0.54	1.00	0.31	0.21	0.13	0.92	0.48	0.35	0.21	0.83	n/a	n/a	n/a
11-1/4 (286)	0.75	0.71	0.66	0.59	1.00	0.52	0.39	0.23	0.69	0.59	0.57	0.55		0.37	0.25	0.15	1.00	0.52	0.39	0.23	0.88	0.59	n/a	n/a
12 (305)	0.77	0.72	0.67	0.60		0.56	0.41	0.24	0.71	0.59	0.57	0.55		0.40	0.27	0.16		0.56	0.41	0.24	0.91	0.60	n/a	n/a
14 (356)	0.81	0.76	0.69	0.62		0.65	0.48	0.28	0.74	0.61	0.58	0.56		0.51	0.35	0.21		0.65	0.48	0.28	0.98	0.65	n/a	n/a
14-1/4 (362)	0.82	0.76	0.70	0.62		0.66	0.49	0.29	0.74	0.61	0.58	0.56		0.52	0.35	0.21		0.66	0.49	0.29	0.99	0.66	0.58	n/a
16 (406)	0.86	0.80	0.72	0.63		0.74	0.55	0.32	0.77	0.62	0.59	0.57		0.62	0.42	0.25		0.74	0.55	0.32	1.00	0.70	0.61	n/a
18 (457)	0.90	0.83	0.75	0.65		0.84	0.62	0.36	0.81	0.64	0.61	0.58		0.74	0.50	0.30		0.84	0.62	0.36		0.74	0.65	n/a
20 (508)	0.95	0.87	0.78	0.67		0.93	0.68	0.40	0.84	0.65	0.62	0.58		0.87	0.59	0.35		0.93	0.68	0.40		0.78	0.68	n/a
22 (559)	0.99	0.91	0.81	0.68		1.00	0.75	0.44	0.88	0.67	0.63	0.59		1.00	0.68	0.41		1.00	0.75	0.44		0.82	0.72	n/a
22-1/4 (565)	1.00	0.91	0.81	0.69			0.76	0.45	0.88	0.67	0.63	0.59		1.00	0.69	0.41			0.76	0.45		0.82	0.72	0.61
24 (610)	1.00	0.94	0.83	0.70			0.82	0.48	0.91	0.68	0.64	0.60			0.77	0.46			0.82	0.48		0.85	0.75	0.63
26 (660)		0.98	0.86	0.72			0.89	0.52	0.94	0.70	0.65	0.61			0.87	0.52			0.89	0.52		0.89	0.78	0.66
28 (711)		1.00	0.89	0.73			0.96	0.56	0.98	0.71	0.66	0.62			0.98	0.59			0.96	0.56		0.92	0.81	0.68
30 (762)			0.92	0.75			1.00	0.60	1.00	0.73	0.68	0.63			1.00	0.65			1.00	0.60		0.95	0.84	0.71
36 (914)			1.00	0.80				0.72		0.77	0.71	0.65				0.85				0.72		1.00	0.92	0.77
> 48 (1219)				0.90				0.96		0.86	0.78	0.70				1.00				0.96			1.00	0.89

Table 34 — Load adjustment factors for 1-in. diameter threaded rods in cracked concrete [1,2,3]

1-in. Cracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear ⊥ Toward edge f_{RV}				Edge distance in shear ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} in (mm)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)	4 (102)	9 (229)	12 (305)	20 (508)
Spacing (s) / edge distance (c_a) / concrete thickness (h), - in (mm): 1-3/4 (44)	n/a	n/a	n/a	n/a	0.43	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	0.04	0.02	n/a	n/a	n/a	n/a
5 (127)	0.61	0.59	0.57	0.54	0.60	0.56	0.50	0.44	0.59	0.54	0.53	0.52	0.37	0.11	0.08	0.05	0.60	0.23	0.17	0.10	n/a	n/a	n/a	n/a
6 (152)	0.63	0.61	0.58	0.55	0.66	0.60	0.53	0.46	0.60	0.55	0.54	0.53	0.49	0.15	0.11	0.07	0.66	0.30	0.22	0.13	n/a	n/a	n/a	n/a
6-1/4 (159)	0.64	0.62	0.59	0.55	0.68	0.61	0.54	0.46	0.61	0.55	0.54	0.53	0.52	0.16	0.12	0.07	0.68	0.32	0.24	0.14	0.66	n/a	n/a	n/a
7 (178)	0.66	0.63	0.60	0.56	0.72	0.65	0.57	0.48	0.62	0.55	0.55	0.53	0.61	0.19	0.14	0.08	0.72	0.37	0.28	0.17	0.69	n/a	n/a	n/a
8 (203)	0.68	0.65	0.61	0.57	0.78	0.70	0.60	0.49	0.64	0.56	0.55	0.54	0.75	0.23	0.17	0.10	0.78	0.46	0.34	0.21	0.74	n/a	n/a	n/a
10 (254)	0.72	0.69	0.64	0.58	0.92	0.80	0.67	0.53	0.67	0.58	0.56	0.55	1.00	0.32	0.24	0.14	0.92	0.64	0.48	0.29	0.83	n/a	n/a	n/a
11-1/4 (286)	0.75	0.71	0.66	0.59	1.00	0.87	0.72	0.56	0.69	0.59	0.57	0.55		0.38	0.29	0.17	1.00	0.76	0.57	0.34	0.88	0.59	n/a	n/a
12 (305)	0.77	0.72	0.67	0.60		0.91	0.75	0.57	0.71	0.59	0.58	0.56		0.42	0.31	0.19		0.84	0.63	0.38	0.91	0.61	n/a	n/a
14 (356)	0.81	0.76	0.69	0.62		1.00	0.83	0.62	0.74	0.61	0.59	0.56		0.53	0.40	0.24		1.00	0.79	0.48	0.98	0.66	n/a	n/a
14-1/4 (362)	0.82	0.76	0.70	0.62			0.84	0.62	0.75	0.61	0.59	0.57		0.54	0.41	0.24			0.81	0.49	0.99	0.67	0.61	n/a
16 (406)	0.86	0.80	0.72	0.63			0.91	0.66	0.78	0.62	0.60	0.57		0.65	0.48	0.29			0.91	0.58	1.00	0.71	0.64	n/a
18 (457)	0.90	0.83	0.75	0.65			1.00	0.70	0.81	0.64	0.62	0.58		0.77	0.58	0.35			1.00	0.69		0.75	0.68	n/a
20 (508)	0.95	0.87	0.78	0.67				0.75	0.84	0.66	0.63	0.59		0.90	0.68	0.41				0.75		0.79	0.72	n/a
22 (559)	0.99	0.91	0.81	0.68				0.80	0.88	0.67	0.64	0.60		1.00	0.78	0.47				0.80		0.83	0.75	n/a
22-1/4 (565)	1.00	0.91	0.81	0.69				0.80	0.88	0.67	0.64	0.60			0.79	0.48				0.80		0.83	0.76	0.64
24 (610)	1.00	0.94	0.83	0.70				0.85	0.91	0.69	0.65	0.61			0.89	0.53				0.85		0.86	0.79	0.66
26 (660)		0.98	0.86	0.72				0.90	0.95	0.70	0.67	0.62			1.00	0.60				0.90		0.90	0.82	0.69
28 (711)		1.00	0.89	0.73				0.95	0.98	0.72	0.68	0.63				0.67				0.95		0.93	0.85	0.72
30 (762)			0.92	0.75				1.00	1.00	0.73	0.69	0.64				0.75				1.00		0.97	0.88	0.74
36 (914)			1.00	0.80						0.78	0.73	0.66				0.98						1.00	0.96	0.81
> 48 (1219)				0.90						0.87	0.81	0.72				1.00							1.00	0.94

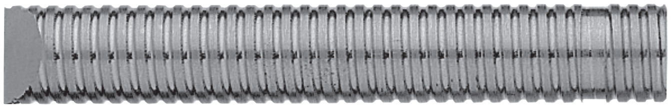
1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d ≤ s ≤ 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with 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 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3{*}h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3{*}h_{ef}$. If $c_a \geq 3{*}h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3{*}h_{ef}$. If $c_a \geq 3{*}h_{ef}$, then $f_{HV} = 1.0$.

Table 35 — Load adjustment factors for 1-1/4-in. diameter threaded rods in uncracked concrete [1,2,3]

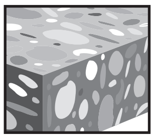
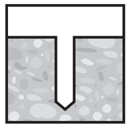
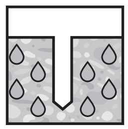
1-1/4-in. Uncracked concrete	Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear [4] f_{AV}				Edge distance in shear ⊥ Toward edge f_{RV}				Edge distance in shear ‖ To edge f_{RV}				Concrete thickness factor in shear [5] f_{HV}			
Embedment h_{ef} 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)	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	n/a	0.37	0.22	0.16	0.09	n/a	n/a	n/a	n/a	0.05	0.02	0.01	0.01	0.11	0.03	0.02	0.01	n/a	n/a	n/a	n/a
6-1/4 (159)	0.62	0.59	0.57	0.54	0.63	0.32	0.24	0.14	0.59	0.54	0.53	0.52	0.37	0.11	0.08	0.05	0.63	0.22	0.16	0.10	n/a	n/a	n/a	n/a
7 (178)	0.64	0.60	0.58	0.55	0.67	0.34	0.25	0.15	0.60	0.54	0.54	0.53	0.44	0.13	0.10	0.06	0.67	0.26	0.19	0.12	n/a	n/a	n/a	n/a
8 (203)	0.66	0.62	0.59	0.55	0.73	0.37	0.27	0.16	0.61	0.55	0.54	0.53	0.53	0.16	0.12	0.07	0.73	0.32	0.24	0.14	0.66	n/a	n/a	n/a
9 (229)	0.68	0.63	0.60	0.56	0.78	0.40	0.29	0.17	0.62	0.56	0.55	0.53	0.63	0.19	0.14	0.08	0.78	0.38	0.28	0.17	0.70	n/a	n/a	n/a
10 (254)	0.70	0.65	0.61	0.57	0.84	0.43	0.32	0.19	0.64	0.56	0.55	0.54	0.74	0.22	0.16	0.10	0.84	0.43	0.32	0.19	0.74	n/a	n/a	n/a
11 (279)	0.72	0.66	0.62	0.57	0.90	0.46	0.34	0.20	0.65	0.57	0.56	0.54	0.86	0.25	0.19	0.11	0.90	0.46	0.34	0.20	0.78	n/a	n/a	n/a
12 (305)	0.74	0.68	0.63	0.58	0.96	0.49	0.36	0.21	0.66	0.57	0.56	0.54	0.98	0.29	0.22	0.13	0.96	0.49	0.36	0.21	0.81	n/a	n/a	n/a
13 (330)	0.76	0.69	0.64	0.59	1.00	0.53	0.39	0.23	0.68	0.58	0.57	0.55	1.00	0.33	0.24	0.15	1.00	0.53	0.39	0.23	0.84	n/a	n/a	n/a
14 (356)	0.78	0.71	0.66	0.59		0.57	0.42	0.24	0.69	0.59	0.57	0.55		0.36	0.27	0.16		0.57	0.42	0.24	0.88	0.58	n/a	n/a
14-1/4 (362)	0.78	0.71	0.66	0.60		0.58	0.42	0.25	0.70	0.59	0.57	0.55		0.37	0.28	0.17		0.58	0.42	0.25	0.88	0.59	n/a	n/a
15 (381)	0.80	0.72	0.67	0.60		0.61	0.45	0.26	0.71	0.59	0.58	0.55		0.40	0.30	0.18		0.61	0.45	0.26	0.91	0.60	n/a	n/a
16 (406)	0.82	0.74	0.68	0.61		0.65	0.48	0.28	0.72	0.60	0.58	0.56		0.45	0.33	0.20		0.65	0.48	0.28	0.94	0.62	n/a	n/a
17 (432)	0.84	0.75	0.69	0.61		0.69	0.51	0.30	0.73	0.60	0.59	0.56		0.49	0.36	0.22		0.69	0.51	0.30	0.96	0.64	n/a	n/a
18 (457)	0.86	0.77	0.70	0.62		0.73	0.54	0.31	0.75	0.61	0.59	0.56		0.53	0.40	0.24		0.73	0.54	0.31	0.99	0.66	0.60	n/a
20 (508)	0.90	0.80	0.72	0.63		0.81	0.59	0.35	0.77	0.62	0.60	0.57		0.62	0.46	0.28		0.81	0.59	0.35	1.00	0.70	0.63	n/a
22 (559)	0.94	0.83	0.74	0.65		0.89	0.65	0.38	0.80	0.63	0.61	0.58		0.72	0.54	0.32		0.89	0.65	0.38		0.73	0.66	n/a
24 (610)	0.98	0.86	0.77	0.66		0.97	0.71	0.42	0.83	0.65	0.62	0.59		0.82	0.61	0.37		0.97	0.71	0.42		0.76	0.69	n/a
26 (660)	1.00	0.89	0.79	0.67		1.00	0.77	0.45	0.86	0.66	0.63	0.59		0.92	0.69	0.41		1.00	0.77	0.45		0.80	0.72	n/a
28 (711)		0.92	0.81	0.69			0.83	0.49	0.88	0.67	0.64	0.60		1.00	0.77	0.46			0.83	0.49		0.83	0.75	0.63
30 (762)		0.94	0.83	0.70			0.89	0.52	0.91	0.68	0.65	0.61			0.85	0.51			0.89	0.52		0.85	0.77	0.65
36 (914)		1.00	0.90	0.74			1.00	0.63	0.99	0.72	0.68	0.63			1.00	0.67			1.00	0.63		0.94	0.85	0.72
> 48 (1219)			1.00	0.82				0.84	1.00	0.79	0.74	0.67				1.00				0.84		1.00	0.98	0.83

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 Chapter 17.
4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Hilti HIT-HY 100 adhesive with Hilti HIS-N and HIS-RN internally threaded insert



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

Permissible Base Materials	 Uncracked concrete	 Dry Concrete	Permissible Drilling Method	 Hammer Drilling with Carbide Tipped Drill Bit
		 Water Saturated Concrete		 Hollow Drill Bit

Hilti HIS-N and HIS-RN installation specifications

Internal Nominal Rod Diameter	Insert External Diameter	Drill Bit Diameter	Embedment Depth	Bolt Embedment	Maximum Installation Torque	Minimum Base Material Thickness
d in (mm)	D in (mm)	d_0 in	h_{ef} in (mm)	h_s in	T_{max} ft-lb (Nm)	h_{min} in (mm)
3/8 (9.5)	0.65 (16.5)	11/16	4-3/8 (110)	3/8 – 15/16	15 (20)	5.9 (150)
1/2 (12.7)	0.81 (20.5)	7/8	5 (125)	1/2 – 1-3/16	30 (41)	6.7 (170)
5/8 (15.9)	1.00 (25.4)	1-1/8	6-3/4 (170)	5/8 – 1-1/2	60 (81)	9.1 (230)
3/4 (19.1)	1.09 (27.6)	1-1/4	8-1/8 (205)	3/4 – 1-7/8	100 (136)	10.6 (270)

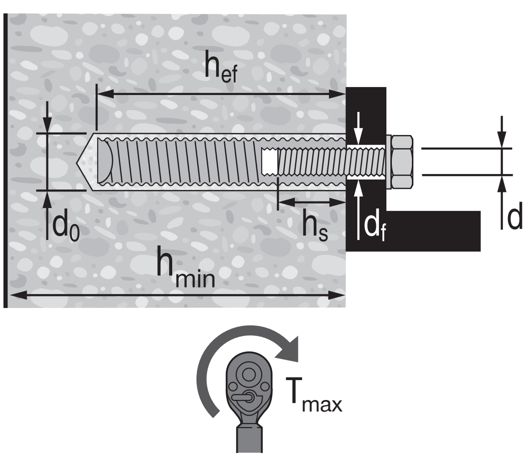


Table 36 — Hilti HIT-HY 100 adhesive design strength with concrete / bond failure for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete [1,2,3,4,5,6,7,8]

Thread size	Effective Embedment Depth in. (mm)	Tension — ΦN_n				Shear — ΦV_n			
		f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
3/8-16 UNC	4-3/8 (111)	7,140 (31.8)	7,820 (34.8)	7,985 (35.5)	8,465 (37.7)	15,375 (68.4)	16,840 (74.9)	17,200 (76.5)	18,230 (81.1)
1/2-13 UNC	5 (127)	8,720 (38.8)	9,555 (42.5)	10,505 (46.7)	11,135 (49.5)	18,785 (83.6)	20,575 (91.5)	22,620 (100.6)	23,980 (106.7)
5/8-11 UNC	6-3/4 (171)	13,680 (60.9)	14,985 (66.7)	15,160 (67.4)	16,070 (71.5)	29,460 (131.0)	32,275 (143.6)	32,655 (145.3)	34,615 (154.0)
3/4-10 UNC	8-1/8 (206)	15,760 (70.1)	15,760 (70.1)	15,760 (70.1)	16,705 (74.3)	38,910 (173.1)	40,120 (178.5)	40,120 (178.5)	42,530 (189.2)

1 Table values determined from calculations according to ACI 318-11 Appendix D. See Section 2.4 for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) 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 table 38 as necessary. Compare to the steel values in table 37. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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.

Table 37 — Steel design strength for steel bolt / cap screw for Hilti HIS-N and HIS-RN internally threaded inserts [1,2,3]

Thread size	ASTM A 193 B7		ASTM A 193 Grade B8M Stainless Steel	
	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)
3/8-16 UNC	6,300 (28.0)	3,490 (15.5)	5,540 (24.6)	3,070 (13.7)
1/2-13 UNC	10,525 (46.8)	6,385 (28.4)	10,145 (45.1)	5,620 (25.0)
5/8-11 UNC	17,500 (77.8)	10,170 (45.2)	16,160 (71.9)	8,950 (39.8)
3/4-10 UNC	17,785 (79.1)	15,055 (67.0)	23,915 (106.4)	13,245 (58.9)

1 See Section 2.4.4 (2017 PTG) to convert design strength value to ASD value.
2 Hilti HIS-N and HIS-RN inserts with steel bolts are considered brittle steel elements.
3 Table values are the lesser of steel failure in the HIS-N insert or inserted steel bolt.
4 Tensile = $\phi A_{se,N} f_{uta}$ as noted in ACI 318 Appendix D
5 Shear = ϕ 0.60 $A_{se,V} f_{uta}$ as noted in ACI 318 Appendix D. For 3/8-in diameter insert shear = ϕ 0.50 $A_{se,V} f_{uta}$

Table 38 — Load adjustment factors for Hilti HIS-N and HIS-RN internally threaded inserts in uncracked concrete [1,2,3]

HIS-N and HIS-RN All Diameters Uncracked Concrete		Spacing Factor in Tension f_{AN}				Edge Distance Factor in Tension f_{RN}				Spacing Factor in Shear[4] f_{AV}				Edge Distance in Shear ⊥ Toward Edge f_{RV}				Edge Distance in Shear ‖ To Edge f_{RV}				Concrete Thickness Factor in Shear[5] f_{HV}			
Internal Diameter in (mm)		3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)	3/8 (9.5)	1/2 (12.7)	5/8 (15.9)	3/4 (19.1)
Embedment h_{ef} in (mm)		4-3/8 (111)	5 (127)	6-3/4 (171)	8-1/8 (206)	4-3/8 (111)	5 (127)	6-3/4 (171)	8-1/8 (206)	4-3/8 (111)	5 (127)	6-3/4 (171)	8-1/8 (206)	4-3/8 (111)	5 (127)	6-3/4 (171)	8-1/8 (206)	4-3/8 (111)	5 (127)	6-3/4 (171)	8-1/8 (206)	4-3/8 (111)	5 (127)	6-3/4 (171)	8-1/8 (206)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h), — in (mm) 3-1/4	(83)	0.61	n/a	n/a	n/a	0.40	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)	0.63	0.61	n/a	n/a	0.45	0.43	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)	0.67	0.64	0.62	n/a	0.52	0.49	0.44	n/a	0.57	0.57	0.55	n/a	0.29	0.26	0.17	n/a	0.52	0.49	0.33	n/a	n/a	n/a	n/a	n/a
5-1/2	(140)	0.68	0.65	0.63	0.61	0.56	0.52	0.46	0.40	0.58	0.58	0.56	0.55	0.34	0.30	0.19	0.15	0.56	0.52	0.39	0.29	n/a	n/a	n/a	n/a
6	(152)	0.70	0.67	0.65	0.62	0.59	0.55	0.49	0.42	0.59	0.58	0.56	0.55	0.39	0.35	0.22	0.17	0.59	0.55	0.44	0.33	0.60	n/a	n/a	n/a
7	(178)	0.73	0.70	0.67	0.64	0.68	0.62	0.53	0.46	0.60	0.60	0.57	0.56	0.49	0.43	0.28	0.21	0.68	0.62	0.53	0.42	0.64	0.62	n/a	n/a
8	(203)	0.77	0.72	0.69	0.66	0.77	0.70	0.58	0.50	0.62	0.61	0.58	0.57	0.60	0.53	0.34	0.26	0.77	0.70	0.58	0.51	0.69	0.66	n/a	n/a
9	(229)	0.80	0.75	0.72	0.68	0.87	0.78	0.63	0.54	0.63	0.62	0.59	0.58	0.71	0.63	0.40	0.31	0.87	0.78	0.63	0.56	0.73	0.70	n/a	n/a
10	(254)	0.83	0.78	0.74	0.71	0.97	0.87	0.69	0.59	0.65	0.64	0.60	0.58	0.83	0.74	0.47	0.36	0.97	0.87	0.69	0.61	0.77	0.74	0.64	n/a
11	(279)	0.87	0.81	0.77	0.73	1.00	0.96	0.75	0.63	0.66	0.65	0.61	0.59	0.96	0.86	0.55	0.41	1.00	0.96	0.75	0.65	0.81	0.78	0.67	0.61
12	(305)	0.90	0.83	0.79	0.75		1.00	0.82	0.69	0.68	0.66	0.62	0.60	1.00	0.98	0.62	0.47		1.00	0.82	0.69	0.84	0.81	0.70	0.64
14	(356)	0.97	0.89	0.84	0.79			0.96	0.81	0.71	0.69	0.64	0.62		1.00	0.78	0.59			0.96	0.81	0.91	0.87	0.75	0.69
16	(406)	1.00	0.95	0.89	0.83			1.00	0.92	0.74	0.72	0.66	0.63			0.96	0.73			1.00	0.92	0.97	0.94	0.80	0.73
18	(457)		1.00	0.94	0.87				1.00	0.77	0.75	0.68	0.65			1.00	0.87				1.00	1.00	0.99	0.85	0.78
24	(610)			1.00	0.99					0.85	0.83	0.74	0.70				1.00						1.00	0.99	0.90
30	(762)				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												

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, perform anchor calculation using design equations from ACI 318 Appendix D or CSA A23.3 Annex D.
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 Spacing factor reduction in shear applicable when $c < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c < 3*h_{ef}$. If $c \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c < 3*h_{ef}$. If $c \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

DESIGN DATA IN CONCRETE PER CSA A23.3

CSA A23.3-14 Annex D 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 testing in accordance with ACI 355.4. These tables are followed by factored resistance tables. The factored resistance 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 of the Hilti North American Product Technical Guide, Volume 2: Anchor Fastening Technical Guide, Edition 17. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.ca.

Table 39 — Hilti HIT-HY 100 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 A23.3-14
				10M	15M	20M	25M	30M	
Anchor O.D.		d_0	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	
Min. concrete thickness [2]		h_{min}	mm	h_{ef} + 30	$h_{ef} + 2d_0$				
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 anchor 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		f_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)	625 (4.3)	725 (5.0)	775 (5.4)	790 (5.4)	800 (5.5)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7]	τ_{uncr}	psi (MPa)	1,275 (8.8)	1,255 (8.7)	1,240 (8.6)	1,220 (8.4)	1,095 (7.6)	D.6.5.2
Temp. range B [6]	Characteristic bond stress in cracked concrete [7]	τ_{cr}	psi (MPa)	575 (4.0)	665 (4.6)	725 (4.9)	725 (5.0)	735 (5.1)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7]	τ_{uncr}	psi (MPa)	1,175 (8.1)	1,155 (8.0)	1,140 (7.9)	1,120 (7.7)	1,010 (7.0)	D.6.5.2
Temp. range C [6]	Characteristic bond stress in cracked concrete [7]	τ_{cr}	psi (MPa)	440 (3.0)	510 (3.5)	545 (3.8)	555 (3.8)	560 (3.9)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7]	τ_{uncr}	psi (MPa)	915 (6.3)	900 (6.2)	885 (6.1)	875 (6.0)	785 (5.4)	D.6.5.2
Reduction for seismic tension		$\alpha_{N,seis}$	-	1.00					D.5.3 (c)
Permissible installation conditions	Resistance modification factor tension & shear, bond failure water-saturated concrete	Anchor category	-	1				2	
		R_{ws}	-	1.00				0.85	

1 Design information in this table is taken from ICC-ES ESR-3574, dated March 2018, table 20 and 21, and converted for use with CSA A23.3-14 Annex D.
2 See figure at the beginning of the rebar section.
3 Minimum edge distance may be reduced to 45mm provided rebar remains untorqued. See ESR-3574 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 = 210°F (99°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: $(f'_c / 17.2)^{0.1}$].

Hilti HIT-HY 100 Adhesive with Deformed Reinforcing Bars (Rebar)

Table 40 — Hilti HIT-HY 100 adhesive factored resistance with concrete / bond failure for CA rebar in uncracked concrete [1,2,3,4,5,6,7,8]

Rebar size	Effective embedment in. (mm)	Tension — N_r				Shear — V_r			
		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)	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 (115)	5,325 (23.7)	5,445 (24.2)	5,545 (24.7)	5,710 (25.4)	10,650 (47.4)	10,890 (48.4)	11,090 (49.3)	11,415 (50.8)
	7-1/16 (180)	8,335 (37.1)	8,525 (37.9)	8,680 (38.6)	8,935 (39.7)	16,670 (74.2)	17,045 (75.8)	17,360 (77.2)	17,865 (79.5)
	8-7/8 (226)	10,465 (46.6)	10,700 (47.6)	10,900 (48.5)	11,215 (49.9)	20,930 (93.1)	21,405 (95.2)	21,795 (97.0)	22,435 (99.8)
15M	5-11/16 (145)	9,360 (41.6)	9,570 (42.6)	9,745 (43.3)	10,030 (44.6)	18,715 (83.3)	19,140 (85.1)	19,490 (86.7)	20,060 (89.2)
	9-13/16 (250)	16,135 (71.8)	16,500 (73.4)	16,800 (74.7)	17,295 (76.9)	32,270 (143.5)	33,000 (146.8)	33,605 (149.5)	34,585 (153.8)
	12-5/8 (320)	20,655 (91.9)	21,120 (93.9)	21,505 (95.7)	22,135 (98.5)	41,305 (183.7)	42,235 (187.9)	43,015 (191.3)	44,270 (196.9)
20M	7-7/8 (200)	15,545 (69.1)	15,895 (70.7)	16,185 (72.0)	16,660 (74.1)	31,085 (138.3)	31,790 (141.4)	32,375 (144.0)	33,320 (148.2)
	14 (355)	27,590 (122.7)	28,210 (125.5)	28,730 (127.8)	29,570 (131.5)	55,180 (245.4)	56,425 (251.0)	57,465 (255.6)	59,140 (263.1)
	15-3/8 (390)	30,310 (134.8)	30,995 (137.9)	31,565 (140.4)	32,485 (144.5)	60,620 (269.6)	61,985 (275.7)	63,130 (280.8)	64,970 (289.0)
25M	9-1/16 (230)	22,725 (101.1)	23,240 (103.4)	23,670 (105.3)	24,360 (108.4)	45,455 (202.2)	46,480 (206.8)	47,335 (210.6)	48,715 (216.7)
	15-15/16 (405)	40,020 (178.0)	40,925 (182.0)	41,675 (185.4)	42,890 (190.8)	80,040 (356.0)	81,845 (364.1)	83,350 (370.8)	85,785 (381.6)
	19-13/16 (504)	49,805 (221.5)	50,925 (226.5)	51,865 (230.7)	53,375 (237.4)	99,605 (443.1)	101,855 (453.1)	103,725 (461.4)	106,755 (474.9)
30M	10-1/4 (260)	23,255 (103.4)	23,780 (105.8)	24,220 (107.7)	24,925 (110.9)	46,510 (206.9)	47,560 (211.6)	48,435 (215.5)	49,850 (221.7)
	17-15/16 (455)	40,700 (181.0)	41,615 (185.1)	42,380 (188.5)	43,620 (194.0)	81,395 (362.1)	83,235 (370.2)	84,765 (377.1)	87,240 (388.1)
	23-9/16 (598)	53,490 (237.9)	54,695 (243.3)	55,705 (247.8)	57,330 (255.0)	106,980 (475.9)	109,390 (486.6)	111,405 (495.6)	114,655 (510.0)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) 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 43-52 as necessary. Compare to the steel values in table 42. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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.

Table 41 — Hilti HIT-HY 100 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 (2,900 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)	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)
da (in)	h_{ef} (in)	20	25	30	40	20	25	30	40
10M	4-1/2	2,610	2,670	2,720	2,800	5,220	5,340	5,435	5,595
	(115)	(11.6)	(11.9)	(12.1)	(12.4)	(23.2)	(23.7)	(24.2)	(24.9)
	7-1/16	4,085	4,180	4,255	4,380	8,170	8,355	8,510	8,760
	(180)	(18.2)	(18.6)	(18.9)	(19.5)	(36.4)	(37.2)	(37.9)	(39.0)
	8-7/8	5,130	5,245	5,340	5,500	10,260	10,490	10,685	10,995
	(226)	(22.8)	(23.3)	(23.8)	(24.5)	(45.6)	(46.7)	(47.5)	(48.9)
15M	5-11/16	5,405	5,530	5,630	5,795	10,810	11,055	11,260	11,590
	(145)	(24.0)	(24.6)	(25.0)	(25.8)	(48.1)	(49.2)	(50.1)	(51.5)
	9-13/16	9,320	9,530	9,705	9,990	18,640	19,065	19,415	19,980
	(250)	(41.5)	(42.4)	(43.2)	(44.4)	(82.9)	(84.8)	(86.4)	(88.9)
	12-5/8	11,930	12,200	12,425	12,785	23,860	24,400	24,850	25,575
	(320)	(53.1)	(54.3)	(55.3)	(56.9)	(106.1)	(108.5)	(110.5)	(113.8)
20M	7-7/8	9,715	9,935	10,115	10,410	19,430	19,870	20,235	20,825
	(200)	(43.2)	(44.2)	(45.0)	(46.3)	(86.4)	(88.4)	(90.0)	(92.6)
	14	17,245	17,635	17,955	18,480	34,485	35,265	35,915	36,960
	(355)	(76.7)	(78.4)	(79.9)	(82.2)	(153.4)	(156.9)	(159.8)	(164.4)
	15-3/8	18,945	19,370	19,725	20,305	37,885	38,740	39,455	40,605
	(390)	(84.3)	(86.2)	(87.8)	(90.3)	(168.5)	(172.3)	(175.5)	(180.6)
25M	9-1/16	14,715	15,050	15,325	15,775	29,435	30,100	30,650	31,545
	(230)	(65.5)	(66.9)	(68.2)	(70.2)	(130.9)	(133.9)	(136.3)	(140.3)
	15-15/16	25,915	26,500	26,985	27,775	51,830	53,000	53,975	55,550
	(405)	(115.3)	(117.9)	(120.0)	(123.5)	(230.5)	(235.7)	(240.1)	(247.1)
	19-13/16	32,250	32,975	33,585	34,565	64,500	65,955	67,165	69,130
	(504)	(143.5)	(146.7)	(149.4)	(153.7)	(286.9)	(293.4)	(298.8)	(307.5)
30M	10-1/4	16,990	17,375	17,695	18,210	33,980	34,750	35,390	36,420
	(260)	(75.6)	(77.3)	(78.7)	(81.0)	(151.2)	(154.6)	(157.4)	(162.0)
	17-15/16	29,735	30,405	30,965	31,870	59,470	60,810	61,930	63,735
	(455)	(132.3)	(135.2)	(137.7)	(141.8)	(264.5)	(270.5)	(275.5)	(283.5)
	23-9/16	39,080	39,960	40,695	41,885	78,160	79,920	81,390	83,765
	(598)	(173.8)	(177.8)	(181.0)	(186.3)	(347.7)	(355.5)	(362.0)	(372.6)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) 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 43-52 as necessary. Compare to the steel values in table 42. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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 α_{seis} = 0.75.

Table 42 — Steel factored resistance for CA rebar [1]

Rebar size	CSA-G30.18 Grade 400 [2] Tensile[3] N_{sar} lb (kN)	Shear[4] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ 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 (2017 PTG) to convert design strength value to ASD value.
2 CSA-G30.18 Grade 400 rebar are considered ductile steel elements.
3 Tensile = $A_{se,N}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Annex D
4 Shear = $A_{se,V}\ \phi_s$ 0.60 f_{uta} as noted in CSA A23.3-14 Annex D.
5 Seismic Shear = $\alpha_{V,seis}\ V_{sa}$: Reduction factor for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

Table 43 — 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 ⊥ Toward edge f_{RV}			Edge distance in shear ∥ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Embedment h_{ef} in (mm)		4-1/2 (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	0.16	0.12	n/a	n/a	n/a	0.08	0.05	0.04	0.15	0.10	0.08	n/a	n/a	n/a
2-3/16	(55)	0.58	0.55	0.54	0.28	0.17	0.13	0.54	0.53	0.52	0.10	0.07	0.05	0.21	0.13	0.11	n/a	n/a	n/a
3	(76)	0.61	0.57	0.56	0.33	0.20	0.16	0.55	0.54	0.53	0.17	0.11	0.09	0.33	0.20	0.16	n/a	n/a	n/a
4	(102)	0.65	0.59	0.57	0.39	0.24	0.19	0.57	0.55	0.54	0.26	0.17	0.13	0.39	0.24	0.19	n/a	n/a	n/a
5	(127)	0.68	0.62	0.59	0.46	0.29	0.23	0.59	0.56	0.55	0.37	0.24	0.19	0.46	0.29	0.23	n/a	n/a	n/a
5-11/16	(145)	0.71	0.63	0.61	0.53	0.33	0.26	0.60	0.57	0.56	0.45	0.29	0.23	0.53	0.33	0.26	0.63	n/a	n/a
6	(152)	0.72	0.64	0.61	0.56	0.35	0.27	0.60	0.58	0.57	0.48	0.31	0.25	0.56	0.35	0.27	0.64	n/a	n/a
7	(178)	0.76	0.66	0.63	0.65	0.40	0.32	0.62	0.59	0.58	0.61	0.39	0.31	0.65	0.40	0.32	0.69	n/a	n/a
8	(203)	0.79	0.69	0.65	0.74	0.46	0.36	0.64	0.60	0.59	0.75	0.48	0.38	0.74	0.46	0.36	0.74	n/a	n/a
8-1/4	(210)	0.80	0.69	0.65	0.77	0.48	0.37	0.64	0.61	0.59	0.78	0.50	0.40	0.77	0.48	0.37	0.75	0.65	n/a
9	(229)	0.83	0.71	0.67	0.83	0.52	0.41	0.65	0.61	0.60	0.89	0.57	0.45	0.83	0.52	0.41	0.79	0.68	n/a
10-1/16	(256)	0.87	0.74	0.69	0.93	0.58	0.46	0.67	0.63	0.61	1.00	0.67	0.54	0.93	0.58	0.46	0.83	0.72	0.66
11	(279)	0.90	0.76	0.71	1.00	0.63	0.50	0.69	0.64	0.62		0.77	0.61	1.00	0.63	0.50	0.87	0.75	0.69
12	(305)	0.94	0.78	0.72		0.69	0.54	0.71	0.65	0.63		0.88	0.70		0.69	0.54	0.91	0.78	0.72
14	(356)	1.00	0.83	0.76		0.81	0.63	0.74	0.68	0.65		1.00	0.88		0.81	0.63	0.98	0.84	0.78
16	(406)		0.88	0.80		0.92	0.73	0.77	0.70	0.67			1.00		0.92	0.73	1.00	0.90	0.84
18	(457)		0.92	0.84		1.00	0.82	0.81	0.73	0.70					1.00	0.82		0.96	0.89
24	(610)		1.00	0.95			1.00	0.91	0.81	0.76						1.00		1.00	1.00
30	(762)			1.00				1.00	0.88	0.83									
36	(914)								0.96	0.89									
> 48	(1219)								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 applicable when $c_a < 3 * h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3 * h_{ef}$. If $c_a \geq 3 * h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3 * h_{ef}$. If $c_a \geq 3 * h_{ef}$, then $f_{HV} = 1.0$.

Table 44 — 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 ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Embedment h_{ef} in (mm)		4-1/2 (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	0.07	0.05	0.04	0.15	0.09	0.07	n/a	n/a	n/a
2-3/16	(55)	0.58	0.55	0.54	0.52	0.46	0.43	0.54	0.53	0.52	0.10	0.06	0.05	0.20	0.13	0.10	n/a	n/a	n/a
3	(76)	0.61	0.57	0.56	0.60	0.50	0.47	0.55	0.54	0.53	0.16	0.10	0.08	0.33	0.21	0.17	n/a	n/a	n/a
4	(102)	0.65	0.59	0.57	0.70	0.56	0.51	0.57	0.55	0.54	0.25	0.16	0.13	0.51	0.32	0.26	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	0.35	0.23	0.18	0.71	0.45	0.36	n/a	n/a	n/a
5-11/16	(145)	0.71	0.63	0.61	0.88	0.66	0.59	0.60	0.57	0.56	0.43	0.28	0.22	0.86	0.55	0.44	0.62	n/a	n/a
6	(152)	0.72	0.64	0.61	0.91	0.68	0.61	0.60	0.57	0.56	0.46	0.30	0.24	0.91	0.59	0.47	0.63	n/a	n/a
7	(178)	0.76	0.66	0.63	1.00	0.74	0.65	0.62	0.59	0.57	0.59	0.37	0.30	1.00	0.74	0.60	0.68	n/a	n/a
8	(203)	0.79	0.69	0.65		0.81	0.70	0.63	0.60	0.58	0.72	0.46	0.36		0.81	0.70	0.73	n/a	n/a
8-1/4	(210)	0.80	0.69	0.65		0.83	0.72	0.64	0.60	0.59	0.75	0.48	0.38		0.83	0.72	0.74	0.64	n/a
9	(229)	0.83	0.71	0.67		0.88	0.76	0.65	0.61	0.60	0.85	0.55	0.43		0.88	0.76	0.77	0.67	n/a
10-1/16	(256)	0.87	0.74	0.69		0.96	0.81	0.67	0.62	0.61	1.00	0.65	0.51		0.96	0.81	0.82	0.71	0.65
11	(279)	0.90	0.76	0.71		1.00	0.86	0.68	0.64	0.62		0.74	0.59		1.00	0.86	0.86	0.74	0.68
12	(305)	0.94	0.78	0.72			0.92	0.70	0.65	0.63		0.84	0.67			0.92	0.89	0.77	0.71
14	(356)	1.00	0.83	0.76			1.00	0.73	0.67	0.65		1.00	0.84			1.00	0.97	0.83	0.77
16	(406)		0.88	0.80				0.77	0.70	0.67			1.00				1.00	0.89	0.82
18	(457)		0.92	0.84				0.80	0.72	0.69								0.94	0.87
24	(610)		1.00	0.95				0.90	0.80	0.75								1.00	1.00
30	(762)			1.00				1.00	0.87	0.82									
36	(914)								0.95	0.88									
> 48	(1219)								1.00	1.00									

Table 45 — 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	0.05	0.03	0.02	0.10	0.06	0.05	n/a	n/a	n/a
3-1/8	(80)	0.59	0.55	0.54	0.31	0.18	0.14	0.54	0.53	0.52	0.12	0.07	0.06	0.25	0.14	0.11	n/a	n/a	n/a
4	(102)	0.62	0.57	0.55	0.36	0.20	0.15	0.55	0.54	0.53	0.18	0.10	0.08	0.36	0.20	0.15	n/a	n/a	n/a
5	(127)	0.65	0.58	0.57	0.41	0.23	0.18	0.57	0.55	0.54	0.25	0.14	0.11	0.41	0.23	0.18	n/a	n/a	n/a
6	(152)	0.68	0.60	0.58	0.46	0.26	0.20	0.58	0.56	0.55	0.33	0.19	0.15	0.46	0.26	0.20	n/a	n/a	n/a
7	(178)	0.70	0.62	0.59	0.52	0.29	0.22	0.59	0.56	0.55	0.41	0.24	0.19	0.52	0.29	0.22	n/a	n/a	n/a
7-1/4	(184)	0.71	0.62	0.60	0.54	0.30	0.23	0.60	0.57	0.56	0.44	0.25	0.20	0.54	0.30	0.23	0.62	n/a	n/a
8	(203)	0.73	0.64	0.61	0.59	0.33	0.26	0.61	0.57	0.56	0.51	0.29	0.23	0.59	0.33	0.26	0.65	n/a	n/a
9	(229)	0.76	0.65	0.62	0.67	0.37	0.29	0.62	0.58	0.57	0.60	0.35	0.27	0.67	0.37	0.29	0.69	n/a	n/a
10	(254)	0.79	0.67	0.63	0.74	0.42	0.32	0.63	0.59	0.58	0.71	0.41	0.32	0.74	0.42	0.32	0.73	n/a	n/a
11-3/8	(289)	0.83	0.69	0.65	0.84	0.47	0.37	0.65	0.60	0.59	0.86	0.50	0.39	0.84	0.47	0.37	0.78	0.65	n/a
12	(305)	0.85	0.70	0.66	0.89	0.50	0.39	0.66	0.61	0.59	0.93	0.54	0.42	0.89	0.50	0.39	0.80	0.66	n/a
14-1/8	(359)	0.91	0.74	0.69	1.00	0.59	0.45	0.69	0.63	0.61	1.00	0.69	0.54	1.00	0.59	0.45	0.86	0.72	0.66
16	(406)	0.97	0.77	0.71		0.66	0.51	0.71	0.65	0.62		0.83	0.65		0.66	0.51	0.92	0.77	0.71
18	(457)	1.00	0.80	0.74		0.75	0.58	0.74	0.67	0.64		0.99	0.77		0.75	0.58	0.98	0.81	0.75
20	(508)		0.84	0.76		0.83	0.64	0.76	0.68	0.66		1.00	0.91		0.83	0.64	1.00	0.86	0.79
22	(559)		0.87	0.79		0.91	0.71	0.79	0.70	0.67			1.00		0.91	0.71		0.90	0.83
24	(610)		0.91	0.82		1.00	0.77	0.82	0.72	0.69					1.00	0.77		0.94	0.87
30	(762)		1.00	0.90			0.96	0.90	0.78	0.73						0.96		1.00	0.97
36	(914)			0.98			1.00	0.98	0.83	0.78						1.00			1.00
> 48	(1219)			1.00				1.00	0.94	0.87									

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 applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 46 — 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	0.05	0.03	0.02	0.10	0.06	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	0.12	0.07	0.05	0.24	0.14	0.11	n/a	n/a	n/a
4	(102)	0.62	0.57	0.55	0.62	0.50	0.46	0.55	0.54	0.53	0.17	0.10	0.08	0.34	0.20	0.15	n/a	n/a	n/a
5	(127)	0.65	0.58	0.57	0.69	0.54	0.49	0.56	0.54	0.54	0.24	0.14	0.11	0.47	0.27	0.21	n/a	n/a	n/a
6	(152)	0.68	0.60	0.58	0.77	0.58	0.52	0.58	0.55	0.55	0.31	0.18	0.14	0.62	0.36	0.28	n/a	n/a	n/a
7	(178)	0.70	0.62	0.59	0.86	0.62	0.56	0.59	0.56	0.55	0.39	0.23	0.18	0.78	0.45	0.35	n/a	n/a	n/a
7-1/4	(184)	0.71	0.62	0.60	0.88	0.63	0.56	0.59	0.56	0.55	0.41	0.24	0.19	0.82	0.48	0.37	0.61	n/a	n/a
8	(203)	0.73	0.64	0.61	0.95	0.66	0.59	0.60	0.57	0.56	0.48	0.28	0.22	0.95	0.55	0.43	0.64	n/a	n/a
9	(229)	0.76	0.65	0.62	1.00	0.71	0.62	0.61	0.58	0.57	0.57	0.33	0.26	1.00	0.66	0.52	0.68	n/a	n/a
10	(254)	0.79	0.67	0.63		0.76	0.66	0.63	0.59	0.58	0.67	0.39	0.30		0.76	0.60	0.71	n/a	n/a
11-3/8	(289)	0.83	0.69	0.65		0.82	0.71	0.64	0.60	0.59	0.81	0.47	0.37		0.82	0.71	0.76	0.63	n/a
12	(305)	0.85	0.70	0.66		0.86	0.73	0.65	0.61	0.59	0.88	0.51	0.40		0.86	0.73	0.78	0.65	n/a
14-1/8	(359)	0.91	0.74	0.69		0.97	0.81	0.68	0.63	0.61	1.00	0.65	0.51		0.97	0.81	0.85	0.71	0.65
16	(406)	0.97	0.77	0.71		1.00	0.88	0.70	0.64	0.62		0.78	0.61		1.00	0.88	0.90	0.75	0.69
18	(457)	1.00	0.80	0.74			0.96	0.73	0.66	0.64		0.93	0.73			0.96	0.96	0.80	0.73
20	(508)		0.84	0.76			1.00	0.75	0.68	0.65		1.00	0.85			1.00	1.00	0.84	0.77
22	(559)		0.87	0.79				0.78	0.69	0.67			0.99					0.88	0.81
24	(610)		0.91	0.82				0.81	0.71	0.68			1.00					0.92	0.85
30	(762)		1.00	0.90				0.88	0.77	0.73								1.00	0.95
36	(914)			0.98				0.96	0.82	0.77									1.00
> 48	(1219)			1.00				1.00	0.92	0.86									

Table 47 — 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} in (mm)		7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (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	0.02	0.02	0.07	0.04	0.03	n/a	n/a	n/a
3-7/8	(98)	0.58	0.55	0.54	0.28	0.15	0.14	0.54	0.53	0.52	0.11	0.06	0.06	0.22	0.12	0.11	n/a	n/a	n/a
4	(102)	0.58	0.55	0.54	0.28	0.15	0.14	0.54	0.53	0.53	0.11	0.06	0.06	0.23	0.13	0.12	n/a	n/a	n/a
5	(127)	0.61	0.56	0.55	0.32	0.17	0.16	0.55	0.53	0.53	0.16	0.09	0.08	0.32	0.17	0.16	n/a	n/a	n/a
6	(152)	0.63	0.57	0.57	0.36	0.19	0.18	0.56	0.54	0.54	0.21	0.12	0.11	0.36	0.19	0.18	n/a	n/a	n/a
7	(178)	0.65	0.58	0.58	0.39	0.21	0.19	0.57	0.55	0.54	0.27	0.15	0.14	0.39	0.21	0.19	n/a	n/a	n/a
8	(203)	0.67	0.60	0.59	0.44	0.24	0.22	0.58	0.55	0.55	0.32	0.18	0.17	0.44	0.24	0.22	n/a	n/a	n/a
9	(229)	0.69	0.61	0.60	0.48	0.26	0.24	0.59	0.56	0.56	0.39	0.22	0.20	0.48	0.26	0.24	n/a	n/a	n/a
10	(254)	0.71	0.62	0.61	0.54	0.29	0.27	0.60	0.57	0.56	0.45	0.26	0.23	0.54	0.29	0.27	0.63	n/a	n/a
11	(279)	0.73	0.63	0.62	0.59	0.32	0.29	0.61	0.57	0.57	0.52	0.29	0.27	0.59	0.32	0.29	0.66	n/a	n/a
12	(305)	0.75	0.64	0.63	0.65	0.35	0.32	0.62	0.58	0.58	0.60	0.34	0.31	0.65	0.35	0.32	0.69	n/a	n/a
14	(356)	0.80	0.67	0.65	0.75	0.41	0.37	0.64	0.59	0.59	0.75	0.42	0.39	0.75	0.41	0.37	0.74	n/a	n/a
16	(406)	0.84	0.69	0.67	0.86	0.47	0.42	0.66	0.61	0.60	0.92	0.52	0.47	0.86	0.47	0.42	0.79	0.66	n/a
18	(457)	0.88	0.71	0.70	0.97	0.53	0.48	0.68	0.62	0.61	1.00	0.62	0.56	0.97	0.53	0.48	0.84	0.70	0.67
20	(508)	0.92	0.74	0.72	1.00	0.59	0.53	0.70	0.63	0.63		0.72	0.66	1.00	0.59	0.53	0.89	0.73	0.71
22	(559)	0.97	0.76	0.74		0.64	0.58	0.72	0.65	0.64		0.83	0.76		0.64	0.58	0.93	0.77	0.74
24	(610)	1.00	0.79	0.76		0.70	0.64	0.74	0.66	0.65		0.95	0.86		0.70	0.64	0.97	0.80	0.78
26	(660)		0.81	0.78		0.76	0.69	0.76	0.67	0.66		1.00	0.98		0.76	0.69	1.00	0.84	0.81
28	(711)		0.83	0.80		0.82	0.74	0.78	0.69	0.68			1.00		0.82	0.74		0.87	0.84
30	(762)		0.86	0.83		0.88	0.80	0.80	0.70	0.69					0.88	0.80		0.90	0.87
36	(914)		0.93	0.89		1.00	0.96	0.85	0.74	0.73					1.00	0.96		0.98	0.95
> 48	(1219)		1.00	1.00			1.00	0.97	0.82	0.80						1.00		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 applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 48 — 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} in (mm)		7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (390)	7-7/8 (200)	14 (355)	15-3/8 (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	0.02	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	0.54	0.52	0.52	0.10	0.06	0.05	0.20	0.11	0.10	n/a	n/a	n/a
4	(102)	0.58	0.55	0.54	0.54	0.45	0.44	0.54	0.53	0.52	0.11	0.06	0.05	0.21	0.12	0.11	n/a	n/a	n/a
5	(127)	0.61	0.56	0.55	0.59	0.48	0.47	0.55	0.53	0.53	0.15	0.08	0.08	0.30	0.17	0.15	n/a	n/a	n/a
6	(152)	0.63	0.57	0.57	0.64	0.51	0.49	0.56	0.54	0.54	0.20	0.11	0.10	0.39	0.22	0.20	n/a	n/a	n/a
7	(178)	0.65	0.58	0.58	0.70	0.53	0.52	0.57	0.54	0.54	0.25	0.14	0.13	0.50	0.28	0.25	n/a	n/a	n/a
8	(203)	0.67	0.60	0.59	0.76	0.56	0.54	0.58	0.55	0.55	0.30	0.17	0.16	0.61	0.34	0.31	n/a	n/a	n/a
9	(229)	0.69	0.61	0.60	0.82	0.59	0.57	0.58	0.56	0.55	0.36	0.20	0.19	0.72	0.41	0.37	n/a	n/a	n/a
10	(254)	0.71	0.62	0.61	0.88	0.62	0.60	0.59	0.56	0.56	0.42	0.24	0.22	0.85	0.48	0.43	0.61	n/a	n/a
11	(279)	0.73	0.63	0.62	0.95	0.65	0.62	0.60	0.57	0.57	0.49	0.27	0.25	0.95	0.55	0.50	0.64	n/a	n/a
12	(305)	0.75	0.64	0.63	1.00	0.69	0.65	0.61	0.58	0.57	0.56	0.31	0.29	1.00	0.63	0.57	0.67	n/a	n/a
14	(356)	0.80	0.67	0.65		0.75	0.71	0.63	0.59	0.58	0.70	0.39	0.36		0.75	0.71	0.73	n/a	n/a
16	(406)	0.84	0.69	0.67		0.82	0.77	0.65	0.60	0.60	0.85	0.48	0.44		0.82	0.77	0.77	0.64	n/a
18	(457)	0.88	0.71	0.70		0.89	0.83	0.67	0.62	0.61	1.00	0.58	0.52		0.89	0.83	0.82	0.68	0.66
20	(508)	0.92	0.74	0.72		0.96	0.90	0.69	0.63	0.62		0.67	0.61		0.96	0.90	0.87	0.72	0.69
22	(559)	0.97	0.76	0.74		1.00	0.96	0.71	0.64	0.63		0.78	0.71		1.00	0.96	0.91	0.75	0.73
24	(610)	1.00	0.79	0.76			1.00	0.73	0.65	0.64		0.89	0.81			1.00	0.95	0.78	0.76
26	(660)		0.81	0.78				0.74	0.67	0.66		1.00	0.91				0.99	0.82	0.79
28	(711)		0.83	0.80				0.76	0.68	0.67			1.00				1.00	0.85	0.82
30	(762)		0.86	0.83				0.78	0.69	0.68								0.88	0.85
36	(914)		0.93	0.89				0.84	0.73	0.72								0.96	0.93
> 48	(1219)		1.00	1.00				0.95	0.81	0.79								1.00	1.00

Table 49 — 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 ⊥ Toward edge f_{RV}			Edge distance in shear ‖ To edge f_{RV}			Concrete thickness factor in shear [5] f_{HV}		
Embedment h_{ef} in (mm)		9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (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	0.05	0.03	0.02	n/a	n/a	n/a
5	(127)	0.59	0.55	0.54	0.32	0.17	0.14	0.54	0.53	0.52	0.11	0.06	0.05	0.22	0.12	0.10	n/a	n/a	n/a
6	(152)	0.61	0.56	0.55	0.35	0.19	0.15	0.55	0.53	0.53	0.14	0.08	0.07	0.29	0.16	0.13	n/a	n/a	n/a
7	(178)	0.63	0.57	0.56	0.38	0.21	0.16	0.55	0.54	0.53	0.18	0.10	0.08	0.36	0.21	0.16	n/a	n/a	n/a
8	(203)	0.65	0.58	0.57	0.41	0.23	0.18	0.56	0.54	0.54	0.22	0.13	0.10	0.41	0.23	0.18	n/a	n/a	n/a
9	(229)	0.67	0.59	0.58	0.45	0.24	0.19	0.57	0.55	0.54	0.26	0.15	0.12	0.45	0.24	0.19	n/a	n/a	n/a
10	(254)	0.68	0.60	0.58	0.48	0.26	0.21	0.58	0.55	0.55	0.31	0.18	0.14	0.48	0.26	0.21	n/a	n/a	n/a
11-9/16	(294)	0.71	0.62	0.60	0.55	0.30	0.24	0.59	0.56	0.55	0.39	0.22	0.18	0.55	0.30	0.24	0.59	n/a	n/a
12	(305)	0.72	0.63	0.60	0.57	0.31	0.25	0.59	0.56	0.55	0.41	0.23	0.19	0.57	0.31	0.25	0.61	n/a	n/a
14	(356)	0.76	0.65	0.62	0.66	0.36	0.29	0.61	0.57	0.56	0.51	0.29	0.23	0.66	0.36	0.29	0.65	n/a	n/a
16	(406)	0.79	0.67	0.63	0.76	0.42	0.33	0.62	0.58	0.57	0.63	0.36	0.29	0.76	0.42	0.33	0.70	n/a	n/a
18	(457)	0.83	0.69	0.65	0.85	0.47	0.37	0.64	0.59	0.58	0.75	0.43	0.34	0.85	0.47	0.37	0.74	n/a	n/a
18-7/16	(469)	0.84	0.69	0.66	0.88	0.48	0.38	0.64	0.60	0.58	0.78	0.44	0.36	0.88	0.48	0.38	0.75	0.62	n/a
20	(508)	0.87	0.71	0.67	0.95	0.52	0.41	0.65	0.60	0.59	0.88	0.50	0.40	0.95	0.52	0.41	0.78	0.65	n/a
22-3/8	(568)	0.91	0.73	0.69	1.00	0.58	0.46	0.67	0.62	0.60	1.00	0.59	0.47	1.00	0.58	0.46	0.83	0.68	0.64
24	(610)	0.94	0.75	0.70		0.62	0.50	0.68	0.63	0.61		0.65	0.53		0.62	0.50	0.86	0.71	0.66
26	(660)	0.98	0.77	0.72		0.67	0.54	0.70	0.64	0.62		0.74	0.59		0.67	0.54	0.89	0.74	0.69
28	(711)	1.00	0.79	0.74		0.73	0.58	0.71	0.65	0.63		0.83	0.66		0.73	0.58	0.92	0.77	0.71
30	(762)		0.81	0.75		0.78	0.62	0.73	0.66	0.64		0.92	0.74		0.78	0.62	0.96	0.79	0.74
36	(914)		0.88	0.80		0.93	0.74	0.77	0.69	0.66		1.00	0.97		0.93	0.74	1.00	0.87	0.81
> 48	(1219)		1.00	0.90		1.00	0.99	0.87	0.75	0.72			1.00		1.00	0.99	1.00	1.00	0.93

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 applicable when $c_a < 3^*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3^*h_{ef}$. If $c_a \geq 3^*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3^*h_{ef}$. If $c_a \geq 3^*h_{ef}$, then $f_{HV} = 1.0$.

Table 50 — 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 ⊥ 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)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (504)	9-1/16 (230)	15-15/16 (405)	19-13/16 (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	0.12	0.07	0.05	0.24	0.14	0.11	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	0.16	0.09	0.07	0.31	0.18	0.14	n/a	n/a	n/a
7 (178)	0.63	0.57	0.56	0.65	0.51	0.48	0.56	0.54	0.53	0.20	0.11	0.09	0.40	0.22	0.18	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	0.24	0.14	0.11	0.48	0.27	0.22	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	0.29	0.16	0.13	0.58	0.33	0.26	n/a	n/a	n/a
10 (254)	0.68	0.60	0.58	0.80	0.59	0.53	0.58	0.56	0.55	0.34	0.19	0.15	0.68	0.38	0.31	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	0.56	0.42	0.24	0.19	0.84	0.48	0.38	0.61	n/a	n/a
12 (305)	0.72	0.63	0.60	0.91	0.64	0.58	0.60	0.57	0.56	0.44	0.25	0.20	0.89	0.50	0.41	0.62	n/a	n/a
14 (356)	0.76	0.65	0.62	1.00	0.69	0.62	0.61	0.58	0.57	0.56	0.32	0.26	1.00	0.64	0.51	0.67	n/a	n/a
16 (406)	0.79	0.67	0.63		0.75	0.66	0.63	0.59	0.58	0.68	0.39	0.31		0.75	0.62	0.72	n/a	n/a
18 (457)	0.83	0.69	0.65		0.81	0.71	0.65	0.60	0.59	0.82	0.46	0.37		0.81	0.71	0.76	n/a	n/a
18-7/16 (469)	0.84	0.69	0.66		0.83	0.72	0.65	0.60	0.59	0.85	0.48	0.39		0.83	0.72	0.77	0.64	n/a
20 (508)	0.87	0.71	0.67		0.87	0.75	0.66	0.61	0.60	0.96	0.54	0.44		0.87	0.75	0.80	0.67	n/a
22-3/8 (568)	0.91	0.73	0.69		0.95	0.81	0.68	0.62	0.61	1.00	0.64	0.52		0.95	0.81	0.85	0.70	0.65
24 (610)	0.94	0.75	0.70		1.00	0.85	0.69	0.63	0.62		0.71	0.57		1.00	0.85	0.88	0.73	0.68
26 (660)	0.98	0.77	0.72			0.90	0.71	0.64	0.62		0.80	0.65			0.90	0.92	0.76	0.71
28 (711)	1.00	0.79	0.74			0.95	0.73	0.66	0.63		0.90	0.72			0.95	0.95	0.79	0.73
30 (762)		0.81	0.75			1.00	0.74	0.67	0.64		1.00	0.80			1.00	0.99	0.82	0.76
36 (914)		0.88	0.80				0.79	0.70	0.67			1.00				1.00	0.89	0.83
> 48 (1219)		1.00	0.90				0.89	0.77	0.73								1.00	0.96

Table 51 — 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 ⊥ 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)	10-1/4 (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	0.03	0.02	n/a	n/a	n/a
5-7/8 (150)	0.60	0.55	0.54	0.34	0.19	0.14	0.54	0.53	0.53	0.14	0.08	0.06	0.28	0.16	0.12	n/a	n/a	n/a
6 (152)	0.60	0.56	0.54	0.34	0.19	0.14	0.55	0.53	0.53	0.14	0.08	0.06	0.28	0.16	0.12	n/a	n/a	n/a
7 (178)	0.61	0.57	0.55	0.37	0.20	0.15	0.55	0.54	0.53	0.18	0.10	0.08	0.36	0.20	0.15	n/a	n/a	n/a
8 (203)	0.63	0.57	0.56	0.40	0.22	0.16	0.56	0.54	0.53	0.22	0.12	0.09	0.40	0.22	0.16	n/a	n/a	n/a
9 (229)	0.65	0.58	0.56	0.43	0.24	0.18	0.57	0.55	0.54	0.26	0.15	0.11	0.43	0.24	0.18	n/a	n/a	n/a
10 (254)	0.66	0.59	0.57	0.46	0.25	0.19	0.58	0.55	0.54	0.30	0.17	0.13	0.46	0.25	0.19	n/a	n/a	n/a
11 (279)	0.68	0.60	0.58	0.50	0.27	0.20	0.58	0.56	0.55	0.35	0.20	0.15	0.50	0.27	0.20	n/a	n/a	n/a
12 (305)	0.70	0.61	0.58	0.53	0.29	0.22	0.59	0.56	0.55	0.40	0.23	0.17	0.53	0.29	0.22	n/a	n/a	n/a
13-1/4 (337)	0.72	0.62	0.59	0.58	0.32	0.24	0.60	0.57	0.56	0.46	0.26	0.20	0.58	0.32	0.24	0.63	n/a	n/a
14 (356)	0.73	0.63	0.60	0.62	0.34	0.25	0.61	0.57	0.56	0.50	0.29	0.22	0.62	0.34	0.25	0.65	n/a	n/a
16 (406)	0.76	0.65	0.61	0.70	0.39	0.29	0.62	0.58	0.57	0.61	0.35	0.27	0.70	0.39	0.29	0.69	n/a	n/a
18 (457)	0.79	0.67	0.63	0.79	0.44	0.33	0.64	0.59	0.58	0.73	0.42	0.32	0.79	0.44	0.33	0.74	n/a	n/a
20 (508)	0.83	0.69	0.64	0.88	0.48	0.36	0.65	0.60	0.59	0.86	0.49	0.37	0.88	0.48	0.36	0.78	n/a	n/a
20-7/8 (531)	0.84	0.69	0.65	0.92	0.51	0.38	0.66	0.61	0.59	0.92	0.52	0.40	0.92	0.51	0.38	0.79	n/a	n/a
22 (559)	0.86	0.70	0.66	0.97	0.53	0.40	0.67	0.61	0.59	0.99	0.57	0.43	0.97	0.53	0.40	0.81	0.68	n/a
24 (610)	0.89	0.72	0.67	1.00	0.58	0.44	0.68	0.62	0.60	1.00	0.64	0.49	1.00	0.58	0.44	0.85	0.71	n/a
26-9/16 (675)	0.93	0.75	0.69		0.64	0.48	0.70	0.64	0.61		0.75	0.57		0.64	0.48	0.89	0.74	0.68
28 (711)	0.96	0.76	0.70		0.68	0.51	0.71	0.65	0.62		0.81	0.62		0.68	0.51	0.92	0.76	0.70
30 (762)	0.99	0.78	0.71		0.73	0.55	0.73	0.66	0.63		0.90	0.68		0.73	0.55	0.95	0.79	0.72
36 (914)	1.00	0.83	0.75		0.87	0.65	0.77	0.69	0.66		1.00	0.90		0.87	0.65	1.00	0.86	0.79
> 48 (1219)		0.95	0.84		1.00	0.87	0.86	0.75	0.71		1.00	1.00		1.00	0.87	1.00	1.00	0.91

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 applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Table 52 — 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 ⊥ 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)		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	0.53	0.13	0.08	0.06	0.27	0.15	0.12	n/a	n/a	n/a
	6 (152)	0.60	0.56	0.54	0.57	0.47	0.44	0.54	0.53	0.53	0.14	0.08	0.06	0.28	0.16	0.12	n/a	n/a	n/a
	7 (178)	0.61	0.57	0.55	0.61	0.49	0.46	0.55	0.54	0.53	0.17	0.10	0.08	0.35	0.20	0.15	n/a	n/a	n/a
	8 (203)	0.63	0.57	0.56	0.65	0.51	0.47	0.56	0.54	0.53	0.21	0.12	0.09	0.42	0.24	0.18	n/a	n/a	n/a
	9 (229)	0.65	0.58	0.56	0.69	0.53	0.49	0.57	0.55	0.54	0.25	0.14	0.11	0.51	0.29	0.22	n/a	n/a	n/a
	10 (254)	0.66	0.59	0.57	0.74	0.56	0.50	0.57	0.55	0.54	0.30	0.17	0.13	0.59	0.34	0.26	n/a	n/a	n/a
	11 (279)	0.68	0.60	0.58	0.79	0.58	0.52	0.58	0.56	0.55	0.34	0.20	0.15	0.68	0.39	0.30	n/a	n/a	n/a
	12 (305)	0.70	0.61	0.58	0.83	0.60	0.54	0.59	0.56	0.55	0.39	0.22	0.17	0.78	0.45	0.34	n/a	n/a	n/a
	13-1/4 (337)	0.72	0.62	0.59	0.89	0.63	0.56	0.60	0.57	0.56	0.45	0.26	0.20	0.89	0.52	0.39	0.63	n/a	n/a
	14 (356)	0.73	0.63	0.60	0.93	0.65	0.57	0.60	0.57	0.56	0.49	0.28	0.21	0.93	0.56	0.43	0.64	n/a	n/a
	16 (406)	0.76	0.65	0.61	1.00	0.70	0.61	0.62	0.58	0.57	0.60	0.34	0.26	1.00	0.69	0.52	0.69	n/a	n/a
	18 (457)	0.79	0.67	0.63		0.75	0.64	0.63	0.59	0.58	0.72	0.41	0.31		0.75	0.62	0.73	n/a	n/a
	20 (508)	0.83	0.69	0.64		0.81	0.68	0.65	0.60	0.59	0.84	0.48	0.36		0.81	0.68	0.77	n/a	n/a
	20-7/8 (531)	0.84	0.69	0.65		0.83	0.70	0.65	0.61	0.59	0.90	0.51	0.39		0.83	0.70	0.79	n/a	n/a
	22 (559)	0.86	0.70	0.66		0.86	0.72	0.66	0.61	0.59	0.97	0.55	0.42		0.86	0.72	0.81	0.67	n/a
	24 (610)	0.89	0.72	0.67		0.92	0.76	0.68	0.62	0.60	1.00	0.63	0.48		0.92	0.76	0.84	0.70	n/a
	26-9/16 (675)	0.93	0.75	0.69		0.99	0.81	0.70	0.64	0.61		0.73	0.56		0.99	0.81	0.89	0.74	0.67
	28 (711)	0.96	0.76	0.70		1.00	0.84	0.71	0.64	0.62		0.79	0.60		1.00	0.84	0.91	0.76	0.69
	30 (762)	0.99	0.78	0.71			0.88	0.72	0.65	0.63		0.88	0.67		1.00	0.88	0.94	0.78	0.71
	36 (914)	1.00	0.83	0.75			1.00	0.77	0.68	0.65		1.00	0.88			1.00	1.00	0.86	0.78
	> 48 (1219)		0.95	0.84				0.86	0.74	0.70			1.00					0.99	0.90

1 Linear interpolation not permitted

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

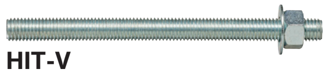
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from CSA A23.3-14 Annex D.

4 Spacing factor reduction in shear applicable when $c_a < 3*h_{ef}$. f_{AV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{AV} = f_{AN}$.

5 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, $c_a < 3*h_{ef}$. If $c_a \geq 3*h_{ef}$, then $f_{HV} = 1.0$.

Hilti HIT-HY 100 adhesive with Hilti HAS threaded rod

HAS



HIT-V

Table 53 — Hilti HIT-HY 100 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 A23.3-14
				3/8	1/2	5/8	3/4	7/8	1	1-1/4	
Anchor O.D.		d_0	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	
Min. concrete thickness [2]		h_{min}	mm	h_{ef} + 30		h_{ef} + 2d0					
Critical edge distance		c_{ac}	-	See ESR-3187, section 4.1.10							
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)	615 (4.2)	670 (4.6)	725 (5.0)	775 (5.3)	780 (5.4)	790 (5.4)	- (-)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7]	τ_{uncr}	psi (MPa)	1,490 (10.3)	1,490 (10.3)	1,490 (10.3)	1,490 (10.3)	1,390 (9.6)	1,270 (8.9)	1,030 (7.1)	D.6.5.2
Temp. range B [6]	Characteristic bond stress in cracked concrete [7]	τ_{cr}	psi (MPa)	565 (3.9)	620 (4.3)	665 (4.6)	715 (4.9)	720 (5.0)	725 (5.0)	- (-)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7]	τ_{uncr}	psi (MPa)	1,450 (10.0)	1,450 (10.0)	1,450 (10.0)	1,385 (9.6)	1,275 (8.8)	1,170 (8.1)	950 (6.6)	D.6.5.2
Temp. range C [6]	Characteristic bond stress in cracked concrete [7]	τ_{cr}	psi (MPa)	440 (3.0)	480 (3.3)	520 (3.5)	555 (3.8)	560 (3.9)	565 (3.9)	- (-)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7]	τ_{uncr}	psi (MPa)	1,250 (8.6)	1,250 (8.6)	1,165 (8.0)	1,080 (7.4)	995 (6.9)	910 (6.3)	740 (5.1)	D.6.5.2
Reduction for seismic tension		$\alpha_{N,seis}$	-	1.00							
Permissible installation conditions	Resistance modification factor tension & shear, bond failure dry concrete	Anchor category	-	1						2	D.5.3 (c)
		R_{dry}	-	1.00						0.85	
	Resistance modification factor tension & shear, bond 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-3574, dated March, 2018, table 8 and 9, and converted for use with CSA A23.3-14 Annex D.
2 See figure at the beginning of the threaded rod section.
3 Minimum edge distance may be reduced to 45mm ≤ c_{ai} < 5d provided τ_{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 = 210°F (99°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: $(f'_c / 17.2)^{0.1}$].

Table 54 — Hilti HIT-HY 100 adhesive factored resistance with concrete / bond failure for threaded rod in uncracked concrete [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension — N_r				Shear — V_r			
		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)	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)	1,165 (5.2)	1,190 (5.3)	1,210 (5.4)	1,245 (5.5)	1,165 (5.2)	1,190 (5.3)	1,210 (5.4)	1,245 (5.5)
	3-3/8 (86)	1,655 (7.4)	1,690 (7.5)	1,720 (7.7)	1,770 (7.9)	3,305 (14.7)	3,380 (15.0)	3,445 (15.3)	3,545 (15.8)
	4-1/2 (114)	2,205 (9.8)	2,255 (10.0)	2,295 (10.2)	2,365 (10.5)	4,410 (19.6)	4,510 (20.1)	4,590 (20.4)	4,725 (21.0)
	7-1/2 (191)	3,675 (16.3)	3,755 (16.7)	3,825 (17.0)	3,940 (17.5)	7,350 (32.7)	7,515 (33.4)	7,650 (34.0)	7,875 (35.0)
1/2	2-3/4 (70)	1,910 (8.5)	1,955 (8.7)	1,990 (8.8)	2,045 (9.1)	3,820 (17.0)	3,905 (17.4)	3,980 (17.7)	4,095 (18.2)
	4-1/2 (114)	3,125 (13.9)	3,195 (14.2)	3,255 (14.5)	3,350 (14.9)	6,250 (27.8)	6,395 (28.4)	6,510 (29.0)	6,700 (29.8)
	6 (152)	4,170 (18.5)	4,260 (19.0)	4,340 (19.3)	4,465 (19.9)	8,335 (37.1)	8,525 (37.9)	8,680 (38.6)	8,935 (39.7)
	10 (254)	6,945 (30.9)	7,105 (31.6)	7,235 (32.2)	7,445 (33.1)	13,895 (61.8)	14,205 (63.2)	14,470 (64.4)	14,890 (66.2)
5/8	3-1/8 (79)	2,935 (13.1)	3,005 (13.4)	3,060 (13.6)	3,145 (14.0)	5,875 (26.1)	6,005 (26.7)	6,115 (27.2)	6,295 (28.0)
	5-5/8 (143)	5,285 (23.5)	5,405 (24.0)	5,505 (24.5)	5,665 (25.2)	10,570 (47.0)	10,810 (48.1)	11,010 (49.0)	11,330 (50.4)
	7-1/2 (191)	7,045 (31.3)	7,205 (32.1)	7,340 (32.6)	7,555 (33.6)	14,095 (62.7)	14,410 (64.1)	14,675 (65.3)	15,105 (67.2)
	12-1/2 (318)	11,745 (52.2)	12,010 (53.4)	12,230 (54.4)	12,590 (56.0)	23,490 (104.5)	24,020 (106.8)	24,460 (108.8)	25,175 (112.0)
3/4	3-1/2 (89)	5,480 (24.4)	6,125 (27.2)	6,710 (29.8)	7,745 (34.5)	10,955 (48.7)	12,250 (54.5)	13,420 (59.7)	15,495 (68.9)
	6-3/4 (171)	14,670 (65.3)	15,995 (71.1)	16,290 (72.5)	16,765 (74.6)	29,340 (130.5)	31,990 (142.3)	32,580 (144.9)	33,530 (149.1)
	9 (229)	20,855 (92.8)	21,325 (94.9)	21,720 (96.6)	22,350 (99.4)	41,710 (185.5)	42,650 (189.7)	43,435 (193.2)	44,705 (198.9)
	15 (381)	34,760 (154.6)	35,545 (158.1)	36,195 (161.0)	37,255 (165.7)	69,520 (309.2)	71,085 (316.2)	72,395 (322.0)	74,510 (331.4)
7/8	3-1/2 (89)	5,480 (24.4)	6,125 (27.2)	6,710 (29.8)	7,745 (34.5)	10,955 (48.7)	12,250 (54.5)	13,420 (59.7)	15,495 (68.9)
	7-7/8 (200)	18,485 (82.2)	20,310 (90.3)	20,685 (92.0)	21,285 (94.7)	36,975 (164.5)	40,620 (180.7)	41,365 (184.0)	42,575 (189.4)
	10-1/2 (267)	26,480 (117.8)	27,080 (120.5)	27,575 (122.7)	28,380 (126.2)	52,965 (235.6)	54,160 (240.9)	55,155 (245.3)	56,765 (252.5)
	17-1/2 (445)	44,135 (196.3)	45,130 (200.8)	45,960 (204.4)	47,305 (210.4)	88,270 (392.6)	90,265 (401.5)	91,925 (408.9)	94,605 (420.8)
1	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)
	9 (229)	22,585 (100.5)	24,235 (107.8)	24,680 (109.8)	25,405 (113.0)	45,175 (200.9)	48,475 (215.6)	49,365 (219.6)	50,805 (226.0)
	12 (305)	31,600 (140.6)	32,315 (143.7)	32,910 (146.4)	33,870 (150.7)	63,205 (281.1)	64,630 (287.5)	65,820 (292.8)	67,740 (301.3)
	20 (508)	52,670 (234.3)	53,860 (239.6)	54,850 (244.0)	56,450 (251.1)	105,340 (468.6)	107,715 (479.1)	109,700 (488.0)	112,900 (502.2)
1-1/4	5 (127)	9,355 (41.6)	10,455 (46.5)	11,455 (51.0)	13,225 (58.8)	18,705 (83.2)	20,915 (93.0)	22,910 (101.9)	26,455 (117.7)
	11-1/4 (286)	30,035 (133.6)	30,715 (136.6)	31,280 (139.1)	32,190 (143.2)	60,070 (267.2)	61,425 (273.2)	62,555 (278.3)	64,380 (286.4)
	15 (381)	40,045 (178.1)	40,950 (182.2)	41,705 (185.5)	42,920 (190.9)	80,095 (356.3)	81,900 (364.3)	83,410 (371.0)	85,840 (381.8)
	25 (635)	66,745 (296.9)	68,250 (303.6)	69,505 (309.2)	71,535 (318.2)	133,490 (593.8)	136,500 (607.2)	139,015 (618.4)	143,070 (636.4)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) 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 23-35 as necessary. Compare to the steel values in table 56. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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.

Table 55 — Hilti HIT-HY 100 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 (2,900 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)	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)	1,135 (5.1)	1,160 (5.2)	1,185 (5.3)	1,215 (5.4)	1,135 (5.1)	1,160 (5.2)	1,185 (5.3)	1,215 (5.4)
	3-3/8 (86)	1,615 (7.2)	1,650 (7.3)	1,680 (7.5)	1,730 (7.7)	3,230 (14.4)	3,300 (14.7)	3,360 (15.0)	3,460 (15.4)
	4-1/2 (114)	2,150 (9.6)	2,200 (9.8)	2,240 (10.0)	2,305 (10.3)	4,305 (19.1)	4,400 (19.6)	4,480 (19.9)	4,615 (20.5)
	7-1/2 (191)	3,585 (16.0)	3,670 (16.3)	3,735 (16.6)	3,845 (17.1)	7,175 (31.9)	7,335 (32.6)	7,470 (33.2)	7,690 (34.2)
1/2	2-3/4 (70)	1,910 (8.5)	1,955 (8.7)	1,990 (8.8)	2,045 (9.1)	3,820 (17.0)	3,905 (17.4)	3,980 (17.7)	4,095 (18.2)
	4-1/2 (114)	3,125 (13.9)	3,195 (14.2)	3,255 (14.5)	3,350 (14.9)	6,250 (27.8)	6,395 (28.4)	6,510 (29.0)	6,700 (29.8)
	6 (152)	4,170 (18.5)	4,260 (19.0)	4,340 (19.3)	4,465 (19.9)	8,335 (37.1)	8,525 (37.9)	8,680 (38.6)	8,935 (39.7)
	10 (254)	6,945 (30.9)	7,105 (31.6)	7,235 (32.2)	7,445 (33.1)	13,895 (61.8)	14,205 (63.2)	14,470 (64.4)	14,890 (66.2)
5/8	3-1/8 (79)	2,935 (13.1)	3,005 (13.4)	3,060 (13.6)	3,145 (14.0)	5,875 (26.1)	6,005 (26.7)	6,115 (27.2)	6,295 (28.0)
	5-5/8 (143)	5,285 (23.5)	5,405 (24.0)	5,505 (24.5)	5,665 (25.2)	10,570 (47.0)	10,810 (48.1)	11,010 (49.0)	11,330 (50.4)
	7-1/2 (191)	7,045 (31.3)	7,205 (32.1)	7,340 (32.6)	7,555 (33.6)	14,095 (62.7)	14,410 (64.1)	14,675 (65.3)	15,105 (67.2)
	12-1/2 (318)	11,745 (52.2)	12,010 (53.4)	12,230 (54.4)	12,590 (56.0)	23,490 (104.5)	24,020 (106.8)	24,460 (108.8)	25,175 (112.0)
3/4	3-1/2 (89)	3,835 (17.1)	4,285 (19.1)	4,395 (19.5)	4,520 (20.1)	7,670 (34.1)	8,575 (38.1)	8,785 (39.1)	9,045 (40.2)
	6-3/4 (171)	8,135 (36.2)	8,320 (37.0)	8,470 (37.7)	8,720 (38.8)	16,270 (72.4)	16,640 (74.0)	16,945 (75.4)	17,440 (77.6)
	9 (229)	10,850 (48.3)	11,090 (49.3)	11,295 (50.2)	11,625 (51.7)	21,695 (96.5)	22,185 (98.7)	22,595 (100.5)	23,250 (103.4)
	15 (381)	18,080 (80.4)	18,485 (82.2)	18,825 (83.7)	19,375 (86.2)	36,160 (160.8)	36,975 (164.5)	37,655 (167.5)	38,755 (172.4)
7/8	3-1/2 (89)	3,835 (17.1)	4,285 (19.1)	4,695 (20.9)	5,310 (23.6)	7,670 (34.1)	8,575 (38.1)	9,390 (41.8)	10,620 (47.2)
	7-7/8 (200)	11,145 (49.6)	11,395 (50.7)	11,605 (51.6)	11,945 (53.1)	22,290 (99.2)	22,795 (101.4)	23,210 (103.3)	23,890 (106.3)
	10-1/2 (267)	14,860 (66.1)	15,195 (67.6)	15,475 (68.8)	15,925 (70.8)	29,720 (132.2)	30,390 (135.2)	30,950 (137.7)	31,855 (141.7)
	17-1/2 (445)	24,765 (110.2)	25,325 (112.7)	25,790 (114.7)	26,545 (118.1)	49,535 (220.3)	50,650 (225.3)	51,585 (229.5)	53,090 (236.1)
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)	14,745 (65.6)	15,075 (67.1)	15,355 (68.3)	15,800 (70.3)	29,485 (131.2)	30,150 (134.1)	30,705 (136.6)	31,605 (140.6)
	12 (305)	19,660 (87.4)	20,100 (89.4)	20,470 (91.1)	21,070 (93.7)	39,315 (174.9)	40,205 (178.8)	40,945 (182.1)	42,140 (187.4)
	20 (508)	32,765 (145.7)	33,500 (149.0)	34,120 (151.8)	35,115 (156.2)	65,525 (291.5)	67,005 (298.1)	68,240 (303.5)	70,230 (312.4)

1 See Section 3.1.8 (2017 PTG) for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) 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 23-35 as necessary. Compare to the steel values in table 56. 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 (2017 PTG).
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 α_{seis} = 0.75
See section 3.1.8.7 (2017 PTG) for additional information on seismic applications.

Table 56 — Steel factored resistance for Hilti HIT-V and HAS threaded rods according to CSA A23.3 Annex D

Nominal anchor diameter in.	HIT-V ASTM A307 Grade A [4]			HAS-E ISO 898 Class 5.8 [4]			HAS-E-B and HAS-E-B HDG ASTM A193 B7 and ASTM F 1554 Gr. 105 [5]		
	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)
3/8	2,765 (12.3)	1,540 (6.9)	1,080 (4.8)	3,345 (14.9)	1,860 (8.3)	1,300 (5.8)	6,570 (29.2)	3,695 (16.4)	2,585 (11.5)
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)	12,035 (53.5)	6,765 (30.1)	4,735 (21.1)
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)	19,160 (85.2)	10,780 (48.0)	7,545 (33.6)
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)	28,365 (126.2)	15,955 (71.0)	11,170 (49.7)
7/8	- -	- -	- -	19,915 (88.6)	11,095 (49.4)	7,765 (34.5)	39,150 (174.1)	22,020 (97.9)	15,415 (68.6)
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)	51,360 (228.5)	28,890 (128.5)	20,225 (90.0)
1-1/4	- -	- -	- -	41,805 (186.0)	23,290 (103.6)	16,305 (72.5)	82,175 (365.5)	46,220 (205.6)	32,355 (143.9)

1 Tensile = $A_{se,N}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Eq. D.2.
2 Shear = $A_{se,V}\ \phi_s$ 0.60 f_{uta} R as noted in CSA A23.3-14 Eq. D.31.
3 Seismic Shear = $\alpha_{V,seis}\ V_{sar}$: Reduction factor for seismic shear only. See CSA A23.3 Annex D for additional information on seismic applications.
4 HIT-V and HAS-E 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.
5 HAS-E-B and HAS-E-B HDG rods are considered ductile steel elements.

Table 56 (Continued) — Steel factored resistance for Hilti HAS threaded rods for use with CSA A23.3 Annex D

Nominal anchor diameter in.	HAS-V / HAS-V HDG ASTM F1554 Gr. 36 [4,6]			HAS-E / HAS-E HDG ASTM F1554 Gr. 55 [4,6]			HAS-B and HAS-B HDG ASTM A193 B7 and ASTM F 1554 Gr. 105 [4,6]			HAS-R Stainless Steel ASTM F593 (3/8-in to 1-in) [5] ASTM A193 (1-1/8-in to 2-in) [4]		
	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)	Tensile[1] N_{sar} lb (kN)	Shear[2] V_{sar} lb (kN)	Seismic Shear[3] $V_{sar,eq}$ lb (kN)
3/8	3,055 (13.6)	1,720 (7.7)	1,030 (4.6)	3,955 (17.6)	2,225 (9.9)	1,560 (6.9)	6,570 (29.2)	3,695 (16.4)	2,585 (11.5)	4,610 (20.5)	2,570 (11.4)	1,800 (8.0)
1/2	5,595 (24.9)	3,150 (14.0)	1,890 (8.4)	7,240 (32.2)	4,070 (18.1)	2,850 (12.7)	12,035 (53.5)	6,765 (30.1)	4,735 (21.1)	8,445 (37.6)	4,705 (20.9)	3,295 (14.7)
5/8	8,915 (39.7)	5,015 (22.3)	3,010 (13.4)	11,525 (51.3)	6,485 (28.8)	4,540 (20.2)	19,160 (85.2)	10,780 (48.0)	7,545 (33.6)	13,445 (59.8)	7,490 (33.3)	5,245 (23.3)
3/4	13,190 (58.7)	7,420 (33.0)	4,450 (19.8)	17,060 (75.9)	9,600 (42.7)	6,720 (29.9)	28,365 (126.2)	15,955 (71.0)	11,170 (49.7)	16,920 (75.3)	9,425 (41.9)	6,600 (29.4)
7/8	18,210 (81.0)	10,245 (45.6)	6,145 (27.3)	23,550 (104.8)	13,245 (58.9)	9,270 (41.2)	39,150 (174.1)	22,020 (97.9)	15,415 (68.6)	23,350 (103.9)	13,010 (57.9)	9,105 (40.5)
1	23,890 (106.3)	13,440 (59.8)	8,065 (35.9)	30,890 (137.4)	17,380 (77.3)	12,165 (54.1)	51,360 (228.5)	28,890 (128.5)	20,225 (90.0)	30,635 (136.3)	17,065 (75.9)	11,945 (53.1)
1-1/4	38,225 (170.0)	21,500 (95.6)	12,900 (57.4)	49,425 (219.9)	27,800 (123.7)	19,460 (86.6)	82,175 (365.5)	46,220 (205.6)	32,355 (143.9)	37,565 (167.1)	21,130 (94.0)	12,680 (56.4)

1 Tensile = $A_{se,N}\ \phi_s\ f_{uta}$ R as noted in CSA A23.3-14 Eq. D.2.
2 Shear = $A_{se,V}\ \phi_s$ 0.60 f_{uta} R as noted in CSA A23.3-14 Eq. D.31.
3 Seismic Shear = $\alpha_{V,seis}\ V_{sar}$: Reduction factor for seismic shear only. See CSA A23.3 Annex D for additional information on seismic applications.
4 HAS-V, HAS-E (3/8-in to 1-1/4-in), HAS-B, and HAS-R (Class 1; 1-1/8-in to 1-1/4-in) threaded rods are considered ductile steel elements (included HDG rods).
5 HAS-R (CW1 and CW2; 3/8-in to 1-in) threaded rods are considered brittle steel elements.
6 3/8-inch dia. threaded rods are not included in the ASTM F1554 standard. Hilti 3/8-inch dia. HAS-V, HAS-E, and HAS-E-B (incl. HDG) threaded rods meet the chemical composition and mechanical property requirements of ASTM F1554.

Hilti HIT-HY 100 adhesive with Hilti HIS-N and HIS-RN internally threaded insert

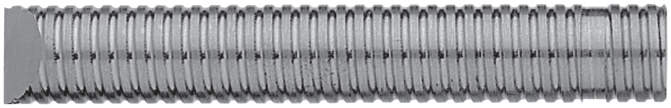


Table 57 — Hilti HIT-HY 100 design information with Hilti HIS-N and HIS-RN internally threaded inserts in hammer drilled holes in accordance with CSA A23.3-14 Annex D [1]

Design parameter		Symbol	Units	Nominal rod diameter (in.)				Ref A23.3-14
				3/8	1/2	5/8	3/4	
HIS insert outside diameter		D	mm	16.5	20.5	25.4	27.6	
Effective embedment [2]		h_{ef}	mm	110	125	170	205	
Min. concrete thickness [2]		h_{min}	mm	150	170	230	270	
Critical edge distance		c_{ac}	-	See ESR-3574, 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 conc. breakout resistance, uncracked concrete		$k_{c,uncr}$ [3]	-	10				D.6.2.2
Concrete material resistance factor		f_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 bond stress in cracked concrete [6]	τ_{uncr}	psi (MPa)	1,375 (9.5)	1,270 (8.8)	1,100 (7.6)	1,030 (7.1)	D.6.5.2
Temp. range B [5]	Characteristic bond stress in cracked concrete [6]	τ_{uncr}	psi (MPa)	1,270 (8.8)	1,170 (8.1)	1,015 (7.0)	945 (6.5)	D.6.5.2
Temp. range C [5]	Characteristic bond stress in cracked concrete [6]	τ_{uncr}	psi (MPa)	990 (6.8)	910 (6.3)	790 (5.4)	740 (5.1)	D.6.5.2
Permissible installation conditions	Resistance modification factor tension & shear, bond failure dry concrete and water-saturated concrete	Anchor category	-	1			2	D.5.3 (c)
		R_{dry}		1.00			0.85	
	Resistance modification factor tension & shear, bond 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-3574, dated March, 2018, table 16 and 17, and converted for use with CSA A23.3-14 Annex D.
2 See figure at the beginning of the HIS-N section.
3 For all design cases, $\psi_{c,N}$ = 1.0. The appropriate coefficient for breakout resistance for 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 = 210°F (99°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 58 — Hilti HIT-HY 100 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]

Thread size	Effective Embedment Depth in. (mm)	Tension — N_n				Shear — V_n			
		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)	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 (110)	7,540 (33.5)	7,905 (35.2)	7,905 (35.2)	8,380 (37.3)	15,080 (67.1)	15,810 (70.3)	15,810 (70.3)	16,760 (74.6)
1/2-13 UNC	5 (125)	9,135 (40.6)	10,210 (45.4)	10,340 (46.0)	10,960 (48.8)	18,265 (81.3)	20,420 (90.8)	20,680 (92.0)	21,920 (97.5)
5/8-11 UNC	6-3/4 (170)	14,485 (64.4)	15,040 (66.9)	15,040 (66.9)	15,940 (70.9)	28,970 (128.9)	30,075 (133.8)	30,075 (133.8)	31,880 (141.8)
3/4-10 UNC	8-1/8 (205)	15,730 (70.0)	15,730 (70.0)	15,730 (70.0)	16,675 (74.2)	31,465 (140.0)	31,465 (140.0)	31,465 (140.0)	33,350 (148.4)

1 Table values determined from calculations according to CSA A23.3-14 Annex D. See Section 2.4 for explanation on development of load values.
2 See Section 3.1.8.6 (2017 PTG) 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 table 38 as necessary. Compare to the steel values in table 59. The lesser of the values is to be used for the design.
5 Data is for temperature range A: Max. short term temperature = 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 value by 0.92.
For temperature range C: Max. short term temperature = 210°F (99°C), max. long term temperature = 162°F (72°C) multiply above value by 0.71.
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 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 (2017 PTG).
8 Tabular values are for normal weight concrete only. For lightweight concrete multiply factored resistance by λ_a as follows:
For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

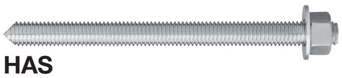
Table 59 — Steel factored resistance for steel bolt / cap screw for Hilti HIS-N and HIS-RN internally threaded inserts [1,2,3]

Thread size	ASTM A 193 B7		ASTM A 193 Grade B8M Stainless Steel	
	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)	Tensile[4] N_{sar} lb (kN)	Shear[5] V_{sar} lb (kN)
3/8-16 UNC	5,765 (25.6)	3,215 (14.3)	5,070 (22.6)	2,825 (12.6)
1/2-13 UNC	9,635 (42.9)	5,880 (26.2)	9,290 (41.3)	5,175 (23.0)
5/8-11 UNC	16,020 (71.3)	9,365 (41.7)	14,790 (65.8)	8,240 (36.7)
3/4-10 UNC	16,280 (72.4)	13,860 (61.7)	21,895 (97.4)	12,195 (54.2)

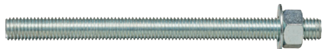
1 See Section 2.4.4 to convert design strength value to ASD value.
2 Hilti HIS-N and HIS-RN inserts with steel bolts are considered brittle steel elements.
3 Table values are the lesser of steel failure in the HIS-N insert or inserted steel bolt.
4 Tensile = $A_{se,N}$ ϕ_s futa R as noted in CSA A23.3-14 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.

DESIGN DATA IN MASONRY

Hilti HIT-HY 100 adhesive in grout-filled CMU with Hilti HAS/HIT V threaded rod



HAS



HIT-V

Hilti HAS/HIT-V threaded rod installation conditions

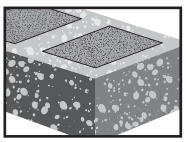
Permissible Base Materials			Permissible Drilling Method		
		Grout-filled concrete masonry construction			Rotary only drilling with carbide tipped drill bit

Table 60 — Allowable tension loads for threaded rods installed with HIT-HY 100 adhesive in the face of grout-filled concrete masonry construction [1,2,3,4,5,6,7,8]

Nominal anchor diameter d_0	Embedment depth [9] h_{ef}		Allowable service tension load P_t		Spacing: Critical spacing [10,11] s_{cr}		Spacing: Minimum spacing [10,11] s_{min}		Spacing: Load [10] reduction factor at s_{min}	Edge distance: Criticaledge dist. [10,11] c_{cr}		Edge distance: Minimum edge dist. [10,11] c_{min}		Edge distance: Load [10] reduction factor at c_{min}
in.	in.	(mm)	lb	(kN)	in.	(mm)	in.	(mm)		in.	(mm)	in.	(mm)	
3/8	3-3/8	(86)	950	(4.2)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.93
1/2	4-1/2	(114)	1,265	(5.6)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.83
5/8	5-5/8	(143)	1,850	(8.2)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.74
3/4	6-3/4	(171)	2,440	(10.9)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.65

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

Table 61 — Allowable shear loads for threaded rods installed with HIT-HY 100 adhesive in the face of grout-filled concrete masonry construction [1,2,3,4,5,6,7,8]

Nominal anchor diameter d_0	Embedment depth [9] h_{ef}		Allowable service shear load V_t		Spacing: Critical spacing [10,11] s_{cr}		Spacing: Minimum spacing [10,11] s_{min}		Spacing: Load [10] reduction factor at s_{min}	Edge distance: Criticaledge dist. [10,11] c_{cr}		Edge distance: Minimum edge dist. [10,11] c_{min}		Edge distance: Load [10] reduction factor at c_{min}
in.	in.	(mm)	lb	(kN)	in.	(mm)	in.	(mm)		in.	(mm)	in.	(mm)	
3/8	3-3/8	(86)	1,135	(5.0)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	1.00
1/2	4-1/2	(114)	1,870	(8.3)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.93
5/8	5-5/8	(143)	2,590	(11.5)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.82
3/4	6-3/4	(171)	2,785	(12.4)	8	(203)	4	(102)	0.70	20	(508)	4	(102)	0.79

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

The following footnotes apply to both Tables 60 and 61:

1 Anchors may be installed in any location in the face of the masonry wall (cell, bed joint, or web) as shown in Figure 2, except anchor must not be installed in or within 1 inch of a head joint.
2 Anchors are limited to one per masonry cell. Anchors in adjacent cells may be spaced apart as close as 4 inches as shown in table above.
3 Allowable load values are for use in fully-grouted masonry construction complying with Section 4.2.4 of ER-547.
4 Concrete masonry thickness must be minimum nominally 8-inch thick.
5 The tabulated allowable loads have been calculated based on a safety factor of 5.0.
6 Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 63 and 64.
7 Allowable loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.
8 When using the basic load combinations in accordance with IBC Section 1605.3.1, tabulated allowable loads must not be increased for seismic or wind loading. When using the alternative basic load combinations in the 2009 or 2006 IBC Section 1605.3.2 that include seismic or wind loads, tabulated allowable loads may be adjusted in accordance with Section 3.2.2.1 of ER-547 and Table 2.
9 Embedment depth is measured from the outside face of the masonry wall.
10 Load values for anchors installed at less than critical spacing (s_{cr}) and critical edge distance (c_{cr}) must be multiplied by the appropriate load reduction factor based on actual edge distance (c) or spacing (s). Linear interpolation of load values between minimum spacing (s_{min}) and s_{cr} and between minimum edge distance (c_{min}) and c_{cr} is permitted. Load reduction factors are multiplicative; both spacing and edge distance load reduction factors must be considered.
11 See Figure 2 of for an illustration of the critical and minimum edge distances.

Table 62 — Allowable tension and shear loads for threaded rods installed with HIT-HY 100 adhesive in the top of grout-filled concrete masonry construction [1,2,3,4,5,6,7,8,9]

Nominal anchor diameter	Embedment depth [10]		Minimum edge distance		Allowable service tension load		Allowable service shear load			
							Load applied perpendicular to edge		Load applied parallel to edge	
d_0	h_{ef}		c_{min}		P_t		$V_{t,\perp}$		$V_{t,\parallel}$	
in.	in.	(mm)	lb	(kN)	lb	(kN)	in.	(mm)	in.	(mm)
1/2	4-1/2	(114)	1-3/4	(44)	1,095	(4.9)	295	(1.3)	815	(3.6)
5/8	5-5/8	(143)	1-3/4	(44)	1,240	(5.5)	400	(1.8)	965	(4.3)

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

1 Loads in this table are for threaded rods in the top of grout-filled masonry construction at a minimum edge distance shown in this table. Anchors must not be installed in or within 1 inch of a head joint. Capacity of attached sill plate or other material to resist loads in this table must comply with the applicable code.
2 Anchors are limited to one per masonry cell. Load values are based on an anchor spacing of 8 inches. Anchors in adjacent cells may be spaced apart as close as 4 inches with a load reduction of 30%. For anchors in adjacent cells spaced apart between 4 inches (s_{min}) and 8 inches (s_{cr}) use linear interpolation. See figure 3.
3 End distance to end of wall must be equal to or greater than 2.0 times the anchor embedment depth.
4 Allowable load values are for use in fully-grouted masonry construction complying with Section 4.2.4 of ER-547.
5 Concrete masonry thickness must be minimum nominally 8-inch thick.
6 The tabulated allowable loads have been calculated based on a safety factor of 5.0.
7 Allowable loads must be the lesser of the adjusted masonry or bond values tabulated above and the steel values given in Table 63-64.
8 Allowable loads must be adjusted for increased base material temperatures in accordance with Figure 1, as applicable.
9 When using the basic load combinations in accordance with IBC Section 1605.3.1, tabulated allowable loads must not be increased for seismic or wind loading. When using the alternative basic load combinations in the 2009 or 2006 IBC Section 1605.3.2 that include seismic or wind loads, tabulated allowable loads may be adjusted in accordance with Section 3.2.2.1 and Table 2 of this report.
10 Embedment depth is measured from the top surface of the masonry wall.

Figure 1 — Influence of grout-filled CMU base-material temperature on allowable tension and shear loads for HIT-HY 100

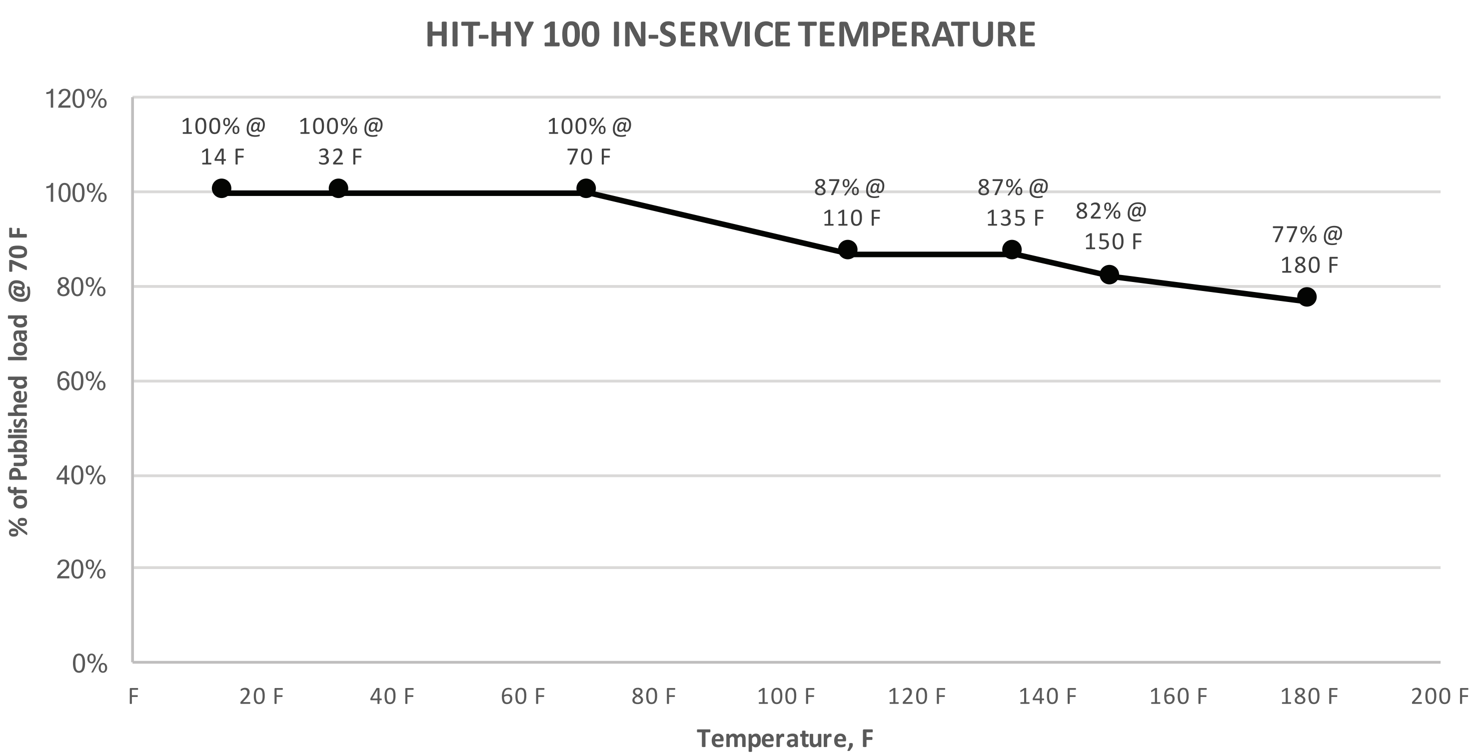


Table 63 — Specifications and physical properties of common carbon and stainless steel threaded rod materials

Description	Specification	Minimum specified yield strength f_y ksi	(Mpa)	Minimum specified ultimate strength f_u ksi	(Mpa)	Nut specification
Standard threaded rod [1]	ASTM A307 Grade A	37.5	(259)	60.0	(414)	SAE J995 Grade 5
	ISO 898-1 Class 5.8	58.0	(400)	72.5	(500)	SAE J995 Grade 5
	ASTM F1554 Gr. 36	36.0	(248)	58.0	(400)	ASTM A194 or ASTM A563
	ASTM F1554 Gr. 55	55.0	(379)	75.0	(517)	
High strength rod [1]	ASTM F1554 Gr. 105	105.0	(724)	125.0	(862)	ASTM A194 or ASTM A563
	ASTM A193 B7	105.0	(724)	125.0	(862)	
Stainless steel rod AISI 304 / 316	3/8-in. to 5/8-in. ASTM F593 CW1	65.0	(448)	100.0	(690)	ASTM F594
	3/4-in. ASTM F593 CW2	45.0	(310)	85.0	(586)	

For SI: 1 ksi = 6.89 MPa.

1 The rods are normally zinc-coated. For exterior use or damp applications, stainless steel or hot-dipped galvanized carbon steel rods with a zinc coating complying with ASTM A153 should be considered.

Table 64 — Allowable tension and shear loads for threaded rods based on steel strength [1]

Nominal anchor diameter in.	ASTM A307 Grade A Tensile lb (kN)	ASTM A307 Grade A Shear lb (kN)	ISO 898 Class 5.8 Tensile lb (kN)	ISO 898 Class 5.8 Shear lb (kN)	ASTM F1554 Gr. 36 [2] Tensile lb (kN)	ASTM F1554 Gr. 36 [2] Shear lb (kN)	ASTM F1554 Gr. 55 [2] Tensile lb (kN)	ASTM F1554 Gr. 55 [2] Shear lb (kN)	ASTM A193 B7 and ASTM F1554 Gr. 105[2] Tensile lb (kN)	ASTM A193 B7 and ASTM F1554 Gr. 105[2] Shear lb (kN)	AISI 304/316 SS ASTM F 593 CW1 and CW2 Tensile lb (kN)	AISI 304/316 SS ASTM F 593 CW1 and CW2 Shear lb (kN)
3/8	2,185 (9.7)	1,125 (5.0)	2,640 (11.7)	1,360 (6.0)	2,115 (9.4)	1,090 (4.8)	2,730 (12.1)	1,410 (6.3)	4,555 (20.3)	2,345 (10.4)	3,645 (16.2)	1,875 (8.3)
1/2	3,885 (17.3)	2,000 (8.9)	4,695 (20.9)	2,420 (10.8)	3,755 (16.7)	1,935 (8.6)	4,860 (21.6)	2,505 (11.1)	8,095 (36.0)	4,170 (18.5)	6,480 (28.8)	3,335 (14.8)
5/8	6,075 (27.0)	3,130 (13.9)	7,340 (32.6)	3,780 (16.8)	5,870 (26.1)	3,025 (13.5)	7,595 (33.8)	3,910 (17.4)	12,655 (56.3)	6,520 (29.0)	10,125 (45.0)	5,215 (23.2)
3/4	8,750 (38.9)	4,505 (20.0)	10,570 (47.0)	5,445 (24.2)	8,455 (37.6)	4,355 (19.4)	10,935 (48.6)	5,635 (25.1)	18,225 (81.1)	9,390 (41.8)	12,390 (55.1)	6,385 (28.4)

For SI: 1 lbf = 4.45 N.

1 Steel strength as defined in AISC Manual of Steel Construction (ASD):
Tensile = 0.33 x F_u x Nominal Area
Shear = 0.17 x F_u x Nominal Area

2 3/8-inch dia. threaded rods are not included in the ASTM F1554 standard. Values are provided in the table for illustration purposes only based on the nominal area of the 3/8-inch rod and ASTM F1554 ultimate steel strength.

Figure 2 — Allowable anchor installation locations in the face of grout-filled masonry construction

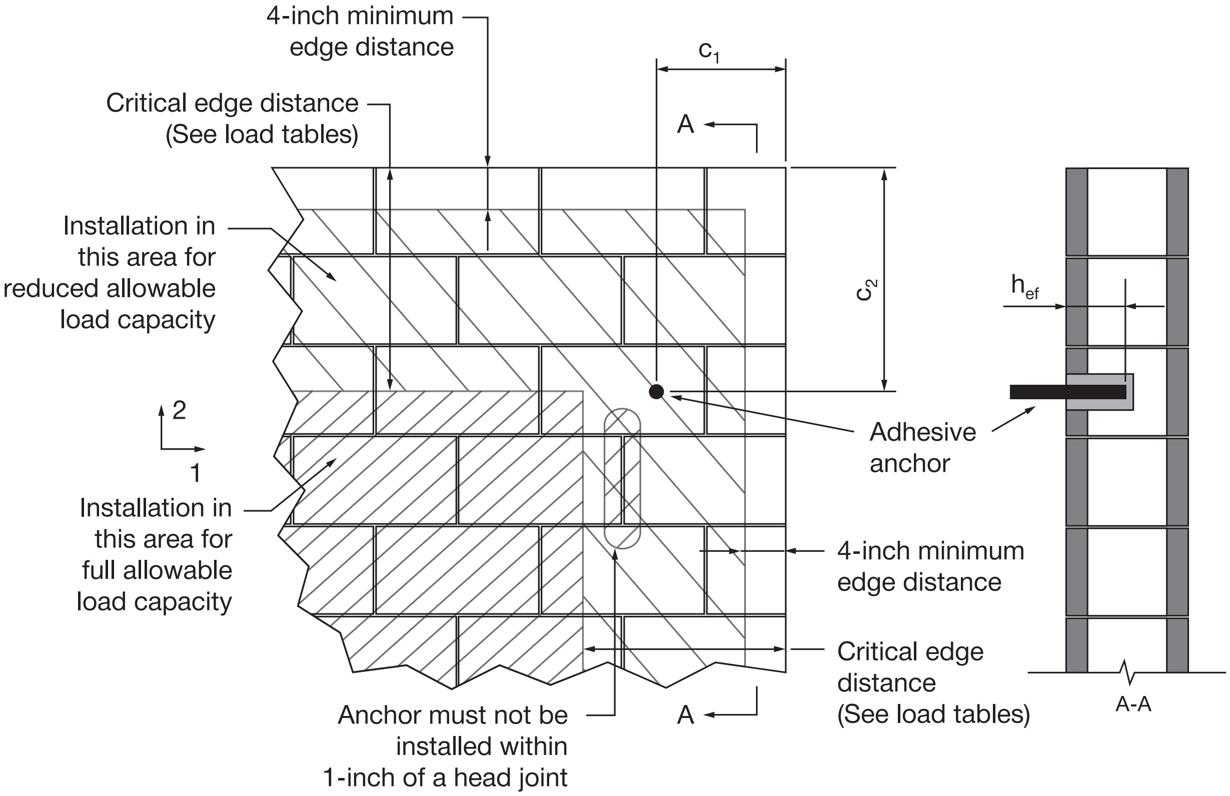
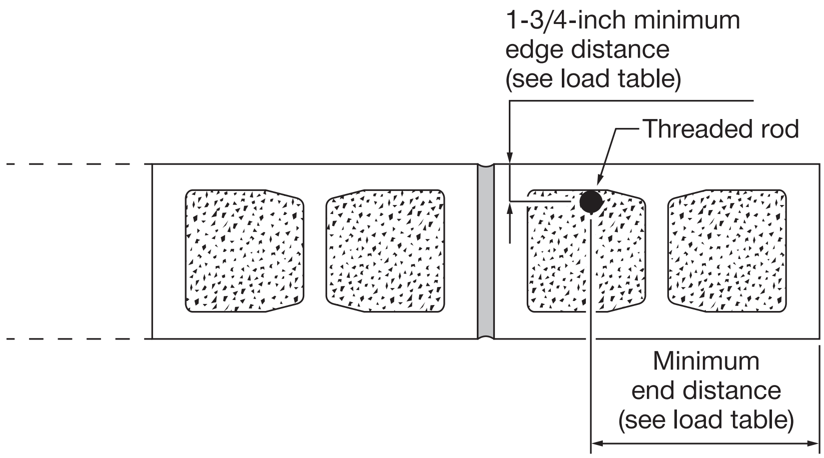


Figure 3 — Allowable anchor installation locations in the top of grout-filled masonry construction



MATERIAL SPECIFICATIONS

Material specifications for Hilti HAS threaded rods, Hilti HIT-Z anchor rods, and Hilti HIS-N inserts are listed in section 3.2.8 (PTG Vol 2 Ed. 17).

Table 65 — Material properties for cured HIT-HY 100 adhesive

Compressive Strength ASTM C579	> 50 MPa	> 7252 psi
Flexural Strength ASTM C 580	> 20 MPa	> 2900 psi
Modulus of Elasticity ASTM C 307	> 3500 MPa	> 5.07 x 10^5 psi
Water Asorption ASTM D 570	< 2%	
Electrical Resistance DIN/VDE 0303T3	~ 2 x 10^{11} OHM/cm	~ 5.1 x 10^{11} OHM/in.

For material specifications for anchor rods and inserts, please refer to section 3.2.8 of the Hilti North American Technical Guide Volume 2: Anchor Fastening Technical Guide

Table 67 — Gel Time [1,2]

Base material temperature		HIT-HY 100
°F	°C	
14	-10	3 h
23	-4	40 min
32	1	20 min
41	6	8 min
51	11	8 min
69	21	5 min
87	31	2 min

Table 68 — Full Cure Time [1,2]

Base material temperature		HIT-HY 100
°F	°C	
14	-10	12 h
23	-4	4 h
32	1	2 h
41	6	60 min
51	11	60 min
69	21	30 min
87	31	30 min

1 Product temperatures must be maintained above 41°F (5°C) prior to installation.
2 Gel times and full cure times are approximate.

Table 66 — Resistance of HIT- HY 100 to chemicals

Chemical		Behavior
Sulphuric acid	conc.	-
	30%	•
	10%	+
Hydrochloric acid	conc.	•
	10%	+
Nitric acid	conc.	-
	10%	•
Phosphoric acid	conc.	+
	10%	+
Acetic acid	conc.	•
	10%	+
Formic acid	conc.	-
	10%	•
Lactic acid	conc.	+
	10%	+
Citric acid	10%	+
Sodium Hydroxide (Caustic soda)	40%	•
	20%	+
	5%	+
Amonia	conc.	•
	5%	+
Soda solution	10%	+
Common salt solution	10%	+
Chlorinated lime solution	10%	+
Sodium hypochlorite	2%	+
Hydrogen peroxide	10%	+
Carbolic acid solution	10%	-
Ethanol		-
Sea water		+
Glycol		+
Acetone		-
Carbon tetrachloride		-
Tolune		+
Petrol/Gasoline		•
Machine Oil		•
Diesel oil		•

Key: - non resistant + resistant • limited resistance

INSTALLATION INSTRUCTIONS

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded online at www.hilti.com (US), or 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.

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The data contained in this literature was current as of the date of publication. Updates and changes may be made based on later testing. If verification is needed that the data is still current, please contact the Hilti Technical Support Specialists at 1-800-879-8000. All published load values contained in this literature represent the results of testing by Hilti or test organizations. Local base materials were used. Because of variations in materials, on-site testing is necessary to determine performance at any specific site. Laser beams represented by red lines in this publication. Printed in the United States

DBS • 04/18