HILTI

HIT-RE 100 Adhesive anchor system

SETTING THE STANDARD FOR PERFORMANCE AND RELIABILITY.

Hilti. Outperform. Outlast.

HIT-RE 100 Adhesive Anchoring System

The new Hilti HIT-RE 100 adhesive anchoring system is the latest addition to the slow cure adhesive anchor portfolio and designed for solid performance in a wide range of applications. Designed to utilize the existing Hilti dispenser platform and ICC-ES approved for cracked and uncracked concrete, this anchor is the perfect complement to the portfolio for day to day jobsite needs.

Performance

- ICC approved for cracked and uncracked concrete
- Complete anchor system available, including HIT-V and HAS-E
- Easy and accurate dispensing with battery dispenser

Reliability

- Reliable fastenings using the traditional cleaning method (2x2x2)
- Tested with wide range of rod diameters and embedments

Hilti Adhesive Anchors — every job, every application.

RE 500 V3 SAFE**set** → **RE 500 V3** → **RE 100**

HIT-RE 100 adhesive anchoring system

HIT-RE 100 epoxy adhesive

Applications and advantages

- Anchoring light structural steel connections (e.g. steel columns, beams)
- Anchoring secondary steel elements
- Rebar doweling and connecting secondary post-installed rebar
- Substituting misplaced or missing rebar
- ICC approved for cracked and un-cracked concrete
- Tested with a wide range of rod diameters and embedments
- Complete anchor system available, including HIT-V rods, HAS-E, HAS-B, and HAS-R
- Easy and accurate dispensing with battery dispenser
- Use a variety of hole conditions including water-filled holes and underwater

Technical data

Product	high strength two-part epoxy
Base material temperature	41° F to 104° F (5° C to 40° C)
Diameter range	3/8" to 1-1/4"

Listings/Approvals
- ICC-ES (International Code Council) – ESR-3829 for cracked and un-cracked concrete
- COLA (City of Los Angeles) (RR 26027)

Package volume
- Volume of HIT-RE 100 11.1 fl oz/330 ml foil pack is 20.1 in³
- Volume of HIT-RE 100 16.9 fl oz/500 ml foil pack is 30.5 in³
- Volume of HIT-RE 100 47.3 fl oz/1400 ml foil pack is 85.4 in³

Working/Full Cure Time Table (Approximate)

Base Material Temperature			
° F	° C	t_{work}	t_{cure}
41	5	2-1/2 h	≥72 h
50	10	2 h	≥48 h
59	15	1-1/2 h	≥24 h
68	20	30 min	≥12 h
86	30	20 min	≥8 h
104	40	12 min	≥4 h

Order Information

Description	Qty of foil packs	Item number
Epoxy adhesive HIT-RE 100 (11.1oz/330ml)	1	2123381
Epoxy adhesive HIT-RE 100 master carton (11.1oz/330ml)	25	3537468
Epoxy adhesive HIT-RE 100 master carton (11.1oz/330ml) + HDM 500	25	3537469
Epoxy adhesive HIT-RE 100 master carton (16.9oz/500ml)	20	2123384
Epoxy adhesive HIT-RE 100 master carton (16.9oz/500ml) + HDM 500	20	3537470
(2) Epoxy adhesive HIT-RE 100 master cartons (16.9oz/500ml) + HDE 500 kit	40	3537471
(5) Epoxy adhesive HIT-RE 100 master cartons (16.9oz/500ml) + HDE 500 kit	100	3537472
Epoxy adhesive HIT-RE 100 (47.3 fl oz/1400 ml)	4	2123387
Epoxy adhesive HIT-RE 100 (47.3 fl oz/1400 ml) pallet + P8000 pneumatic dispenser	64	3537473

Accessories

Description	Item number
Manual dispenser HDM 500	3498241
Compact cordless dispenser HDE 500 + (2) B 18/2.6 Li-ion battery packs + C 4/36-90 100-127V charger + HIT-CB 500 black cartridge + HIT-CR 500 red cartridge + small tool bag	3496606
Industrial cordless dispenser HDE 500 + (2) B 18/5.2 Li-ion battery packs + C 4/36-90 100a-127V charger + HIT-CB 500 black cartridge + HIT-CR 500 red cartridge + small tool bag	3496605
Pneumatic dispenser P8000	373959

HIT-RE 100 adhesive anchoring system

1.0 Product Description

2.0 Technical Data

Listings/Approvals

ICC-ES (International Code Council) ESR-3829

NSF/ANSI Standard 61 Certification for use of HIT-RE 100 in potable water

City of Los Angeles Research Report No. 260__

Independent Code Evaluation

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

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

IBC®/IRC® 2009 (ICC-ES AC308)

IBC®/IRC® 2006 (ICC-ES AC308)

LEED®: Credit 4.1-Low Emitting Materials

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

1.0 Product Description

The Hilti HIT-RE 100 adhesive anchoring system is used to resist static, wind and seismic tension and shear loads in normal-weight concrete having a compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa). It is suitable to be used in cracked and uncracked concrete as defined per ICC-ES, ACI, and CSA.

Hilti HIT-RE 100 adhesive is an injectable two-component epoxy adhesive. The two components are separated by means of a dual-cylinder foil pack attached to a manifold. The two components combine and react when dispensed through a static mixing nozzle attached to the manifold.

Elements that are suitable for use with this system are as follows: threaded steel rods and steel reinforcing bars.

Product Features

- Seismic qualified with ICC-ES Acceptance Criteria AC308 and ACI 355.4
- Use in water-filled holes and underwater up to 165 ft (50 m)
- Mixing tube provides proper mixing, eliminates measuring errors and minimizes waste
- Meets requirements of ASTM C881-14, Type I, II, IV, and V Grade 3, Class A, B, C
- Meets requirements of AASHTO specification M235, Type I, II, IV, and V Grade 3, Class A, B, C

Hilti HIT-RE 100 Adhesive Technical Data Table of Contents

Element Type	 Rebar		 Hilti HAS Threaded Rod
	United States	Canada	
Pages	9 – 20	32 – 45	21 – 31
Tables	1 – 20	39 – 57	21 – 38

Information on Working Time and Cure Time on page 46
Information on Resistance of Cured Hilti HIT-RE 100 to Chemicals on page 46

2.0 Technical Data

2.1 Testing and Product Evaluation

Hilti HIT-RE 100 has been tested in accordance with ICC Evaluation Services (ICC-ES) Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements (AC308) which incorporates requirements in ACI 355.4-11.

Hilti has had Hilti HIT-RE 100 evaluated according to AC308 and has received ESR-3829 from ICC-ES.

2.2 Adhesive Anchor Design Codes

For post-installed and cast-in anchor systems in the United States, design calculations illustrated in this supplement are performed in accordance with ACI 318-14 Chapter 17.

For post-installed and cast-in anchor systems in Canada, design calculations illustrated in this supplement are performed in accordance with CSA A23.3-14 Annex D.

2.3 Design of Hilti HIT-RE 100 Adhesive Anchor System

2.3.1 Using technical data in ESR-3829

Technical data for the system components of Hilti HIT-RE 100 can be found in ICC-ES ESR-3829. This includes:

- Hilti HIT-RE 100 adhesive.
- Standard threaded rods including Hilti HAS/HIT-V threaded rods.
- Post-installed reinforcing bars (rebar) designed as an anchor per ACI 318-14 Chapter 17, ACI 318-11 Appendix D, or CSA A23.3-14 Annex D.

A designer can use the data in ESR-3829 to calculate the capacity of the Hilti HIT-RE 100 system in the following manner:

- For standard threaded rods and rebar a design using either ACI 318-14 Chapter 17, or ACI 318-11 Appendix D, and AC308 Section 3.3 amendments to ACI 318 would be appropriate.

The tables from ESR-3829 are not included in this supplement, but can be found by downloading ESR-3829 from www.us.hilti.com, www.hilti.ca, or on the ICC-ES website at www.icc-es.org, or by contacting your local Hilti representative.

2.3.2 Using Hilti PROFIS Anchor Design Software

The Hilti PROFIS anchor design software is the most innovative and comprehensive design software available for accurate and complete anchor designs.

For Hilti HIT-RE 100, the data from ESR-3829 is used as the data base for the program. PROFIS anchor calculates the design capacity of the anchor according to ACI 318-08, ACI 318-11 including AC 308 amendments, ACI 318-14 Chapter 17, and CSA A23.3-14. The PROFIS anchor HIT-RE 100 portfolio includes the same components listed in section 2.3.1.

This is the most accurate and best way to optimize the anchor design, especially for anchor systems with multiple anchors, complicated loading, edge distance constraints, and numerous other conditions.

Hilti PROFIS anchor design software can be downloaded at www.us.hilti.com (US) or www.hilti.ca (Canada). Contact your local Hilti representative for a demonstration on this software at your office.

2.3.3 Using the Hilti Simplified Design Tables

In lieu of providing a copy of ESR-3829 design tables in this supplement, Hilti is providing a simple approach for designing an anchor according to the current model codes described in Section 2.2. Refer to Section 2.4 for a description of these tables.

2.4 Hilti Simplified Design Tables

The Hilti Simplified Design Tables is not a new "method" of designing an anchor that is different than the provisions of ACI 318 Chapter 17 or CSA A23.3 Annex D. Rather, it is a series of pre-calculated tables and reduction factors meant to help the designer create a quick calculation of the capacity of the Hilti anchor system, and still be compliant with the model codes and criteria of ACI and CSA.

The Hilti Simplified Design Tables are formatted similar to the Allowable Stress Design (ASD) tables and reduction factors which was a standard of practice for design of post-installed anchors.

The Hilti Simplified Design Tables combine the simplicity of performing a calculation according to the ASD method with the code-required testing, evaluation criteria and technical data in ACI Chapter 17 and CSA Annex D.

HIT-RE 100 adhesive anchoring system

2.4.1 Simplified Tables Data Development

The Simplified Tables have two table types. The single anchor capacity table and the reduction factor table.

Single anchor capacity tables show the design strength (for ACI) or factored resistance (for CSA) in tension and shear for a single anchor. This is the capacity of a single anchor with no edge distance or concrete thickness influences and is based on the assumptions outlined in the footnotes below each table.

Reduction factor tables are created by comparing the single anchor capacity to the capacity that includes the influence of a specific edge distance, spacing, or concrete thickness, using the equations of ACI 318-14 Chapter 17.

The single anchor tension capacity is based on the lesser of concrete breakout strength or bond strength:

ACI: $\Phi N_n = \min | \Phi N_{cb} ; \Phi N_a |$

CSA/ACI: $N_r = \min | N_{cbr} ; N_a |$

$\Phi N_n = N_r$

The shear value is based on the pryout strength.

ACI: $\Phi V_n = \Phi V_{cp}$

CSA/ACI: $V_r = V_{cpr}$

$\Phi V_n = V_r$

The steel design strength is provided in a separate table and should be compared to the concrete strengths to determine the controlling failure mode.

These values published in the tables are calculated based on ACI/CSA, see Section 3.1.8 in the 2016 Hilti North America Product Technical Guide, Volume 2: Anchor Fastening Technical Guide for additional information.

2.4.3 How to Calculate Anchor Capacity Using Simplified Tables

The process for calculating the capacity of a single anchor or anchor group is similar to the ASD calculation process currently outlined in the 2015 North American Product Technical Guide Volume 2: Anchor Fastening Technical Guide on Section 3.1.9.

The design strength (factored resistance) of an anchor is obtained as follows:

Tension:

ACI: $N_{des} = n \bullet min | \Phi N_n \bullet f_{AN} \bullet f_{RN} ; \Phi N_{sa} |$

CSA: $N_{des} = n \bullet min | N_r \bullet f_{AN} \bullet f_{RN} ; N_{sr} |$

Shear:

ACI: $V_{des} = n \bullet min | \Phi V_n \bullet f_{AV} \bullet f_{RV} \bullet f_{HV} ; \Phi V_{sa} |$

CSA: $V_{des} = n \bullet min | V_r \bullet f_{AV} \bullet f_{RV} \bullet f_{HV} ; V_{sr} |$

where:

- n = number of anchors
- N_{des} = design resistance in tension
- ΦN_n = design strength in tension considering concrete breakout, pullout, or bond failure (ACI)
- ΦN_{sa} = design strength in tension considering steel failure (ACI)
- N_r = factored resistance in tension considering concrete breakout, pullout, or bond failure (CSA)
- N_{sr} = factored resistance in tension considering steel failure (CSA)
- V_{des} = design resistance in shear
- ΦV_n = design strength in shear considering concrete failure (ACI)
- ΦV_{sa} = design strength in shear considering steel failure (ACI)
- V_r = factored resistance in shear considering concrete failure (CSA)
- V_{sr} = factored resistance in shear considering steel failure (CSA)
- f_{AN} = adjustment factor for spacing in tension
- f_{RN} = adjustment factor for edge distance in tension
- f_{AV} = adjustment factor for spacing in shear
- f_{RV} = adjustment factor for edge distance in shear
- f_{HV} = adjustment factor for concrete thickness in shear (this is a new factor that ASD did not use previously)

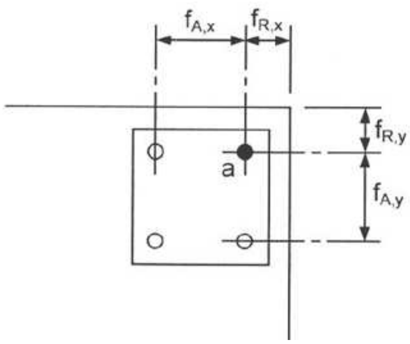
Adjustment factors are applied for all applicable near edge and spacing conditions.

HIT-RE 100 adhesive anchoring system

For example, the capacity in tension corresponding to the anchor group based on worst case anchor “a” in the figure below is evaluated as follows:

ACI: $N_{des} = 4 \bullet \Phi N_n \bullet f_{A,x} \bullet f_{A,y} \bullet f_{R,x} \bullet f_{R,y}$

CSA: $N_{des} = 4 \bullet N_r \bullet f_{A,x} \bullet f_{A,y} \bullet f_{R,x} \bullet f_{R,y}$



Note: designs are for orthogonal anchor bolt patterns and no reduction factor for the diagonally located adjacent anchor is required.

Where anchors are loaded simultaneously in tension and shear, interaction must be considered. The interaction equation is as follows:

ACI: $$\frac{N_{ua}}{N_{des}} + \frac{V_{ua}}{V_{des}} \leq 1.2$$

CSA: $$\frac{N_f}{N_{des}} + \frac{V_f}{V_{des}} \leq 1.2$$

where:

N_{ua} = Required strength in tension based on factored load combinations of ACI 318 Chapter 5.

V_{ua} = Required strength in shear based on factored load combinations of ACI 318 Chapter 5.

N_f = Required strength in tension based on factored load combinations of CSA A23.3 Chapter 8.

V_f = Required strength in shear based on factored load combinations of CSA A23.3 Chapter 8.

The full tension strength can be permitted if:

ACI: $$\frac{V_{ua}}{V_{des}} \leq 0.2$$

CSA: $$\frac{V_f}{V_{des}} \leq 0.2$$

The full shear strength can be permitted if:

ACI: $$\frac{N_{ua}}{N_{des}} \leq 0.2$$

CSA: $$\frac{N_f}{N_{des}} \leq 0.2$$

2.4.4 Allowable Stress Design (ASD)

The values of N_{des} and V_{des} developed from Section 2.4.3 are design strengths (factored resistances) and are to be compared to the required strength in tension and shear from factored load combinations of ACI 318 Chapter 5 or CSA A23.3 Chapter 8.

To design using Allowable Stress Design (ASD), refer to Section 3.1.8.6 in the 2016 Hilti North America Product Technical Guide, Volume 2: Anchor Fastening Technical Guide.

2.4.5 Seismic Design

To determine the seismic design strength (factored resistance) a reduction factor, α_{seis}, is applied to the applicable table values.

This value of α_{seis} will be in the footnotes of the relevant design tables. The value of α_{seis} for concrete / bond / pullout failure is based on 0.75 times a reduction factor determined from testing. The total reduction is footnoted in the tables.

The value of α_{seis} for steel failure is based on testing and is typically only applied for shear. There is no additional 0.75 factor. The reduction is footnoted in the tables.

The factored load and associated seismic load combinations that will be compared to the design strength (factored resistance) can be determined from ACI or CSA provisions and national or local code requirements. An additional value for $\phi_{non\text{-}ductile}$ may be needed based on failure mode or ductility of the attached components.

HIT-RE 100 adhesive anchoring system

2.4.6 Sustained Loads and Overhead Use

Sustained loading is calculated by multiplying the value of ΦN_n or N_r by 0.55 and comparing the value to the tension dead load contribution (and any sustained live loads or other loads) of the factored load. Edge, spacing, and concrete thickness influences do not need to be accounted for when evaluating sustained loads.

2.4.7 Accuracy of the Simplified Tables

Calculations using the Simplified Tables have the potential of providing a design strength (factored resistance) that is exactly what would be calculated using equations from ACI 318 Chapter 17 or CSA A23.3 Annex D.

The tables for the single anchor design strength (factored resistance) for concrete / bond / pullout failure or steel failure have the same values that will be computed using the provisions of ACI and CSA.

The load adjustment factors for edge distance influences are based on a single anchor near an edge. The load adjustment factors for spacing are determined from the influence of two adjacent anchors. Each reduction factor is calculated for the minimum value of either concrete or bond failure. When more than one edge distance and/or spacing condition exists, the load adjustment factors are multiplied together. This will result in a conservative design when compared to a full calculation based on ACI or CSA.

Since the table values, including load adjustment factors, are calculated using equations that are not linear, linear interpolation is not permitted. Use the smaller of the two table values listed. This provides a conservative value if the application falls between concrete compressive strengths, embedment depths, or spacing, edge distance, and concrete thickness.

For a summary of the accuracy of the simplified tables, refer to Section 3.1.8.9 of the 2016 Hilti North America Product Technical Guide, Volume 2: Anchor Fastening Technical Guide.

Additional assistance can be given by your local Hilti representative.

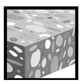
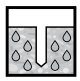
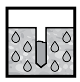
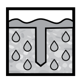
2.4.8 Limitations Using Simplified Tables

There are limitations that the Simplified Tables do not consider. Refer to Section 3.1.8.10 of the 2016 Hilti North America Product Technical Guide, Volume 2: Anchor Fastening Technical Guide for additional information.

Contact Hilti with any questions for specific applications.

HIT-RE 100 adhesive anchoring system

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

Cracked or uncracked concrete	Permissible concete conditions	Permissible drilling methods
 Uncracked Concrete  Cracked Concrete	 Dry concrete  Water-saturated concrete  Water-filled holes  Submerged (underwater)	 Hammer Drilling with Carbide Tipped Drill Bit

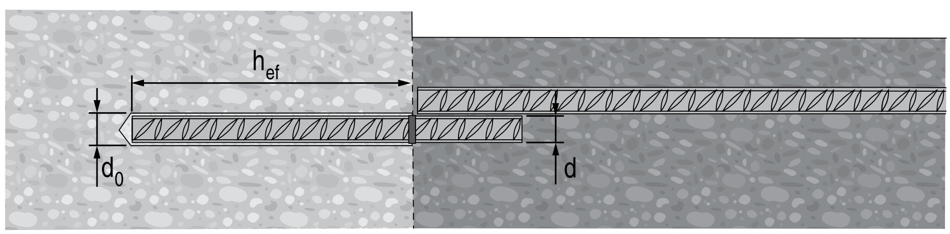


Table 1 — Specifications for rebar installed with HIT-RE 100 adhesive

Setting information		Symbol	Units	Rebar Size							
				3	4	5	6	7	8	9	10
Nominal bit diameter		d_o	in.	1/2	5/8	3/4	7/8	1	1-1/8	1-3/8	1-1/2
Effective Embedment	minimum	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-1/8	4	4-1/2	5
			(mm)	(60)	(70)	(79)	(89)	(89)	(102)	(114)	(127)
	maximum	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	22-1/2	25
			(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(572)	(635)
Minimum Concrete Thickness		h_{min}	in.	h_{ef} + 1-1/4		$h_{ef} + 2d_o$					
			(mm)	(h_{ef} + 30)							
Minimum edge distance[1]		c_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)	(159)
Minimum anchor spacing		s_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8	6-1/4
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)	(159)

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

HIT-RE 100 adhesive anchoring system

Table 2 — Hilti HIT-RE 100 adhesive design strength with concrete / bond failure for US rebar in uncracked concrete [1,2,3,4,5,6,7,8,9,10]

Rebar 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	3-3/8 (86)	2,780 (12.4)	2,835 (12.6)	2,915 (13.0)	3,035 (13.5)	7,080 (31.5)	7,210 (32.1)	7,420 (33.0)	7,730 (34.4)
	4-1/2 (114)	3,710 (16.5)	3,775 (16.8)	3,885 (17.3)	4,050 (18.0)	9,440 (42.0)	9,615 (42.8)	9,895 (44.0)	10,305 (45.8)
	7-1/2 (191)	6,180 (27.5)	6,295 (28.0)	6,480 (28.8)	6,745 (30.0)	15,735 (70.0)	16,025 (71.3)	16,490 (73.4)	17,175 (76.4)
#4	4-1/2 (114)	4,885 (21.7)	4,975 (22.1)	5,120 (22.8)	5,330 (23.7)	12,430 (55.3)	12,660 (56.3)	13,030 (58.0)	13,565 (60.3)
	6 (152)	6,510 (29.0)	6,630 (29.5)	6,825 (30.4)	7,105 (31.6)	16,575 (73.7)	16,875 (75.1)	17,370 (77.3)	18,090 (80.5)
	10 (254)	10,850 (48.3)	11,050 (49.2)	11,375 (50.6)	11,845 (52.7)	27,620 (122.9)	28,130 (125.1)	28,950 (128.8)	30,150 (134.1)
#5	5-5/8 (143)	7,315 (32.5)	7,450 (33.1)	7,665 (34.1)	7,985 (35.5)	18,615 (82.8)	18,960 (84.3)	19,515 (86.8)	20,320 (90.4)
	7-1/2 (191)	9,750 (43.4)	9,930 (44.2)	10,220 (45.5)	10,645 (47.4)	24,825 (110.4)	25,280 (112.5)	26,015 (115.7)	27,095 (120.5)
	12-1/2 (318)	16,255 (72.3)	16,550 (73.6)	17,035 (75.8)	17,740 (78.9)	41,370 (184.0)	42,130 (187.4)	43,360 (192.9)	45,155 (200.9)
#6	6-3/4 (171)	10,180 (45.3)	10,370 (46.1)	10,670 (47.5)	11,115 (49.4)	25,920 (115.3)	26,395 (117.4)	27,165 (120.8)	28,290 (125.8)
	9 (229)	13,575 (60.4)	13,825 (61.5)	14,230 (63.3)	14,820 (65.9)	34,555 (153.7)	35,195 (156.6)	36,220 (161.1)	37,720 (167.8)
	15 (381)	22,625 (100.6)	23,045 (102.5)	23,715 (105.5)	24,695 (109.8)	57,595 (256.2)	58,655 (260.9)	60,365 (268.5)	62,865 (279.6)
#7	7-7/8 (200)	13,385 (59.5)	13,630 (60.6)	14,025 (62.4)	14,605 (65.0)	34,065 (151.5)	34,690 (154.3)	35,705 (158.8)	37,180 (165.4)
	10-1/2 (267)	17,845 (79.4)	18,170 (80.8)	18,700 (83.2)	19,475 (86.6)	45,420 (202.0)	46,255 (205.8)	47,605 (211.8)	49,575 (220.5)
	17-1/2 (445)	29,740 (132.3)	30,285 (134.7)	31,170 (138.7)	32,460 (144.4)	75,700 (336.7)	77,090 (342.9)	79,340 (352.9)	82,625 (367.5)
#8	9 (229)	16,980 (75.5)	17,295 (76.9)	17,800 (79.2)	18,535 (82.4)	43,225 (192.3)	44,020 (195.8)	45,305 (201.5)	47,180 (209.9)
	12 (305)	22,640 (100.7)	23,060 (102.6)	23,730 (105.6)	24,715 (109.9)	57,635 (256.4)	58,695 (261.1)	60,410 (268.7)	62,910 (279.8)
	20 (508)	37,735 (167.9)	38,430 (170.9)	39,555 (175.9)	41,190 (183.2)	96,055 (427.3)	97,825 (435.1)	100,680 (447.8)	104,845 (466.4)
#9	10-1/8 (257)	21,020 (93.5)	21,405 (95.2)	22,030 (98.0)	22,945 (102.1)	53,505 (238.0)	54,490 (242.4)	56,080 (249.5)	58,400 (259.8)
	13-1/2 (343)	28,025 (124.7)	28,540 (127.0)	29,375 (130.7)	30,590 (136.1)	71,340 (317.3)	72,655 (323.2)	74,775 (332.6)	77,870 (346.4)
	22-1/2 (572)	46,710 (207.8)	47,570 (211.6)	48,960 (217.8)	50,985 (226.8)	118,900 (528.9)	121,090 (538.6)	124,620 (554.3)	129,780 (577.3)
#10	11-1/4 (286)	25,465 (113.3)	25,935 (115.4)	26,690 (118.7)	27,795 (123.6)	63,395 (282.0)	66,010 (293.6)	67,940 (302.2)	70,750 (314.7)
	15 (381)	33,955 (151.0)	34,575 (153.8)	35,585 (158.3)	37,060 (164.9)	86,425 (384.4)	88,015 (391.5)	90,585 (402.9)	94,335 (419.6)
	25 (635)	56,590 (251.7)	57,630 (256.3)	59,310 (263.8)	61,765 (274.7)	144,040 (640.7)	146,690 (652.5)	150,975 (671.6)	157,220 (699.3)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 5-20 as necessary. Compare to the steel values in table 4. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.4.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

HIT-RE 100 adhesive anchoring system

Table 3 — Hilti HIT-RE 100 adhesive design strength with concrete / bond failure for US rebar in cracked concrete [1,2,3,4,5,6,7,8,9,10]

Rebar 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	3-3/8 (86)	1,040 (4.6)	1,060 (4.7)	1,090 (4.8)	1,135 (5.0)	2,650 (11.8)	2,700 (12.0)	2,775 (12.3)	2,890 (12.9)
	4-1/2 (114)	1,390 (6.2)	1,415 (6.3)	1,455 (6.5)	1,515 (6.7)	3,535 (15.7)	3,600 (16.0)	3,705 (16.5)	3,855 (17.1)
	7-1/2 (191)	2,315 (10.3)	2,355 (10.5)	2,425 (10.8)	2,525 (11.2)	5,890 (26.2)	5,995 (26.7)	6,170 (27.4)	6,425 (28.6)
#4	4-1/2 (114)	1,850 (8.2)	1,885 (8.4)	1,940 (8.6)	2,020 (9.0)	4,710 (21.0)	4,795 (21.3)	4,935 (22.0)	5,140 (22.9)
	6 (152)	2,465 (11.0)	2,515 (11.2)	2,585 (11.5)	2,695 (12.0)	6,280 (27.9)	6,395 (28.4)	6,585 (29.3)	6,855 (30.5)
	10 (254)	4,110 (18.3)	4,190 (18.6)	4,310 (19.2)	4,490 (20.0)	10,470 (46.6)	10,660 (47.4)	10,970 (48.8)	11,425 (50.8)
#5	5-5/8 (143)	2,890 (12.9)	2,945 (13.1)	3,030 (13.5)	3,155 (14.0)	7,360 (32.7)	7,495 (33.3)	7,715 (34.3)	8,035 (35.7)
	7-1/2 (191)	3,855 (17.1)	3,925 (17.5)	4,040 (18.0)	4,210 (18.7)	9,815 (43.7)	9,995 (44.5)	10,285 (45.7)	10,710 (47.6)
	12-1/2 (318)	6,425 (28.6)	6,545 (29.1)	6,735 (30.0)	7,015 (31.2)	16,355 (72.8)	16,655 (74.1)	17,145 (76.3)	17,850 (79.4)
#6	6-3/4 (171)	4,165 (18.5)	4,240 (18.9)	4,365 (19.4)	4,545 (20.2)	10,600 (47.2)	10,795 (48.0)	11,110 (49.4)	11,570 (51.5)
	9 (229)	5,550 (24.7)	5,655 (25.2)	5,820 (25.9)	6,060 (27.0)	14,130 (62.9)	14,390 (64.0)	14,810 (65.9)	15,425 (68.6)
	15 (381)	9,255 (41.2)	9,425 (41.9)	9,700 (43.1)	10,100 (44.9)	23,555 (104.8)	23,985 (106.7)	24,685 (109.8)	25,705 (114.3)
#7	7-7/8 (200)	5,665 (25.2)	5,770 (25.7)	5,940 (26.4)	6,185 (27.5)	14,425 (64.2)	14,690 (65.3)	15,120 (67.3)	15,745 (70.0)
	10-1/2 (267)	7,555 (33.6)	7,695 (34.2)	7,920 (35.2)	8,250 (36.7)	19,235 (85.6)	19,590 (87.1)	20,160 (89.7)	20,995 (93.4)
	17-1/2 (445)	12,595 (56.0)	12,825 (57.0)	13,200 (58.7)	13,745 (61.1)	32,060 (142.6)	32,645 (145.2)	33,600 (149.5)	34,990 (155.6)
#8	9 (229)	7,030 (31.3)	7,160 (31.8)	7,365 (32.8)	7,670 (34.1)	17,890 (79.6)	18,220 (81.0)	18,755 (83.4)	19,530 (86.9)
	12 (305)	9,370 (41.7)	9,545 (42.5)	9,825 (43.7)	10,230 (45.5)	23,855 (106.1)	24,295 (108.1)	25,005 (111.2)	26,040 (115.8)
	20 (508)	15,620 (69.5)	15,905 (70.7)	16,370 (72.8)	17,050 (75.8)	39,760 (176.9)	40,490 (180.1)	41,675 (185.4)	43,400 (193.1)
#9	10-1/8 (257)	8,425 (37.5)	8,580 (38.2)	8,830 (39.3)	9,195 (40.9)	21,440 (95.4)	21,835 (97.1)	22,475 (100.0)	23,405 (104.1)
	13-1/2 (343)	11,230 (50.0)	11,440 (50.9)	11,770 (52.4)	12,260 (54.5)	28,590 (127.2)	29,115 (129.5)	29,965 (133.3)	31,205 (138.8)
	22-1/2 (572)	18,720 (83.3)	19,065 (84.8)	19,620 (87.3)	20,430 (90.9)	47,650 (212.0)	48,525 (215.8)	49,940 (222.1)	52,010 (231.4)
#10	11-1/4 (286)	9,915 (44.1)	10,095 (44.9)	10,390 (46.2)	10,820 (48.1)	25,235 (112.3)	25,700 (114.3)	26,450 (117.7)	27,545 (122.5)
	15 (381)	13,220 (58.8)	13,460 (59.9)	13,855 (61.6)	14,430 (64.2)	33,645 (149.7)	34,265 (152.4)	35,265 (156.9)	36,725 (163.4)
	25 (635)	22,030 (98.0)	22,435 (99.8)	23,090 (102.7)	24,045 (107.0)	56,075 (249.4)	57,110 (254.0)	58,775 (261.4)	61,210 (272.3)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 5-20 as necessary. Compare to the steel values in table 4. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.60.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.4.6.
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 T abular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.675. See section 2.4.5 for additional information on seismic applications.

HIT-RE 100 adhesive anchoring system

Table 4 — Steel design strength for US rebar [1]

Rebar Size	ASTM A 615 Grade 40 [2]			ASTM A 615 Grade 60 [2]			ASTM A 706 Grade 60 [2]		
	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 2.4.4 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 318-14 Chapter 17
4 Shear = $\phi\, 0.60\, A_{se,N} f_{uta}$ as noted in ACI 318-14 Chapter 17
5 Seismic Shear = $\alpha_{V,seis}\, \phi V_{sa}$: Reduction for seismic shear only. See section 2.4.5 for additional information on seismic applications.

HIT-RE 100 adhesive anchoring system

Table 5 — 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	0.18	0.11	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	0.34	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	0.50	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	0.80	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)									0.95									
>48	(1219)									1.00									

Table 6 — 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[5] 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	0.20	0.15	0.09	0.40	0.30	0.18	n/a	n/a	n/a
1-7/8	(48)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.54	0.22	0.17	0.10	0.44	0.33	0.20	n/a	n/a	n/a
2	(51)	0.60	0.57	0.54	0.57	0.51	0.44	0.56	0.55	0.54	0.24	0.18	0.11	0.49	0.36	0.22	n/a	n/a	n/a
3	(76)	0.65	0.61	0.57	0.70	0.60	0.49	0.60	0.58	0.56	0.45	0.33	0.20	0.70	0.60	0.40	n/a	n/a	n/a
4	(102)	0.70	0.65	0.59	0.84	0.70	0.55	0.63	0.61	0.58	0.69	0.51	0.31	0.84	0.70	0.55	n/a	n/a	n/a
4-5/8	(117)	0.73	0.67	0.60	0.93	0.76	0.58	0.65	0.62	0.59	0.85	0.64	0.38	0.93	0.76	0.58	0.77	n/a	n/a
5	(127)	0.75	0.69	0.61	0.99	0.80	0.60	0.66	0.63	0.60	0.96	0.72	0.43	0.99	0.80	0.60	0.81	n/a	n/a
5-3/4	(146)	0.78	0.71	0.63	1.00	0.88	0.64	0.69	0.65	0.61	1.00	0.89	0.53	1.00	0.88	0.64	0.86	0.78	n/a
6	(152)	0.80	0.72	0.63		0.91	0.66	0.69	0.66	0.61		0.95	0.57		0.91	0.66	0.88	0.80	n/a
7	(178)	0.85	0.76	0.66		1.00	0.72	0.73	0.69	0.63		1.00	0.72		1.00	0.72	0.95	0.87	n/a
8	(203)	0.90	0.80	0.68			0.78	0.76	0.71	0.65			0.87			0.78	1.00	0.93	n/a
8-3/4	(222)	0.93	0.82	0.69			0.83	0.78	0.73	0.67			1.00			0.83		0.97	0.82
9	(229)	0.94	0.83	0.70			0.85	0.79	0.74	0.67						0.85		0.98	0.83
10	(254)	0.99	0.87	0.72			0.91	0.82	0.77	0.69						0.91		1.00	0.87
11	(279)	1.00	0.91	0.74			0.98	0.86	0.79	0.71						0.98			0.92
12	(305)		0.94	0.77			1.00	0.89	0.82	0.73						1.00			0.96
14	(356)		1.00	0.81				0.95	0.87	0.77									1.00
16	(406)			0.86				1.00	0.93	0.80									
18	(457)			0.90					0.98	0.84									
24	(610)			1.00					1.00	0.96									
30	(762)									1.00									
36	(914)																		
>48	(1219)																		

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 7 — 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	0.18	0.11	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	0.12	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	0.24	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	0.41	0.31	0.18	0.54	0.40	0.23	0.61	n/a	n/a
6	(152)	0.72	0.67	0.60	0.57	0.42	0.24	0.60	0.58	0.56	0.43	0.33	0.20	0.57	0.42	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	0.55	0.41	0.25	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	0.60	0.57	0.58	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	0.57	0.67	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	0.80	0.60	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	0.94	0.70	0.42	0.94	0.69	0.40	0.80	0.73	n/a
11-1/4	(286)	0.92	0.81	0.69	1.00	0.78	0.46	0.68	0.65	0.61	1.00	0.84	0.50	1.00	0.78	0.46	0.85	0.77	0.65
12	(305)	0.94	0.83	0.70		0.83	0.49	0.69	0.66	0.61		0.92	0.55		0.83	0.49	0.87	0.79	0.67
14	(356)	1.00	0.89	0.73		0.97	0.57	0.72	0.68	0.63		1.00	0.70		0.97	0.57	0.94	0.86	0.72
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)		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	0.87
22	(559)			0.87			0.89	0.85	0.79	0.71						0.89			0.91
24	(610)			0.90			0.97	0.88	0.82	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 8 — 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	0.13	0.10	0.06	0.26	0.19	0.12	n/a	n/a	n/a
2-1/2	(64)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.54	0.22	0.17	0.10	0.44	0.33	0.20	n/a	n/a	n/a
3	(76)	0.61	0.58	0.55	0.60	0.53	0.46	0.57	0.56	0.54	0.29	0.22	0.13	0.58	0.43	0.26	n/a	n/a	n/a
4	(102)	0.65	0.61	0.57	0.70	0.60	0.49	0.60	0.58	0.56	0.45	0.33	0.20	0.70	0.60	0.40	n/a	n/a	n/a
5	(127)	0.69	0.64	0.58	0.80	0.67	0.53	0.62	0.60	0.57	0.62	0.47	0.28	0.80	0.67	0.53	n/a	n/a	n/a
5-3/4	(146)	0.71	0.66	0.60	0.88	0.73	0.56	0.64	0.62	0.58	0.77	0.58	0.35	0.88	0.73	0.56	0.75	n/a	n/a
6	(152)	0.72	0.67	0.60	0.91	0.75	0.57	0.65	0.62	0.59	0.82	0.61	0.37	0.91	0.75	0.57	0.76	n/a	n/a
7	(178)	0.76	0.69	0.62	1.00	0.83	0.62	0.67	0.64	0.60	1.00	0.77	0.46	1.00	0.83	0.62	0.83	n/a	n/a
7-1/4	(184)	0.77	0.70	0.62		0.85	0.63	0.68	0.65	0.60		0.82	0.49		0.85	0.63	0.84	0.76	n/a
8	(203)	0.80	0.72	0.63		0.91	0.66	0.69	0.66	0.61		0.95	0.57		0.91	0.66	0.88	0.80	n/a
9	(229)	0.83	0.75	0.65		1.00	0.70	0.72	0.68	0.63		1.00	0.68		1.00	0.70	0.94	0.85	n/a
10	(254)	0.87	0.78	0.67			0.75	0.74	0.70	0.64			0.79			0.75	0.99	0.90	n/a
11-1/4	(286)	0.92	0.81	0.69			0.81	0.77	0.73	0.66			0.95			0.81	1.00	0.95	0.80
12	(305)	0.94	0.83	0.70			0.85	0.79	0.74	0.67			1.00			0.85		0.98	0.83
14	(356)	1.00	0.89	0.73			0.95	0.84	0.78	0.70						0.95		1.00	0.89
16	(406)		0.94	0.77			1.00	0.89	0.82	0.73						1.00			0.96
18	(457)		1.00	0.80				0.94	0.86	0.76									1.00
20	(508)			0.83				0.99	0.90	0.79									
22	(559)			0.87				1.00	0.94	0.81									
24	(610)			0.90					0.98	0.84									
30	(762)			1.00					1.00	0.93									
36	(914)									1.00									
>48	(1219)																		

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 9 — 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	0.08	0.05	n/a	n/a	n/a
3-1/8	(79)	0.59	0.57	0.54	0.32	0.23	0.14	0.54	0.53	0.52	0.12	0.09	0.05	0.24	0.18	0.11	n/a	n/a	n/a
4	(102)	0.62	0.59	0.55	0.36	0.27	0.16	0.55	0.54	0.53	0.18	0.13	0.08	0.35	0.26	0.16	n/a	n/a	n/a
5	(127)	0.65	0.61	0.57	0.42	0.31	0.18	0.57	0.55	0.54	0.25	0.19	0.11	0.42	0.31	0.18	n/a	n/a	n/a
6	(152)	0.68	0.63	0.58	0.47	0.35	0.20	0.58	0.56	0.55	0.32	0.24	0.15	0.47	0.35	0.20	n/a	n/a	n/a
7	(178)	0.71	0.66	0.59	0.53	0.39	0.23	0.59	0.58	0.55	0.41	0.31	0.18	0.53	0.39	0.23	n/a	n/a	n/a
7-1/8	(181)	0.71	0.66	0.60	0.54	0.40	0.23	0.59	0.58	0.55	0.42	0.31	0.19	0.54	0.40	0.23	0.61	n/a	n/a
8	(203)	0.74	0.68	0.61	0.61	0.45	0.26	0.60	0.59	0.56	0.50	0.37	0.22	0.61	0.45	0.26	0.65	n/a	n/a
9	(229)	0.77	0.70	0.62	0.69	0.51	0.30	0.62	0.60	0.57	0.60	0.45	0.27	0.69	0.51	0.30	0.69	0.62	n/a
10	(254)	0.80	0.72	0.63	0.76	0.56	0.33	0.63	0.61	0.58	0.70	0.52	0.31	0.76	0.56	0.33	0.72	0.66	n/a
11	(279)	0.83	0.74	0.65	0.84	0.62	0.36	0.64	0.62	0.58	0.81	0.60	0.36	0.84	0.62	0.36	0.76	0.69	n/a
12	(305)	0.86	0.77	0.66	0.92	0.67	0.39	0.66	0.63	0.59	0.92	0.69	0.41	0.92	0.67	0.39	0.79	0.72	n/a
14	(356)	0.91	0.81	0.69	1.00	0.79	0.46	0.68	0.65	0.61	1.00	0.87	0.52	1.00	0.79	0.46	0.86	0.78	0.66
16	(406)	0.97	0.86	0.71		0.90	0.53	0.71	0.67	0.62		1.00	0.64		0.90	0.53	0.92	0.83	0.70
18	(457)	1.00	0.90	0.74		1.00	0.59	0.74	0.69	0.64			0.76		1.00	0.59	0.97	0.88	0.74
20	(508)		0.94	0.77			0.66	0.76	0.72	0.65			0.89			0.66	1.00	0.93	0.78
22	(559)		0.99	0.79			0.72	0.79	0.74	0.67			1.00			0.72		0.98	0.82
24	(610)		1.00	0.82			0.79	0.81	0.76	0.68						0.79		1.00	0.86
26	(660)			0.85			0.85	0.84	0.78	0.70						0.85			0.90
28	(711)			0.87			0.92	0.87	0.80	0.72						0.92			0.93
30	(762)			0.90			0.99	0.89	0.82	0.73						0.99			0.96
36	(914)			0.98			1.00	0.97	0.89	0.78						1.00			1.00
>48	(1219)			1.00				1.00	1.00	0.87									

Table 10 — 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	0.09	0.07	0.04	0.18	0.14	0.08	n/a	n/a	n/a
3-1/8	(79)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.54	0.22	0.17	0.10	0.44	0.33	0.20	n/a	n/a	n/a
4	(102)	0.62	0.59	0.55	0.62	0.55	0.46	0.58	0.56	0.55	0.32	0.24	0.14	0.62	0.48	0.29	n/a	n/a	n/a
5	(127)	0.65	0.61	0.57	0.70	0.60	0.49	0.60	0.58	0.56	0.45	0.33	0.20	0.70	0.60	0.40	n/a	n/a	n/a
6	(152)	0.68	0.63	0.58	0.78	0.66	0.53	0.62	0.60	0.57	0.59	0.44	0.26	0.78	0.66	0.53	n/a	n/a	n/a
7	(178)	0.71	0.66	0.59	0.87	0.72	0.56	0.64	0.61	0.58	0.74	0.55	0.33	0.87	0.72	0.56	n/a	n/a	n/a
7-1/8	(181)	0.71	0.66	0.60	0.88	0.73	0.56	0.64	0.61	0.58	0.76	0.57	0.34	0.88	0.73	0.56	0.74	n/a	n/a
8	(203)	0.74	0.68	0.61	0.96	0.78	0.59	0.66	0.63	0.59	0.90	0.68	0.41	0.96	0.78	0.59	0.79	n/a	n/a
9	(229)	0.77	0.70	0.62	1.00	0.85	0.62	0.68	0.64	0.60	1.00	0.81	0.48	1.00	0.85	0.62	0.84	0.76	n/a
10	(254)	0.80	0.72	0.63		0.91	0.66	0.69	0.66	0.61		0.95	0.57		0.91	0.66	0.88	0.80	n/a
11	(279)	0.83	0.74	0.65		0.98	0.69	0.71	0.68	0.63		1.00	0.65		0.98	0.69	0.93	0.84	n/a
12	(305)	0.86	0.77	0.66		1.00	0.73	0.73	0.69	0.64			0.75		1.00	0.73	0.97	0.88	n/a
14	(356)	0.91	0.81	0.69			0.81	0.77	0.72	0.66			0.94			0.81	1.00	0.95	0.80
16	(406)	0.97	0.86	0.71			0.89	0.81	0.76	0.68			1.00			0.89		1.00	0.86
18	(457)	1.00	0.90	0.74			0.97	0.85	0.79	0.71						0.97			0.91
20	(508)		0.94	0.77			1.00	0.89	0.82	0.73						1.00			0.96
22	(559)		0.99	0.79				0.93	0.85	0.75									1.00
24	(610)		1.00	0.82				0.97	0.89	0.77									
26	(660)			0.85				1.00	0.92	0.80									
28	(711)			0.87					0.95	0.82									
30	(762)			0.90					0.98	0.84									
36	(914)			0.98					1.00	0.91									
>48	(1219)			1.00						1.00									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 11 — 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	0.08	0.06	0.04	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	0.06	0.25	0.19	0.11	n/a	n/a	n/a
4 (102)	0.60	0.57	0.54	0.33	0.24	0.14	0.54	0.54	0.53	0.14	0.10	0.06	0.27	0.20	0.12	n/a	n/a	n/a
5 (127)	0.62	0.59	0.56	0.37	0.27	0.16	0.56	0.55	0.53	0.19	0.14	0.09	0.37	0.27	0.16	n/a	n/a	n/a
6 (152)	0.65	0.61	0.57	0.42	0.31	0.18	0.57	0.55	0.54	0.25	0.19	0.11	0.42	0.31	0.18	n/a	n/a	n/a
7 (178)	0.67	0.63	0.58	0.47	0.34	0.20	0.58	0.56	0.55	0.32	0.24	0.14	0.47	0.34	0.20	n/a	n/a	n/a
8 (203)	0.70	0.65	0.59	0.52	0.38	0.22	0.59	0.57	0.55	0.39	0.29	0.17	0.52	0.38	0.22	n/a	n/a	n/a
8-1/2 (216)	0.71	0.66	0.59	0.55	0.40	0.24	0.59	0.58	0.56	0.42	0.32	0.19	0.55	0.40	0.24	0.61	n/a	n/a
9 (229)	0.72	0.67	0.60	0.58	0.43	0.25	0.60	0.58	0.56	0.46	0.34	0.21	0.58	0.43	0.25	0.63	n/a	n/a
10 (254)	0.75	0.69	0.61	0.64	0.47	0.28	0.61	0.59	0.56	0.54	0.40	0.24	0.64	0.47	0.28	0.66	n/a	n/a
10-3/4 (273)	0.77	0.70	0.62	0.69	0.51	0.30	0.62	0.60	0.57	0.60	0.45	0.27	0.69	0.51	0.30	0.69	0.63	n/a
12 (305)	0.80	0.72	0.63	0.77	0.57	0.33	0.63	0.61	0.58	0.71	0.53	0.32	0.77	0.57	0.33	0.73	0.66	n/a
14 (356)	0.85	0.76	0.66	0.90	0.66	0.39	0.65	0.63	0.59	0.89	0.67	0.40	0.90	0.66	0.39	0.79	0.71	n/a
16 (406)	0.90	0.80	0.68	1.00	0.76	0.44	0.68	0.65	0.60	1.00	0.82	0.49	1.00	0.76	0.44	0.84	0.76	n/a
16-3/4 (425)	0.91	0.81	0.69		0.79	0.46	0.68	0.65	0.61		0.87	0.52		0.79	0.46	0.86	0.78	0.66
18 (457)	0.94	0.83	0.70		0.85	0.50	0.70	0.66	0.62		0.97	0.58		0.85	0.50	0.89	0.81	0.68
20 (508)	0.99	0.87	0.72		0.95	0.55	0.72	0.68	0.63		1.00	0.68		0.95	0.55	0.94	0.85	0.72
22 (559)	1.00	0.91	0.74		1.00	0.61	0.74	0.70	0.64			0.79		1.00	0.61	0.99	0.89	0.75
24 (610)		0.94	0.77			0.67	0.76	0.72	0.66			0.90			0.67	1.00	0.93	0.79
26 (660)		0.98	0.79			0.72	0.79	0.74	0.67			1.00			0.72		0.97	0.82
28 (711)		1.00	0.81			0.78	0.81	0.75	0.68						0.78		1.00	0.85
30 (762)			0.83			0.83	0.83	0.77	0.69						0.83			0.88
36 (914)			0.90			1.00	0.90	0.83	0.73						1.00			0.97
>48 (1219)			1.00				1.00	0.94	0.81									1.00

Table 12 — 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}			ConcreteThickness 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	0.07	0.05	0.03	0.14	0.10	0.06	n/a	n/a	n/a
3-3/4 (95)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.54	0.22	0.16	0.10	0.43	0.32	0.19	n/a	n/a	n/a
4 (102)	0.60	0.57	0.54	0.57	0.51	0.44	0.56	0.55	0.54	0.24	0.18	0.11	0.48	0.36	0.21	n/a	n/a	n/a
5 (127)	0.62	0.59	0.56	0.63	0.56	0.47	0.58	0.57	0.55	0.33	0.25	0.15	0.63	0.50	0.30	n/a	n/a	n/a
6 (152)	0.65	0.61	0.57	0.70	0.60	0.49	0.60	0.58	0.56	0.44	0.33	0.20	0.70	0.60	0.39	n/a	n/a	n/a
7 (178)	0.67	0.63	0.58	0.77	0.65	0.52	0.61	0.59	0.57	0.55	0.41	0.25	0.77	0.65	0.50	n/a	n/a	n/a
8 (203)	0.70	0.65	0.59	0.84	0.70	0.55	0.63	0.61	0.58	0.67	0.50	0.30	0.84	0.70	0.55	n/a	n/a	n/a
8-1/2 (216)	0.71	0.66	0.59	0.88	0.72	0.56	0.64	0.61	0.58	0.74	0.55	0.33	0.88	0.72	0.56	0.74	n/a	n/a
9 (229)	0.72	0.67	0.60	0.91	0.75	0.57	0.64	0.62	0.58	0.80	0.60	0.36	0.91	0.75	0.57	0.76	n/a	n/a
10 (254)	0.75	0.69	0.61	0.99	0.80	0.60	0.66	0.63	0.59	0.94	0.70	0.42	0.99	0.80	0.60	0.80	n/a	n/a
10-3/4 (273)	0.77	0.70	0.62	1.00	0.84	0.62	0.67	0.64	0.60	1.00	0.79	0.47	1.00	0.84	0.62	0.83	0.75	n/a
12 (305)	0.80	0.72	0.63		0.91	0.66	0.69	0.66	0.61	1.00	0.93	0.56		0.91	0.66	0.88	0.80	n/a
14 (356)	0.85	0.76	0.66		1.00	0.72	0.72	0.68	0.63		1.00	0.70		1.00	0.72	0.95	0.86	n/a
16 (406)	0.90	0.80	0.68			0.78	0.76	0.71	0.65			0.86			0.78	1.00	0.92	n/a
16-3/4 (425)	0.91	0.81	0.69			0.81	0.77	0.72	0.66			0.92			0.81		0.94	0.79
18 (457)	0.94	0.83	0.70			0.85	0.79	0.74	0.67			1.00			0.85		0.97	0.82
20 (508)	0.99	0.87	0.72			0.91	0.82	0.76	0.69						0.91		1.00	0.87
22 (559)	1.00	0.91	0.74			0.98	0.85	0.79	0.71						0.98			0.91
24 (610)		0.94	0.77			1.00	0.88	0.82	0.73						1.00			0.95
26 (660)		0.98	0.79				0.92	0.84	0.74									0.99
28 (711)		1.00	0.81				0.95	0.87	0.76									1.00
30 (762)			0.83				0.98	0.90	0.78									
36 (914)			0.90				1.00	0.98	0.84									
>48 (1219)			1.00					1.00	0.95									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 13 — 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	0.06	0.04	0.03	n/a	n/a	n/a
4-3/8 (111)	0.59	0.57	0.54	0.32	0.24	0.14	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	0.34	0.25	0.15	0.55	0.54	0.53	0.14	0.11	0.07	0.29	0.22	0.13	n/a	n/a	n/a
6 (152)	0.63	0.60	0.56	0.38	0.28	0.16	0.56	0.55	0.53	0.19	0.14	0.09	0.38	0.28	0.16	n/a	n/a	n/a
7 (178)	0.65	0.61	0.57	0.42	0.31	0.18	0.56	0.55	0.54	0.24	0.18	0.11	0.42	0.31	0.18	n/a	n/a	n/a
8 (203)	0.67	0.63	0.58	0.46	0.34	0.20	0.57	0.56	0.54	0.29	0.22	0.13	0.46	0.34	0.20	n/a	n/a	n/a
9 (229)	0.69	0.64	0.59	0.51	0.37	0.22	0.58	0.57	0.55	0.35	0.26	0.16	0.51	0.37	0.22	n/a	n/a	n/a
9-7/8 (251)	0.71	0.66	0.59	0.55	0.41	0.24	0.59	0.57	0.55	0.40	0.30	0.18	0.55	0.41	0.24	0.60	n/a	n/a
10 (254)	0.71	0.66	0.60	0.56	0.41	0.24	0.59	0.58	0.55	0.41	0.31	0.18	0.56	0.41	0.24	0.61	n/a	n/a
11 (279)	0.73	0.67	0.60	0.61	0.45	0.26	0.60	0.58	0.56	0.47	0.35	0.21	0.61	0.45	0.26	0.64	n/a	n/a
12 (305)	0.75	0.69	0.61	0.67	0.49	0.29	0.61	0.59	0.56	0.54	0.40	0.24	0.67	0.49	0.29	0.66	n/a	n/a
12-1/2 (318)	0.76	0.70	0.62	0.70	0.51	0.30	0.61	0.59	0.57	0.57	0.43	0.26	0.70	0.51	0.30	0.68	0.62	n/a
14 (356)	0.80	0.72	0.63	0.78	0.58	0.34	0.63	0.61	0.58	0.68	0.51	0.31	0.78	0.58	0.34	0.72	0.65	n/a
16 (406)	0.84	0.75	0.65	0.89	0.66	0.39	0.65	0.62	0.59	0.83	0.62	0.37	0.89	0.66	0.39	0.77	0.70	n/a
18 (457)	0.88	0.79	0.67	1.00	0.74	0.43	0.67	0.64	0.60	0.99	0.74	0.44	1.00	0.74	0.43	0.81	0.74	n/a
19-1/2 (495)	0.91	0.81	0.69		0.80	0.47	0.68	0.65	0.61	1.00	0.84	0.50		0.80	0.47	0.85	0.77	0.65
20 (508)	0.92	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
22 (559)	0.97	0.85	0.71		0.90	0.53	0.70	0.67	0.62		1.00	0.60		0.90	0.53	0.90	0.82	0.69
24 (610)	1.00	0.88	0.73		0.99	0.58	0.72	0.68	0.63			0.68		0.99	0.58	0.94	0.85	0.72
26 (660)		0.91	0.75		1.00	0.63	0.74	0.70	0.64			0.77		1.00	0.63	0.98	0.89	0.75
28 (711)		0.94	0.77			0.67	0.76	0.71	0.65			0.86			0.67	1.00	0.92	0.78
30 (762)		0.98	0.79			0.72	0.78	0.73	0.66			0.96			0.72		0.95	0.80
36 (914)		1.00	0.84			0.87	0.83	0.77	0.69			1.00			0.87		1.00	0.88
>48 (1219)			0.96			1.00	0.94	0.86	0.76						1.00			1.00

Table 14 — 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	0.05	0.04	0.02	0.10	0.08	0.05	n/a	n/a	n/a
4-3/8 (111)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.53	0.20	0.15	0.09	0.40	0.30	0.18	n/a	n/a	n/a
5 (127)	0.61	0.58	0.55	0.59	0.52	0.45	0.57	0.55	0.54	0.24	0.18	0.11	0.49	0.37	0.22	n/a	n/a	n/a
6 (152)	0.63	0.60	0.56	0.64	0.56	0.47	0.58	0.56	0.55	0.32	0.24	0.14	0.64	0.48	0.29	n/a	n/a	n/a
7 (178)	0.65	0.61	0.57	0.70	0.60	0.49	0.59	0.58	0.55	0.40	0.30	0.18	0.70	0.60	0.36	n/a	n/a	n/a
8 (203)	0.67	0.63	0.58	0.76	0.64	0.52	0.60	0.59	0.56	0.49	0.37	0.22	0.76	0.64	0.44	n/a	n/a	n/a
9 (229)	0.69	0.64	0.59	0.82	0.68	0.54	0.62	0.60	0.57	0.59	0.44	0.27	0.82	0.68	0.53	n/a	n/a	n/a
9-7/8 (251)	0.71	0.66	0.59	0.87	0.72	0.56	0.63	0.61	0.58	0.68	0.51	0.30	0.87	0.72	0.56	0.72	n/a	n/a
10 (254)	0.71	0.66	0.60	0.88	0.73	0.56	0.63	0.61	0.58	0.69	0.52	0.31	0.88	0.73	0.56	0.72	n/a	n/a
11 (279)	0.73	0.67	0.60	0.95	0.77	0.59	0.64	0.62	0.58	0.80	0.60	0.36	0.95	0.77	0.59	0.76	n/a	n/a
12 (305)	0.75	0.69	0.61	1.00	0.82	0.61	0.66	0.63	0.59	0.91	0.68	0.41	1.00	0.82	0.61	0.79	n/a	n/a
12-1/2 (318)	0.76	0.70	0.62		0.84	0.62	0.66	0.63	0.60	0.97	0.72	0.43		0.84	0.62	0.81	0.73	n/a
14 (356)	0.80	0.72	0.63		0.91	0.66	0.68	0.65	0.61	1.00	0.86	0.51		0.91	0.66	0.85	0.78	n/a
16 (406)	0.84	0.75	0.65		1.00	0.71	0.71	0.67	0.62		1.00	0.63		1.00	0.71	0.91	0.83	n/a
18 (457)	0.88	0.79	0.67			0.76	0.73	0.69	0.64			0.75			0.76	0.97	0.88	n/a
19-1/2 (495)	0.91	0.81	0.69			0.80	0.75	0.71	0.65			0.85			0.80	1.00	0.92	0.77
20 (508)	0.92	0.82	0.69			0.82	0.76	0.71	0.65			0.88			0.82		0.93	0.78
22 (559)	0.97	0.85	0.71			0.87	0.79	0.74	0.67			1.00			0.87		0.97	0.82
24 (610)	1.00	0.88	0.73			0.93	0.81	0.76	0.68						0.93		1.00	0.86
26 (660)		0.91	0.75			0.99	0.84	0.78	0.70						0.99			0.89
28 (711)		0.94	0.77			1.00	0.86	0.80	0.71						1.00			0.93
30 (762)		0.98	0.79				0.89	0.82	0.73									0.96
36 (914)		1.00	0.84				0.97	0.89	0.78									1.00
>48 (1219)			0.96				1.00	1.00	0.87									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

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

#8 Uncracked Concrete	Spacing Factor in Tension f_{AN}			Edge Distance Factor in Tension f_{RN}			Spacing Factor in Shear[4] f_{AV}			Edge Distance in Shear ⊥ Toward Edge f_{RV}			Edge Distance in Shear ‖ To Edge f_{RV}			Concrete Thickness Factor in Shear[5] f_{HV}		
Embedment h_{ef} in (mm)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h), — in (mm)																		
1-3/4 (44)	n/a	n/a	n/a	0.23	0.17	0.10	n/a	n/a	n/a	0.02	0.02	0.01	0.05	0.04	0.02	n/a	n/a	n/a
5 (127)	0.59	0.57	0.54	0.32	0.24	0.14	0.54	0.53	0.52	0.11	0.09	0.05	0.23	0.17	0.10	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	0.15	0.11	0.07	0.30	0.22	0.13	n/a	n/a	n/a
7 (178)	0.63	0.60	0.56	0.39	0.29	0.17	0.55	0.55	0.53	0.19	0.14	0.09	0.38	0.28	0.17	n/a	n/a	n/a
8 (203)	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
9 (229)	0.67	0.63	0.58	0.46	0.34	0.20	0.57	0.56	0.54	0.28	0.21	0.12	0.46	0.34	0.20	n/a	n/a	n/a
10 (254)	0.69	0.64	0.58	0.50	0.37	0.21	0.58	0.56	0.55	0.32	0.24	0.15	0.50	0.37	0.21	n/a	n/a	n/a
11 (279)	0.70	0.65	0.59	0.54	0.40	0.23	0.59	0.57	0.55	0.37	0.28	0.17	0.54	0.40	0.23	n/a	n/a	n/a
11-1/4 (286)	0.71	0.66	0.59	0.56	0.41	0.24	0.59	0.57	0.55	0.38	0.29	0.17	0.56	0.41	0.24	0.59	n/a	n/a
12 (305)	0.72	0.67	0.60	0.59	0.44	0.26	0.59	0.58	0.56	0.42	0.32	0.19	0.59	0.44	0.26	0.61	n/a	n/a
13 (330)	0.74	0.68	0.61	0.64	0.47	0.28	0.60	0.58	0.56	0.48	0.36	0.22	0.64	0.47	0.28	0.64	n/a	n/a
14 (356)	0.76	0.69	0.62	0.69	0.51	0.30	0.61	0.59	0.56	0.53	0.40	0.24	0.69	0.51	0.30	0.66	n/a	n/a
14-1/4 (362)	0.76	0.70	0.62	0.70	0.52	0.30	0.61	0.59	0.57	0.55	0.41	0.25	0.70	0.52	0.30	0.67	0.61	n/a
16 (406)	0.80	0.72	0.63	0.79	0.58	0.34	0.63	0.60	0.57	0.65	0.49	0.29	0.79	0.58	0.34	0.71	0.64	n/a
18 (457)	0.83	0.75	0.65	0.89	0.65	0.38	0.64	0.62	0.58	0.78	0.58	0.35	0.89	0.65	0.38	0.75	0.68	n/a
20 (508)	0.87	0.78	0.67	0.99	0.73	0.43	0.66	0.63	0.59	0.91	0.68	0.41	0.99	0.73	0.43	0.79	0.72	n/a
22 (559)	0.91	0.81	0.68	1.00	0.80	0.47	0.67	0.64	0.60	1.00	0.79	0.47	1.00	0.80	0.47	0.83	0.75	n/a
22-1/4 (565)	0.91	0.81	0.69		0.81	0.47	0.67	0.64	0.60		0.80	0.48		0.81	0.47	0.84	0.76	0.64
24 (610)	0.94	0.83	0.70		0.87	0.51	0.69	0.66	0.61		0.90	0.54		0.87	0.51	0.87	0.79	0.66
26 (660)	0.98	0.86	0.72		0.94	0.55	0.70	0.67	0.62		1.00	0.61		0.94	0.55	0.90	0.82	0.69
28 (711)	1.00	0.89	0.73		1.00	0.60	0.72	0.68	0.63			0.68		1.00	0.60	0.94	0.85	0.72
30 (762)		0.92	0.75			0.64	0.74	0.69	0.64			0.75			0.64	0.97	0.88	0.74
36 (914)		1.00	0.80			0.77	0.78	0.73	0.67			0.99			0.77	1.00	0.97	0.81
>48 (1219)			0.90			1.00	0.88	0.81	0.72			1.00			1.00		1.00	0.94

Table 16 — Load adjustment factors for #8 rebar in cracked concrete [1,2,3]

#8 Cracked Concrete	Spacing Factor in Tension f_{AN}			Edge Distance Factor in Tension f_{RN}			Spacing Factor in Shear[4] f_{AV}			Edge Distance in Shear ⊥ Toward Edge f_{RV}			Edge Distance in Shear ‖ To Edge f_{RV}			Concrete Thickness Factor in Shear[5] f_{HV}		
Embedment h_{ef} in (mm)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)	9 (229)	12 (305)	20 (508)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h), — in (mm)																		
1-3/4 (44)	n/a	n/a	n/a	0.42	0.40	0.38	n/a	n/a	n/a	0.04	0.03	0.02	0.08	0.06	0.04	n/a	n/a	n/a
5 (127)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.53	0.20	0.15	0.09	0.39	0.30	0.18	n/a	n/a	n/a
6 (152)	0.61	0.58	0.55	0.60	0.53	0.46	0.57	0.56	0.54	0.26	0.19	0.12	0.52	0.39	0.23	n/a	n/a	n/a
7 (178)	0.63	0.60	0.56	0.65	0.57	0.47	0.58	0.57	0.55	0.33	0.24	0.15	0.65	0.49	0.29	n/a	n/a	n/a
8 (203)	0.65	0.61	0.57	0.70	0.60	0.49	0.59	0.57	0.55	0.40	0.30	0.18	0.70	0.60	0.36	n/a	n/a	n/a
9 (229)	0.67	0.63	0.58	0.75	0.64	0.51	0.60	0.58	0.56	0.48	0.36	0.21	0.75	0.64	0.43	n/a	n/a	n/a
10 (254)	0.69	0.64	0.58	0.80	0.67	0.53	0.61	0.59	0.57	0.56	0.42	0.25	0.80	0.67	0.50	n/a	n/a	n/a
11 (279)	0.70	0.65	0.59	0.86	0.71	0.55	0.62	0.60	0.57	0.64	0.48	0.29	0.86	0.71	0.55	n/a	n/a	n/a
11-1/4 (286)	0.71	0.66	0.59	0.87	0.72	0.56	0.63	0.60	0.57	0.66	0.50	0.30	0.87	0.72	0.56	0.71	n/a	n/a
12 (305)	0.72	0.67	0.60	0.91	0.75	0.57	0.64	0.61	0.58	0.73	0.55	0.33	0.91	0.75	0.57	0.74	n/a	n/a
13 (330)	0.74	0.68	0.61	0.97	0.79	0.59	0.65	0.62	0.59	0.83	0.62	0.37	0.97	0.79	0.59	0.77	n/a	n/a
14 (356)	0.76	0.69	0.62	1.00	0.83	0.62	0.66	0.63	0.59	0.92	0.69	0.42	1.00	0.83	0.62	0.79	n/a	n/a
14-1/4 (362)	0.76	0.70	0.62		0.84	0.62	0.66	0.63	0.59	0.95	0.71	0.43		0.84	0.62	0.80	0.73	n/a
16 (406)	0.80	0.72	0.63		0.91	0.66	0.68	0.65	0.61	1.00	0.85	0.51		0.91	0.66	0.85	0.77	n/a
18 (457)	0.83	0.75	0.65		1.00	0.70	0.70	0.67	0.62		1.00	0.61		1.00	0.70	0.90	0.82	n/a
20 (508)	0.87	0.78	0.67			0.75	0.73	0.69	0.63			0.71			0.75	0.95	0.86	n/a
22 (559)	0.91	0.81	0.68			0.80	0.75	0.70	0.65			0.82			0.80	1.00	0.91	n/a
22-1/4 (565)	0.91	0.81	0.69			0.80	0.75	0.71	0.65			0.83			0.80		0.91	0.77
24 (610)	0.94	0.83	0.70			0.85	0.77	0.72	0.66			0.93			0.85		0.95	0.80
26 (660)	0.98	0.86	0.72			0.90	0.79	0.74	0.67			1.00			0.90		0.98	0.83
28 (711)	1.00	0.89	0.73			0.95	0.82	0.76	0.69						0.95		1.00	0.86
30 (762)		0.92	0.75			1.00	0.84	0.78	0.70						1.00			0.89
36 (914)		1.00	0.80				0.91	0.84	0.74									0.98
>48 (1219)			0.90				1.00	0.95	0.82									1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 17 — 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	0.16	0.10	n/a	n/a	n/a
6	(152)	0.60	0.57	0.54	0.34	0.25	0.14	0.54	0.53	0.52	0.12	0.09	0.05	0.24	0.18	0.11	n/a	n/a	n/a
7	(178)	0.62	0.59	0.55	0.37	0.27	0.16	0.55	0.54	0.53	0.15	0.11	0.07	0.31	0.23	0.14	n/a	n/a	n/a
8	(203)	0.63	0.60	0.56	0.40	0.29	0.17	0.55	0.54	0.53	0.19	0.14	0.08	0.37	0.28	0.17	n/a	n/a	n/a
9	(229)	0.65	0.61	0.57	0.43	0.31	0.18	0.56	0.55	0.54	0.22	0.17	0.10	0.43	0.31	0.18	n/a	n/a	n/a
10	(254)	0.66	0.62	0.57	0.46	0.34	0.20	0.57	0.56	0.54	0.26	0.20	0.12	0.46	0.34	0.20	n/a	n/a	n/a
11	(279)	0.68	0.64	0.58	0.50	0.36	0.21	0.57	0.56	0.54	0.30	0.23	0.14	0.50	0.36	0.21	n/a	n/a	n/a
12	(305)	0.70	0.65	0.59	0.54	0.39	0.23	0.58	0.57	0.55	0.34	0.26	0.15	0.54	0.39	0.23	n/a	n/a	n/a
12-7/8	(327)	0.71	0.66	0.60	0.57	0.42	0.25	0.59	0.57	0.55	0.38	0.29	0.17	0.57	0.42	0.25	0.59	n/a	n/a
13	(330)	0.71	0.66	0.60	0.58	0.43	0.25	0.59	0.57	0.55	0.39	0.29	0.17	0.58	0.43	0.25	0.59	n/a	n/a
14	(356)	0.73	0.67	0.60	0.62	0.46	0.27	0.60	0.58	0.56	0.43	0.32	0.19	0.62	0.46	0.27	0.62	n/a	n/a
16	(406)	0.76	0.70	0.62	0.71	0.52	0.31	0.61	0.59	0.56	0.53	0.40	0.24	0.71	0.52	0.31	0.66	n/a	n/a
16-1/4	(413)	0.77	0.70	0.62	0.72	0.53	0.31	0.61	0.59	0.56	0.54	0.40	0.24	0.72	0.53	0.31	0.66	0.60	n/a
18	(457)	0.80	0.72	0.63	0.80	0.59	0.35	0.62	0.60	0.57	0.63	0.47	0.28	0.80	0.59	0.35	0.70	0.64	n/a
20	(508)	0.83	0.75	0.65	0.89	0.66	0.38	0.64	0.61	0.58	0.74	0.55	0.33	0.89	0.66	0.38	0.74	0.67	n/a
22	(559)	0.86	0.77	0.66	0.98	0.72	0.42	0.65	0.62	0.59	0.85	0.64	0.38	0.98	0.72	0.42	0.77	0.70	n/a
24	(610)	0.90	0.80	0.68	1.00	0.79	0.46	0.66	0.63	0.60	0.97	0.73	0.44	1.00	0.79	0.46	0.81	0.73	n/a
25-1/4	(641)	0.92	0.81	0.69		0.83	0.48	0.67	0.64	0.60	1.00	0.78	0.47		0.83	0.48	0.83	0.75	0.64
26	(660)	0.93	0.82	0.69		0.85	0.50	0.68	0.65	0.60		0.82	0.49		0.85	0.50	0.84	0.76	0.64
28	(711)	0.96	0.85	0.71		0.92	0.54	0.69	0.66	0.61		0.92	0.55		0.92	0.54	0.87	0.79	0.67
30	(762)	0.99	0.87	0.72		0.98	0.58	0.70	0.67	0.62		1.00	0.61		0.98	0.58	0.90	0.82	0.69
36	(914)	1.00	0.94	0.77		1.00	0.69	0.74	0.70	0.64			0.80		1.00	0.69	0.99	0.90	0.76
>48	(1219)		1.00	0.86			0.92	0.83	0.77	0.69			1.00			0.92	1.00	1.00	0.88

Table 18 — 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	0.03	0.03	0.02	0.07	0.05	0.03	n/a	n/a	n/a
5-5/8	(143)	0.59	0.57	0.54	0.56	0.50	0.44	0.56	0.55	0.53	0.20	0.15	0.09	0.39	0.29	0.18	n/a	n/a	n/a
6	(152)	0.60	0.57	0.54	0.57	0.51	0.44	0.56	0.55	0.54	0.22	0.16	0.10	0.43	0.32	0.19	n/a	n/a	n/a
7	(178)	0.62	0.59	0.55	0.61	0.54	0.46	0.57	0.56	0.54	0.27	0.20	0.12	0.54	0.41	0.24	n/a	n/a	n/a
8	(203)	0.63	0.60	0.56	0.65	0.57	0.48	0.58	0.57	0.55	0.33	0.25	0.15	0.65	0.50	0.30	n/a	n/a	n/a
9	(229)	0.65	0.61	0.57	0.70	0.60	0.49	0.59	0.57	0.55	0.40	0.30	0.18	0.70	0.59	0.36	n/a	n/a	n/a
10	(254)	0.66	0.62	0.57	0.74	0.63	0.51	0.60	0.58	0.56	0.46	0.35	0.21	0.74	0.63	0.42	n/a	n/a	n/a
11	(279)	0.68	0.64	0.58	0.79	0.67	0.53	0.61	0.59	0.56	0.54	0.40	0.24	0.79	0.67	0.48	n/a	n/a	n/a
12	(305)	0.70	0.65	0.59	0.84	0.70	0.55	0.62	0.60	0.57	0.61	0.46	0.27	0.84	0.70	0.55	n/a	n/a	n/a
12-7/8	(327)	0.71	0.66	0.60	0.88	0.73	0.56	0.63	0.61	0.58	0.68	0.51	0.31	0.88	0.73	0.56	0.72	n/a	n/a
13	(330)	0.71	0.66	0.60	0.89	0.73	0.56	0.63	0.61	0.58	0.69	0.52	0.31	0.89	0.73	0.56	0.72	n/a	n/a
14	(356)	0.73	0.67	0.60	0.94	0.77	0.58	0.64	0.62	0.58	0.77	0.58	0.35	0.94	0.77	0.58	0.75	n/a	n/a
16	(406)	0.76	0.70	0.62	1.00	0.84	0.62	0.66	0.63	0.59	0.94	0.71	0.42	1.00	0.84	0.62	0.80	n/a	n/a
16-1/4	(413)	0.77	0.70	0.62		0.85	0.63	0.66	0.63	0.60	0.96	0.72	0.43		0.85	0.63	0.81	0.73	n/a
18	(457)	0.80	0.72	0.63		0.91	0.66	0.68	0.65	0.61	1.00	0.84	0.50		0.91	0.66	0.85	0.77	n/a
20	(508)	0.83	0.75	0.65		0.99	0.70	0.70	0.67	0.62		0.99	0.59		0.99	0.70	0.89	0.81	n/a
22	(559)	0.86	0.77	0.66		1.00	0.74	0.72	0.68	0.63		1.00	0.68		1.00	0.74	0.94	0.85	n/a
24	(610)	0.90	0.80	0.68			0.78	0.74	0.70	0.64			0.78			0.78	0.98	0.89	n/a
25-1/4	(641)	0.92	0.81	0.69			0.81	0.75	0.71	0.65			0.84			0.81	1.00	0.91	0.77
26	(660)	0.93	0.82	0.69			0.82	0.76	0.71	0.65			0.88			0.82		0.93	0.78
28	(711)	0.96	0.85	0.71			0.87	0.78	0.73	0.66			0.98			0.87		0.96	0.81
30	(762)	0.99	0.87	0.72			0.91	0.80	0.75	0.68			1.00			0.91		1.00	0.84
36	(914)	1.00	0.94	0.77			1.00	0.86	0.80	0.71						1.00			0.92
>48	(1219)		1.00	0.86			1.00	0.98	0.90	0.78									1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 19 — 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	0.32	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	0.34	0.25	0.15	0.54	0.53	0.52	0.13	0.09	0.06	0.26	0.19	0.11	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	0.29	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	0.18	0.56	0.55	0.54	0.22	0.16	0.10	0.43	0.32	0.18	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	0.21	0.13	0.49	0.36	0.21	n/a	n/a	n/a
13	(330)	0.69	0.64	0.59	0.53	0.39	0.23	0.58	0.56	0.55	0.33	0.24	0.14	0.53	0.39	0.23	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	0.42	0.25	0.59	0.57	0.55	0.37	0.27	0.16	0.58	0.42	0.25	0.59	n/a	n/a
15	(381)	0.72	0.67	0.60	0.61	0.45	0.26	0.59	0.57	0.55	0.40	0.30	0.18	0.61	0.45	0.26	0.60	n/a	n/a
16	(406)	0.74	0.68	0.61	0.65	0.47	0.28	0.60	0.58	0.56	0.45	0.33	0.20	0.65	0.47	0.28	0.62	n/a	n/a
17	(432)	0.75	0.69	0.61	0.69	0.50	0.30	0.60	0.58	0.56	0.49	0.36	0.21	0.69	0.50	0.30	0.64	n/a	n/a
18	(457)	0.77	0.70	0.62	0.73	0.53	0.31	0.61	0.59	0.56	0.53	0.39	0.23	0.73	0.53	0.31	0.66	0.60	n/a
20	(508)	0.80	0.72	0.63	0.81	0.59	0.35	0.62	0.60	0.57	0.62	0.46	0.27	0.81	0.59	0.35	0.70	0.63	n/a
22	(559)	0.83	0.74	0.65	0.89	0.65	0.38	0.63	0.61	0.58	0.72	0.53	0.32	0.89	0.65	0.38	0.73	0.66	n/a
24	(610)	0.86	0.77	0.66	0.97	0.71	0.42	0.65	0.62	0.58	0.82	0.60	0.36	0.97	0.71	0.42	0.76	0.69	n/a
26	(660)	0.89	0.79	0.67	1.00	0.77	0.45	0.66	0.63	0.59	0.92	0.68	0.41	1.00	0.77	0.45	0.79	0.72	n/a
28	(711)	0.91	0.81	0.69	1.00	0.83	0.49	0.67	0.64	0.60	1.00	0.76	0.45		0.83	0.49	0.82	0.74	0.63
30	(762)	0.94	0.83	0.70		0.89	0.52	0.68	0.65	0.61		0.84	0.50		0.89	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	0.66		1.00	0.63	0.94	0.84	0.71
>48	(1219)		1.00	0.82			0.83	0.79	0.74	0.67			1.00			0.83	1.00	0.97	0.82

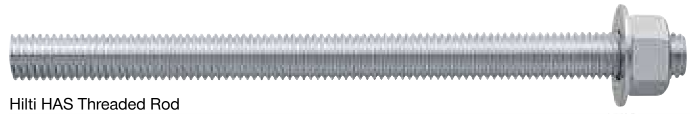
Table 20 — Load adjustment factors for #10 rebar in cracked concrete [1,2,3]

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

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

2.4.9 Hilti HIT-RE 100 Adhesive with Hilti HAS Threaded Rod


Hilti HAS Threaded Rod


Hilti HIT-V Threaded Rod

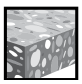
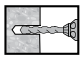
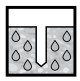
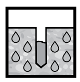
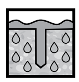
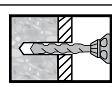
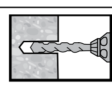
Cracked or uncracked concrete	Permissible concete conditions	Permissible drilling methods
 Uncracked Concrete  Cracked Concrete	 Dry concrete  Water-saturated concrete  Water-filled holes  Submerged (underwater)	 Hammer Drilling with Carbide Tipped Drill Bit

Table 21 — Specifications for fractional threaded rod installed with HIT-RE 100 adhesive

Setting information		Symbol	Units	Nominal anchor diameter						
				3/8	1/2	5/8	3/4	7/8	1	1-1/4
Nominal bit diameter		d_o	in.	7/16	9/16	3/4	7/8	1	1-1/8	1-3/8
Standard effective embedment		$h_{ef,std}$	in.	3-3/8	4-1/2	5-5/8	6-3/4	7-7/8	9	11-1/4
			(mm)	(86)	(114)	(143)	(171)	(200)	(229)	(286)
Effective Embedment	minimum	$h_{ef,min}$	in.	2-3/8	2-3/4	3-1/8	3-1/2	3-1/2	4	5
			(mm)	(60)	(70)	(79)	(89)	(89)	(102)	(127)
	maximum	$h_{ef,max}$	in.	7-1/2	10	12-1/2	15	17-1/2	20	25
			(mm)	(191)	(254)	(318)	(381)	(445)	(508)	(635)
Minimum diameter of fixture hole	through-set		in.	1/2	5/8	13/16[1]	15/16[1]	1-1/8[1]	1-1/4[1]	1-1/2[1]
	preset		in.	7/16	19/16	11/16	13/16	15/16	1-1/8	1-3/8
Installation torque		T_{inst}	ft-lb	15	30	60	100	125	150	200
			(Nm)	(20)	(40)	(80)	(136)	(169)	(203)	(271)
Minimum Concrete Thickness		h_{min}	in.	h_{ef} + 1-1/4		5/8 to 7/8 rods also have min. conc.			h_{ef} + 2	h_{ef} + 3
			(mm)	(h_{ef} + 51)		thickness = h_{ef}+2d_o			(h_{ef} + 57)	(h_{ef} + 76)
Minimum edge distance[2]		c_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)
Minimum anchor spacing		s_{min}	in.	1-7/8	2-1/2	3-1/8	3-3/4	4-3/8	5	5-5/8
			(mm)	(48)	(64)	(79)	(95)	(111)	(127)	(143)

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

Figure 4 — HAS/HIT-V threaded rods

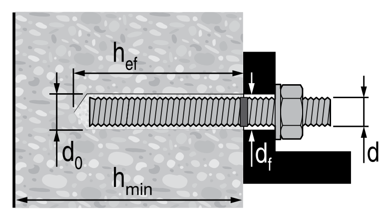
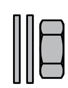


Figure 5 — Installation with (2) washers



HIT-RE 100 adhesive anchoring system

Table 22 — Hilti HIT-RE 100 adhesive design strength with concrete / bond failure for fractional threaded rod in uncracked concrete [1,2,3,4,5,6,7,8,9,10]

Nominal Anchor Diameter in. (mm)	Nominal anchor diameter 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)	1,955 (8.7)	1,995 (8.9)	2,050 (9.1)	2,135 (9.5)	2,490 (11.1)	2,535 (11.3)	2,610 (11.6)	2,720 (12.1)
	3-3/8 (86)	2,780 (12.4)	2,835 (12.6)	2,915 (13.0)	3,035 (13.5)	7,080 (31.5)	7,210 (32.1)	7,420 (33.0)	7,730 (34.4)
	4-1/2 (114)	3,710 (16.5)	3,775 (16.8)	3,885 (17.3)	4,050 (18.0)	9,440 (42.0)	9,615 (42.8)	9,895 (44.0)	10,305 (45.8)
	7-1/2 (191)	6,180 (27.5)	6,295 (28.0)	6,480 (28.8)	6,745 (30.0)	15,735 (70.0)	16,025 (71.3)	16,490 (73.4)	17,175 (76.4)
1/2	2-3/4 (70)	2,985 (13.3)	3,040 (13.5)	3,130 (13.9)	3,255 (14.5)	7,595 (33.8)	7,735 (34.4)	7,960 (35.4)	8,290 (36.9)
	4-1/2 (114)	4,885 (21.7)	4,975 (22.1)	5,120 (22.8)	5,330 (23.7)	12,430 (55.3)	12,660 (56.3)	13,030 (58.0)	13,565 (60.3)
	6 (152)	6,510 (29.0)	6,630 (29.5)	6,825 (30.4)	7,105 (31.6)	16,575 (73.7)	16,875 (75.1)	17,370 (77.3)	18,090 (80.5)
	10 (254)	10,850 (48.3)	11,050 (49.2)	11,375 (50.6)	11,845 (52.7)	27,620 (122.9)	28,130 (125.1)	28,950 (128.8)	30,150 (134.1)
5/8	3-1/8 (79)	4,065 (18.1)	4,140 (18.4)	4,260 (18.9)	4,435 (19.7)	9,280 (41.3)	10,165 (45.2)	10,840 (48.2)	11,290 (50.2)
	5-5/8 (143)	7,315 (32.5)	7,450 (33.1)	7,665 (34.1)	7,985 (35.5)	18,615 (82.8)	18,960 (84.3)	19,515 (86.8)	20,320 (90.4)
	7-1/2 (191)	9,750 (43.4)	9,930 (44.2)	10,220 (45.5)	10,645 (47.4)	24,825 (110.4)	25,280 (112.5)	26,015 (115.7)	27,095 (120.5)
	12-1/2 (318)	16,255 (72.3)	16,550 (73.6)	17,035 (75.8)	17,740 (78.9)	41,370 (184.0)	42,130 (187.4)	43,360 (192.9)	45,155 (200.9)
3/4	3-1/2 (89)	5,105 (22.7)	5,375 (23.9)	5,535 (24.6)	5,765 (25.6)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	14,670 (65.3)
	6-3/4 (171)	10,180 (45.3)	10,370 (46.1)	10,670 (47.5)	11,115 (49.4)	25,920 (115.3)	26,395 (117.4)	27,165 (120.8)	28,290 (125.8)
	9 (229)	13,575 (60.4)	13,825 (61.5)	14,230 (63.3)	14,820 (65.9)	34,555 (153.7)	35,195 (156.6)	36,220 (161.1)	37,720 (167.8)
	15 (381)	22,625 (100.6)	23,045 (102.5)	23,715 (105.5)	24,695 (109.8)	57,595 (256.2)	58,655 (260.9)	60,365 (268.5)	62,865 (279.6)
7/8	3-1/2 (89)	5,105 (22.7)	5,595 (24.9)	6,235 (27.7)	6,490 (28.9)	11,000 (48.9)	12,050 (53.6)	13,915 (61.9)	16,525 (73.5)
	7-7/8 (200)	13,385 (59.5)	13,630 (60.6)	14,025 (62.4)	14,605 (65.0)	34,065 (151.5)	34,690 (154.3)	35,705 (158.8)	37,180 (165.4)
	10-1/2 (267)	17,845 (79.4)	18,170 (80.8)	18,700 (83.2)	19,475 (86.6)	45,420 (202.0)	46,255 (205.8)	47,605 (211.8)	49,575 (220.5)
	17-1/2 (445)	29,740 (132.3)	30,285 (134.7)	31,170 (138.7)	32,460 (144.4)	75,700 (336.7)	77,090 (342.9)	79,340 (352.9)	82,625 (367.5)
1	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	8,240 (36.7)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	9 (229)	16,980 (75.5)	17,295 (76.9)	17,800 (79.2)	18,535 (82.4)	43,225 (192.3)	44,020 (195.8)	45,305 (201.5)	47,180 (209.9)
	12 (305)	22,640 (100.7)	23,060 (102.6)	23,730 (105.6)	24,715 (109.9)	57,635 (256.4)	58,695 (261.1)	60,410 (268.7)	62,910 (279.8)
	20 (508)	37,735 (167.9)	38,430 (170.9)	39,555 (175.9)	41,190 (183.2)	96,055 (427.3)	97,825 (435.1)	100,680 (447.8)	104,845 (466.4)
1-1/4	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	12,355 (55.0)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	11-1/4 (286)	25,465 (113.3)	25,935 (115.4)	26,690 (118.7)	27,795 (123.6)	63,395 (282.0)	66,010 (293.6)	67,940 (302.2)	70,750 (314.7)
	15 (381)	33,955 (151.0)	34,575 (153.8)	35,585 (158.3)	37,060 (164.9)	86,425 (384.4)	88,015 (391.5)	90,585 (402.9)	94,335 (419.6)
	25 (635)	56,590 (251.7)	57,630 (256.3)	59,310 (263.8)	61,765 (274.7)	144,040 (640.7)	146,690 (652.5)	150,975 (671.6)	157,220 (699.3)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 26-38 as necessary. Compare to the steel values in table 24 . The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.4.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

HIT-RE 100 adhesive anchoring system

Table 23 — Hilti HIT-RE 100 adhesive design strength with concrete / bond failure for threaded rod in cracked concrete [1,2,3,4,5,6,7,8,9,10]

Nominal anchor diameter in. (mm)	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	2-3/8 (60)	950 (4.2)	965 (4.3)	995 (4.4)	1,035 (4.6)	1,205 (5.4)	1,230 (5.5)	1,265 (5.6)	1,315 (5.8)
	3-3/8 (86)	1,345 (6.0)	1,370 (6.1)	1,410 (6.3)	1,470 (6.5)	3,430 (15.3)	3,490 (15.5)	3,595 (16.0)	3,745 (16.7)
	4-1/2 (114)	1,795 (8.0)	1,830 (8.1)	1,885 (8.4)	1,960 (8.7)	4,570 (20.3)	4,655 (20.7)	4,790 (21.3)	4,990 (22.2)
	7-1/2 (191)	2,995 (13.3)	3,050 (13.6)	3,140 (14.0)	3,265 (14.5)	7,620 (33.9)	7,760 (34.5)	7,985 (35.5)	8,315 (37.0)
1/2	2-3/4 (70)	1,405 (6.2)	1,430 (6.4)	1,475 (6.6)	1,535 (6.8)	3,580 (15.9)	3,645 (16.2)	3,750 (16.7)	3,910 (17.4)
	4-1/2 (114)	2,300 (10.2)	2,345 (10.4)	2,410 (10.7)	2,510 (11.2)	5,860 (26.1)	5,965 (26.5)	6,140 (27.3)	6,395 (28.4)
	6 (152)	3,070 (13.7)	3,125 (13.9)	3,215 (14.3)	3,350 (14.9)	7,810 (34.7)	7,955 (35.4)	8,185 (36.4)	8,525 (37.9)
	10 (254)	5,115 (22.8)	5,210 (23.2)	5,360 (23.8)	5,580 (24.8)	13,020 (57.9)	13,260 (59.0)	13,645 (60.7)	14,210 (63.2)
5/8	3-1/8 (79)	2,000 (8.9)	2,035 (9.1)	2,095 (9.3)	2,180 (9.7)	5,085 (22.6)	5,180 (23.0)	5,330 (23.7)	5,550 (24.7)
	5-5/8 (143)	3,595 (16.0)	3,660 (16.3)	3,770 (16.8)	3,925 (17.5)	9,155 (40.7)	9,320 (41.5)	9,595 (42.7)	9,990 (44.4)
	7-1/2 (191)	4,795 (21.3)	4,885 (21.7)	5,025 (22.4)	5,235 (23.3)	12,205 (54.3)	12,430 (55.3)	12,790 (56.9)	13,320 (59.3)
	12-1/2 (318)	7,990 (35.5)	8,140 (36.2)	8,375 (37.3)	8,725 (38.8)	20,340 (90.5)	20,715 (92.1)	21,320 (94.8)	22,205 (98.8)
3/4	3-1/2 (89)	2,540 (11.3)	2,585 (11.5)	2,660 (11.8)	2,770 (12.3)	6,465 (28.8)	6,585 (29.3)	6,775 (30.1)	7,055 (31.4)
	6-3/4 (171)	4,900 (21.8)	4,990 (22.2)	5,135 (22.8)	5,345 (23.8)	12,470 (55.5)	12,700 (56.5)	13,070 (58.1)	13,610 (60.5)
	9 (229)	6,530 (29.0)	6,650 (29.6)	6,845 (30.4)	7,130 (31.7)	16,625 (74.0)	16,930 (75.3)	17,425 (77.5)	18,145 (80.7)
	15 (381)	10,885 (48.4)	11,085 (49.3)	11,410 (50.8)	11,880 (52.8)	27,710 (123.3)	28,220 (125.5)	29,040 (129.2)	30,245 (134.5)
7/8	3-1/2 (89)	2,730 (12.1)	2,780 (12.4)	2,860 (12.7)	2,980 (13.3)	6,950 (30.9)	7,080 (31.5)	7,285 (32.4)	7,585 (33.7)
	7-7/8 (200)	6,145 (27.3)	6,255 (27.8)	6,440 (28.6)	6,705 (29.8)	15,640 (69.6)	15,925 (70.8)	16,390 (72.9)	17,070 (75.9)
	10-1/2 (267)	8,190 (36.4)	8,340 (37.1)	8,585 (38.2)	8,940 (39.8)	20,850 (92.7)	21,235 (94.5)	21,855 (97.2)	22,760 (101.2)
	17-1/2 (445)	13,650 (60.7)	13,905 (61.9)	14,310 (63.7)	14,900 (66.3)	34,750 (154.6)	35,390 (157.4)	36,425 (162.0)	37,930 (168.7)
1	4 (102)	3,320 (14.8)	3,380 (15.0)	3,475 (15.5)	3,620 (16.1)	8,445 (37.6)	8,600 (38.3)	8,850 (39.4)	9,215 (41.0)
	9 (229)	7,465 (33.2)	7,600 (33.8)	7,825 (34.8)	8,145 (36.2)	19,000 (84.5)	19,350 (86.1)	19,915 (88.6)	20,740 (92.3)
	12 (305)	9,955 (44.3)	10,135 (45.1)	10,430 (46.4)	10,865 (48.3)	25,335 (112.7)	25,800 (114.8)	26,555 (118.1)	27,650 (123.0)
	20 (508)	16,590 (73.8)	16,895 (75.2)	17,385 (77.3)	18,105 (80.5)	42,225 (187.8)	43,000 (191.3)	44,255 (196.9)	46,085 (205.0)
1-1/4	5 (127)	4,405 (19.6)	4,485 (20.0)	4,620 (20.6)	4,810 (21.4)	11,215 (49.9)	11,420 (50.8)	11,755 (52.3)	12,240 (54.4)
	11-1/4 (286)	9,915 (44.1)	10,095 (44.9)	10,390 (46.2)	10,820 (48.1)	25,235 (112.3)	25,700 (114.3)	26,450 (117.7)	27,545 (122.5)
	15 (381)	13,220 (58.8)	13,460 (59.9)	13,855 (61.6)	14,430 (64.2)	33,645 (149.7)	34,265 (152.4)	35,265 (156.9)	36,725 (163.4)
	25 (635)	22,030 (98.0)	22,435 (99.8)	23,090 (102.7)	24,045 (107.0)	56,075 (249.4)	57,110 (254.0)	58,775 (261.4)	61,210 (272.3)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 5-20 as necessary. Compare to the steel values in table 24. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.4.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.675. See section 2.4.5 for additional information on seismic applications

HIT-RE 100 adhesive anchoring system

Table 24 — Steel design strength for Hilti HIT-V and HAS threaded rods [1]

Nominal anchor diameter in. (mm)	HAS-E ISO 898 Class 5.8 [2]			HAS-E-B7 ASTM A193 B7 [3]			HAS-R stainless steel ASTM F 593 - AISI 304/316 SS [2]		
	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)	Tensile[4] ϕN_{sa} lb (kN)	Shear[5] ϕV_{sa} lb (kN)	Seismic Shear[6] $\phi V_{sa,eq}$ lb (kN)
3/8	3,655 (16.3)	2,020 (9.0)	1,415 (6.3)	7,265 (32.3)	3,775 (16.8)	2,645 (11.8)	5,040 (22.4)	2,790 (12.4)	1,955 (8.7)
1/2	6,690 (29.8)	3,705 (16.5)	2,595 (11.5)	13,300 (59.2)	6,915 (30.8)	4,840 (21.5)	9,225 (41.0)	5,110 (22.7)	3,575 (15.9)
5/8	10,650 (47.4)	5,900 (26.2)	4,130 (18.4)	21,190 (94.3)	11,020 (49.0)	7,715 (34.3)	14,690 (65.3)	8,135 (36.2)	5,695 (25.3)
3/4	15,765 (70.1)	8,730 (38.8)	6,110 (27.2)	31,360 (139.5)	16,305 (72.5)	11,415 (50.8)	18,480 (82.2)	10,235 (45.5)	7,165 (31.9)
7/8	21,755 (96.8)	12,050 (53.6)	8,435 (37.5)	43,285 (192.5)	22,505 (100.1)	15,755 (70.1)	25,510 (113.5)	14,125 (62.8)	9,890 (44.0)
1	28,540 (127.0)	15,805 (70.3)	11,065 (49.2)	56,785 (252.6)	29,525 (131.3)	20,670 (91.9)	33,465 (148.9)	18,535 (82.4)	12,975 (57.7)
1-1/4	45,670 (203.1)	25,295 (112.5)	17,705 (78.8)	90,850 (404.1)	47,240 (210.1)	33,070 (147.1)	53,540 (238.2)	29,655 (131.9)	20,760 (92.3)

1 See Section 2.4.4 to convert design strength value to ASD value.
2 HAS-E and HAS-R threaded rods are considered brittle steel elements.
HAS-E does not comply with % elongation requirements of ISO 898-1.
3 HAS-E-B7 rods are considered ductile steel elements.
4 Tensile = $\phi A_{se,N} f_{uta}$ as noted inACI 318-14 Chapter 17
5 Shear = ϕ 0.60 $As_{e,V} f_{uta}$ as noted inACI 318-14 Chapter 17. For 3/8-in diameter threaded rod, shear = ϕ 0.50 $A_{se,V} f_{uta}$
6 Seismic Shear = $\alpha_{V,seis} \phi V_{sa}$: Reduction for seismic shear only. See section 2.4.5 for additional information on seismic applications.

HIT-RE 100 adhesive anchoring system

Table 25 — Load adjustment factors for 3/8-in. diameter fractional threaded rods in uncracked concrete [1,2,3]

3/8 in Uncracked Concrete		Spacing Factor in Tension f_{AN}				Edge Distance Factor in Tension f_{RN}				Spacing Factor in Shear[4] f_{AV}				Edge Distance in Shear ⊥ Toward Edge f_{RV}				Edge Distance in Shear ‖ To Edge f_{RV}				Conc. Thickness Factor in Shear[5] f_{HV}			
Embedment h_{ef} in (mm)		2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h), — in (mm) 1-3/4	(44)	n/a	n/a	n/a	n/a	0.43	0.32	0.23	0.13	n/a	n/a	n/a	n/a	0.28	0.10	0.08	0.05	0.43	0.21	0.16	0.09	n/a	n/a	n/a	n/a
1-7/8	(48)	0.61	0.59	0.57	0.54	0.45	0.33	0.24	0.14	0.58	0.54	0.53	0.52	0.31	0.12	0.09	0.05	0.45	0.23	0.17	0.10	n/a	n/a	n/a	n/a
2	(51)	0.62	0.60	0.57	0.54	0.47	0.34	0.25	0.14	0.58	0.54	0.53	0.52	0.34	0.13	0.10	0.06	0.47	0.25	0.19	0.11	n/a	n/a	n/a	n/a
3	(76)	0.68	0.65	0.61	0.57	0.60	0.42	0.31	0.18	0.62	0.56	0.55	0.54	0.63	0.23	0.18	0.11	0.60	0.42	0.31	0.18	n/a	n/a	n/a	n/a
3-5/8	(92)	0.72	0.68	0.63	0.58	0.70	0.48	0.35	0.20	0.65	0.58	0.56	0.54	0.84	0.31	0.23	0.14	0.70	0.48	0.35	0.20	0.77	n/a	n/a	n/a
4	(102)	0.74	0.70	0.65	0.59	0.77	0.52	0.38	0.22	0.66	0.58	0.57	0.55	0.98	0.36	0.27	0.16	0.77	0.52	0.38	0.22	0.81	n/a	n/a	n/a
4-5/8	(117)	0.77	0.73	0.67	0.60	0.89	0.60	0.43	0.25	0.69	0.60	0.58	0.56	1.00	0.45	0.34	0.20	0.89	0.60	0.43	0.25	0.87	0.62	n/a	n/a
5	(127)	0.80	0.75	0.69	0.61	0.96	0.64	0.47	0.27	0.70	0.61	0.59	0.56		0.50	0.38	0.23	0.96	0.64	0.47	0.27	0.91	0.65	n/a	n/a
5-3/4	(146)	0.84	0.78	0.71	0.63	1.00	0.74	0.54	0.31	0.74	0.62	0.60	0.57		0.62	0.46	0.28	1.00	0.74	0.54	0.31	0.97	0.70	0.63	n/a
6	(152)	0.86	0.80	0.72	0.63		0.77	0.56	0.33	0.75	0.63	0.60	0.57		0.66	0.50	0.30		0.77	0.56	0.33	0.99	0.71	0.65	n/a
7	(178)	0.92	0.85	0.76	0.66		0.90	0.66	0.38	0.79	0.65	0.62	0.59		0.83	0.62	0.37		0.90	0.66	0.38	1.00	0.77	0.70	n/a
8	(203)	0.97	0.90	0.80	0.68		1.00	0.75	0.43	0.83	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)	1.00	0.93	0.82	0.69			0.82	0.48	0.86	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	0.87	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	0.91	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	0.95	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	0.99	0.75	0.71	0.65				0.84				0.65		1.00	0.91	0.77
14	(356)			1.00	0.81				0.76	1.00	0.80	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)												0.95												
>48	(1219)												1.00												

Table 26 — Load adjustment factors for 3/8-in. diameter fractional threaded rods in cracked concrete [1,2,3]

3/8 in Cracked Concrete		Spacing Factor in Tension f_{AN}				Edge Distance Factor in Tension f_{RN}				Spacing Factor in Shear[4] f_{AV}				Edge Distance in Shear ⊥ Toward Edge f_{RV}				Edge Distance in Shear ‖ To Edge f_{RV}				Conc. Thickness Factor in Shear[5] f_{HV}			
Embedment h_{ef} in (mm)		2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)	2-3/8 (60)	3-3/8 (86)	4-1/2 (114)	7-1/2 (191)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h), — in (mm) 1-3/4	(44)	n/a	n/a	n/a	n/a	0.58	0.54	0.49	0.43	n/a	n/a	n/a	n/a	0.42	0.15	0.12	0.07	0.58	0.31	0.23	0.14	n/a	n/a	n/a	n/a
1-7/8	(48)	0.61	0.59	0.57	0.54	0.60	0.56	0.50	0.44	0.60	0.55	0.54	0.53	0.46	0.17	0.13	0.08	0.60	0.34	0.26	0.15	n/a	n/a	n/a	n/a
2	(51)	0.62	0.60	0.57	0.54	0.62	0.57	0.51	0.44	0.61	0.55	0.55	0.53	0.51	0.19	0.14	0.08	0.62	0.38	0.28	0.17	n/a	n/a	n/a	n/a
3	(76)	0.68	0.65	0.61	0.57	0.78	0.70	0.60	0.49	0.66	0.58	0.57	0.55	0.93	0.34	0.26	0.16	0.78	0.69	0.52	0.31	n/a	n/a	n/a	n/a
3-5/8	(92)	0.72	0.68	0.63	0.58	0.89	0.78	0.66	0.53	0.69	0.60	0.58	0.56	1.00	0.46	0.34	0.21	0.89	0.78	0.66	0.41	0.88	n/a	n/a	n/a
4	(102)	0.74	0.70	0.65	0.59	0.96	0.84	0.70	0.55	0.71	0.61	0.59	0.56		0.53	0.40	0.24	0.96	0.84	0.70	0.48	0.92	n/a	n/a	n/a
4-5/8	(117)	0.77	0.73	0.67	0.60	1.00	0.93	0.76	0.58	0.75	0.63	0.60	0.57		0.66	0.49	0.30	1.00	0.93	0.76	0.58	0.99	0.71	n/a	n/a
5	(127)	0.80	0.75	0.69	0.61		0.99	0.80	0.60	0.77	0.64	0.61	0.58		0.74	0.56	0.33		0.99	0.80	0.60	1.00	0.74	n/a	n/a
5-3/4	(146)	0.84	0.78	0.71	0.63		1.00	0.88	0.64	0.81	0.66	0.63	0.59		0.91	0.69	0.41		1.00	0.88	0.64		0.79	0.72	n/a
6	(152)	0.86	0.80	0.72	0.63			0.91	0.66	0.82	0.66	0.64	0.60		0.97	0.73	0.44			0.91	0.66		0.81	0.74	n/a
7	(178)	0.92	0.85	0.76	0.66			1.00	0.72	0.87	0.69	0.66	0.61		1.00	0.92	0.55			1.00	0.72		0.87	0.79	n/a
8	(203)	0.97	0.90	0.80	0.68				0.78	0.92	0.72	0.68	0.63			1.00	0.68				0.78		0.93	0.85	n/a
8-3/4	(222)	1.00	0.93	0.82	0.69				0.83	0.96	0.74	0.70	0.64				0.77				0.83		0.98	0.89	0.75
9	(229)		0.94	0.83	0.70				0.85	0.98	0.75	0.70	0.64				0.81				0.85		0.99	0.90	0.76
10	(254)		0.99	0.87	0.72				0.91	1.00	0.77	0.73	0.66				0.94				0.91		1.00	0.95	0.80
11	(279)		1.00	0.91	0.74				0.98		0.80	0.75	0.68				1.00				0.98			1.00	0.84
12	(305)			0.94	0.77				1.00		0.83	0.77	0.69								1.00				0.88
14	(356)			1.00	0.81						0.88	0.82	0.72												0.95
16	(406)				0.86						0.94	0.86	0.76												1.00
18	(457)				0.90						0.99	0.91	0.79												
24	(610)				1.00						1.00	1.00	0.88												
30	(762)												0.98												
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 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 27 — Load adjustment factors for 1/2-in. diameter fractional 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}				Conc. 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	0.40	0.27	0.20	0.12	n/a	n/a	n/a	n/a	0.10	0.07	0.05	0.03	0.21	0.14	0.10	0.06	n/a	n/a	n/a	n/a
2-1/2	(64)	0.61	0.59	0.57	0.54	0.48	0.32	0.23	0.14	0.55	0.54	0.53	0.52	0.18	0.12	0.09	0.05	0.35	0.23	0.18	0.11	n/a	n/a	n/a	n/a
3	(76)	0.63	0.61	0.58	0.55	0.53	0.35	0.26	0.15	0.56	0.55	0.54	0.53	0.23	0.15	0.12	0.07	0.47	0.31	0.23	0.14	n/a	n/a	n/a	n/a
4	(102)	0.68	0.65	0.61	0.57	0.66	0.41	0.30	0.18	0.58	0.56	0.55	0.54	0.36	0.24	0.18	0.11	0.66	0.41	0.30	0.18	0.58	n/a	n/a	n/a
5	(127)	0.72	0.69	0.64	0.58	0.82	0.48	0.35	0.21	0.61	0.58	0.57	0.55	0.50	0.33	0.25	0.15	0.82	0.48	0.35	0.21	0.65	n/a	n/a	n/a
5-3/4	(146)	0.76	0.71	0.66	0.60	0.94	0.54	0.40	0.23	0.62	0.59	0.58	0.55	0.62	0.41	0.31	0.18	0.94	0.54	0.40	0.23	0.70	0.61	n/a	n/a
6	(152)	0.77	0.72	0.67	0.60	0.98	0.57	0.42	0.24	0.63	0.60	0.58	0.56	0.66	0.43	0.33	0.20	0.98	0.57	0.42	0.24	0.71	0.62	n/a	n/a
7	(178)	0.81	0.76	0.69	0.62	1.00	0.66	0.48	0.28	0.65	0.61	0.59	0.57	0.83	0.55	0.41	0.25	1.00	0.66	0.48	0.28	0.77	0.67	n/a	n/a
7-1/4	(184)	0.82	0.77	0.70	0.62		0.68	0.50	0.29	0.65	0.62	0.60	0.57	0.88	0.58	0.43	0.26		0.68	0.50	0.29	0.78	0.68	0.62	n/a
8	(203)	0.86	0.80	0.72	0.63		0.75	0.55	0.32	0.67	0.63	0.61	0.57	1.00	0.67	0.50	0.30		0.75	0.55	0.32	0.82	0.71	0.65	n/a
9	(229)	0.90	0.83	0.75	0.65		0.85	0.62	0.36	0.69	0.64	0.62	0.58		0.80	0.60	0.36		0.85	0.62	0.36	0.87	0.76	0.69	n/a
10	(254)	0.95	0.87	0.78	0.67		0.94	0.69	0.40	0.71	0.66	0.63	0.59		0.94	0.70	0.42		0.94	0.69	0.40	0.92	0.80	0.73	n/a
11-1/4	(286)	1.00	0.92	0.81	0.69		1.00	0.78	0.46	0.74	0.68	0.65	0.61		1.00	0.84	0.50		1.00	0.78	0.46	0.97	0.85	0.77	0.65
12	(305)		0.94	0.83	0.70			0.83	0.49	0.75	0.69	0.66	0.61			0.92	0.55			0.83	0.49	1.00	0.87	0.79	0.67
14	(356)		1.00	0.89	0.73			0.97	0.57	0.79	0.72	0.68	0.63			1.00	0.70			0.97	0.57		0.94	0.86	0.72
16	(406)			0.94	0.77			1.00	0.65	0.84	0.76	0.71	0.65				0.85			1.00	0.65		1.00	0.92	0.77
18	(457)			1.00	0.80				0.73	0.88	0.79	0.74	0.67				1.00				0.73			0.97	0.82
20	(508)				0.83				0.81	0.92	0.82	0.76	0.69								0.81			1.00	0.87
22	(559)				0.87				0.89	0.96	0.85	0.79	0.71								0.89				0.91
24	(610)				0.90				0.97	1.00	0.88	0.82	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 28 — Load adjustment factors for 1/2-in. diameter fractional 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}				Conc. 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	0.52	0.49	0.45	0.41	n/a	n/a	n/a	n/a	0.16	0.10	0.08	0.05	0.32	0.21	0.16	0.09	n/a	n/a	n/a	n/a
2-1/2	(64)	0.61	0.59	0.57	0.54	0.60	0.56	0.50	0.44	0.57	0.55	0.54	0.53	0.27	0.18	0.13	0.08	0.54	0.35	0.27	0.16	n/a	n/a	n/a	n/a
3	(76)	0.63	0.61	0.58	0.55	0.66	0.60	0.53	0.46	0.58	0.56	0.55	0.54	0.35	0.23	0.17	0.10	0.66	0.47	0.35	0.21	n/a	n/a	n/a	n/a
4	(102)	0.68	0.65	0.61	0.57	0.79	0.70	0.60	0.49	0.61	0.58	0.57	0.55	0.54	0.36	0.27	0.16	0.79	0.70	0.54	0.32	0.67	n/a	n/a	n/a
5	(127)	0.72	0.69	0.64	0.58	0.92	0.80	0.67	0.53	0.64	0.61	0.59	0.56	0.76	0.50	0.38	0.23	0.92	0.80	0.67	0.45	0.75	n/a	n/a	n/a
5-3/4	(146)	0.76	0.71	0.66	0.60	1.00	0.88	0.73	0.56	0.66	0.62	0.60	0.57	0.94	0.62	0.46	0.28	1.00	0.88	0.73	0.56	0.80	0.70	n/a	n/a
6	(152)	0.77	0.72	0.67	0.60		0.91	0.75	0.57	0.67	0.63	0.60	0.57	1.00	0.66	0.49	0.30		0.91	0.75	0.57	0.82	0.71	n/a	n/a
7	(178)	0.81	0.76	0.69	0.62		1.00	0.83	0.62	0.69	0.65	0.62	0.59		0.83	0.62	0.37		1.00	0.83	0.62	0.88	0.77	n/a	n/a
7-1/4	(184)	0.82	0.77	0.70	0.62			0.85	0.63	0.70	0.65	0.63	0.59		0.87	0.66	0.39			0.85	0.63	0.90	0.78	0.71	n/a
8	(203)	0.86	0.80	0.72	0.63			0.91	0.66	0.72	0.67	0.64	0.60		1.00	0.76	0.46			0.91	0.66	0.94	0.82	0.75	n/a
9	(229)	0.90	0.83	0.75	0.65			1.00	0.70	0.75	0.69	0.66	0.61			0.91	0.54			1.00	0.70	1.00	0.87	0.79	n/a
10	(254)	0.95	0.87	0.78	0.67				0.75	0.78	0.71	0.67	0.62			1.00	0.64				0.75		0.92	0.83	n/a
11-1/4	(286)	1.00	0.92	0.81	0.69				0.81	0.81	0.74	0.70	0.64				0.76				0.81		0.97	0.88	0.75
12	(305)		0.94	0.83	0.70				0.85	0.83	0.75	0.71	0.65				0.84				0.85		1.00	0.91	0.77
14	(356)		1.00	0.89	0.73				0.95	0.89	0.79	0.74	0.67				1.00				0.95			0.99	0.83
16	(406)			0.94	0.77				1.00	0.94	0.84	0.78	0.70								1.00			1.00	0.89
18	(457)			1.00	0.80					1.00	0.88	0.81	0.72												0.94
20	(508)				0.83						0.92	0.85	0.75												0.99
22	(559)				0.87						0.96	0.88	0.77												1.00
24	(610)				0.90						1.00	0.92	0.80												
30	(762)				1.00							1.00	0.87												
36	(914)												0.94												
>48	(1219)												1.00												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d < s < 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 29 — Load adjustment factors for 5/8-in. diameter fractional 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}				Conc. 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	0.39	0.25	0.19	0.11	n/a	n/a	n/a	n/a	0.09	0.05	0.04	0.02	0.19	0.10	0.08	0.05	n/a	n/a	n/a	n/a
3-1/8	(79)	0.61	0.59	0.57	0.54	0.52	0.32	0.23	0.14	0.56	0.54	0.53	0.52	0.22	0.12	0.09	0.05	0.45	0.24	0.18	0.11	n/a	n/a	n/a	n/a
4	(102)	0.65	0.62	0.59	0.55	0.61	0.36	0.27	0.16	0.58	0.55	0.54	0.53	0.32	0.18	0.13	0.08	0.61	0.35	0.26	0.16	n/a	n/a	n/a	n/a
4-5/8	(117)	0.67	0.64	0.60	0.56	0.68	0.40	0.29	0.17	0.59	0.56	0.55	0.54	0.40	0.22	0.16	0.10	0.68	0.40	0.29	0.17	0.60	n/a	n/a	n/a
5	(127)	0.68	0.65	0.61	0.57	0.74	0.42	0.31	0.18	0.60	0.57	0.55	0.54	0.45	0.25	0.19	0.11	0.74	0.42	0.31	0.18	0.63	n/a	n/a	n/a
6	(152)	0.72	0.68	0.63	0.58	0.89	0.47	0.35	0.20	0.62	0.58	0.56	0.55	0.59	0.32	0.24	0.15	0.89	0.47	0.35	0.20	0.69	n/a	n/a	n/a
7	(178)	0.76	0.71	0.66	0.59	1.00	0.53	0.39	0.23	0.64	0.59	0.58	0.55	0.75	0.41	0.31	0.18	1.00	0.53	0.39	0.23	0.74	n/a	n/a	n/a
7-1/8	(181)	0.76	0.71	0.66	0.60		0.54	0.40	0.23	0.64	0.59	0.58	0.55	0.77	0.42	0.31	0.19		0.54	0.40	0.23	0.75	0.61	n/a	n/a
8	(203)	0.79	0.74	0.68	0.61		0.61	0.45	0.26	0.66	0.60	0.59	0.56	0.91	0.50	0.37	0.22		0.61	0.45	0.26	0.79	0.65	n/a	n/a
9	(229)	0.83	0.77	0.70	0.62		0.69	0.51	0.30	0.68	0.62	0.60	0.57	1.00	0.60	0.45	0.27		0.69	0.51	0.30	0.84	0.69	0.62	n/a
10	(254)	0.87	0.80	0.72	0.63		0.76	0.56	0.33	0.70	0.63	0.61	0.58		0.70	0.52	0.31		0.76	0.56	0.33	0.89	0.72	0.66	n/a
11	(279)	0.90	0.83	0.74	0.65		0.84	0.62	0.36	0.72	0.64	0.62	0.58		0.81	0.60	0.36		0.84	0.62	0.36	0.93	0.76	0.69	n/a
12	(305)	0.94	0.86	0.77	0.66		0.92	0.67	0.39	0.74	0.66	0.63	0.59		0.92	0.69	0.41		0.92	0.67	0.39	0.97	0.79	0.72	n/a
14	(356)	1.00	0.91	0.81	0.69		1.00	0.79	0.46	0.77	0.68	0.65	0.61		1.00	0.87	0.52		1.00	0.79	0.46	1.00	0.86	0.78	0.66
16	(406)		0.97	0.86	0.71			0.90	0.53	0.81	0.71	0.67	0.62			1.00	0.64			0.90	0.53		0.92	0.83	0.70
18	(457)		1.00	0.90	0.74			1.00	0.59	0.85	0.74	0.69	0.64				0.76			1.00	0.59		0.97	0.88	0.74
20	(508)			0.94	0.77				0.66	0.89	0.76	0.72	0.65				0.89				0.66		1.00	0.93	0.78
22	(559)			0.99	0.79				0.72	0.93	0.79	0.74	0.67				1.00				0.72			0.98	0.82
24	(610)			1.00	0.82				0.79	0.97	0.81	0.76	0.68								0.79			1.00	0.86
26	(660)				0.85				0.85	1.00	0.84	0.78	0.70								0.85				0.90
28	(711)				0.87				0.92		0.87	0.80	0.72								0.92				0.93
30	(762)				0.90				0.99		0.89	0.82	0.73								0.99				0.96
36	(914)				0.98				1.00		0.97	0.89	0.78								1.00				1.00
>48	(1219)				1.00						1.00	1.00	0.87												

Table 30 — Load adjustment factors for 5/8-in. diameter fractional 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}				Conc. 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	0.49	0.46	0.43	0.40	n/a	n/a	n/a	n/a	0.12	0.07	0.06	0.03	0.24	0.15	0.11	0.07	n/a	n/a	n/a	n/a
3-1/8	(79)	0.61	0.59	0.57	0.54	0.61	0.56	0.50	0.44	0.57	0.55	0.54	0.53	0.29	0.18	0.13	0.08	0.58	0.35	0.27	0.16	n/a	n/a	n/a	n/a
4	(102)	0.65	0.62	0.59	0.55	0.69	0.62	0.55	0.46	0.59	0.57	0.56	0.54	0.42	0.26	0.19	0.12	0.69	0.51	0.38	0.23	n/a	n/a	n/a	n/a
4-5/8	(117)	0.67	0.64	0.60	0.56	0.76	0.67	0.58	0.48	0.61	0.58	0.56	0.55	0.52	0.32	0.24	0.14	0.76	0.64	0.48	0.29	0.66	n/a	n/a	n/a
5	(127)	0.68	0.65	0.61	0.57	0.80	0.70	0.60	0.49	0.62	0.58	0.57	0.55	0.59	0.36	0.27	0.16	0.80	0.70	0.54	0.32	0.68	n/a	n/a	n/a
6	(152)	0.72	0.68	0.63	0.58	0.91	0.78	0.66	0.53	0.64	0.60	0.58	0.56	0.77	0.47	0.35	0.21	0.91	0.78	0.66	0.42	0.75	n/a	n/a	n/a
7	(178)	0.76	0.71	0.66	0.59	1.00	0.87	0.72	0.56	0.66	0.62	0.60	0.57	0.97	0.59	0.45	0.27	1.00	0.87	0.72	0.53	0.81	n/a	n/a	n/a
7-1/8	(181)	0.76	0.71	0.66	0.60		0.88	0.73	0.56	0.67	0.62	0.60	0.57	1.00	0.61	0.46	0.27		0.88	0.73	0.55	0.82	0.69	n/a	n/a
8	(203)	0.79	0.74	0.68	0.61		0.96	0.78	0.59	0.69	0.63	0.61	0.58		0.73	0.54	0.33		0.96	0.78	0.59	0.87	0.73	n/a	n/a
9	(229)	0.83	0.77	0.70	0.62		1.00	0.85	0.62	0.71	0.65	0.62	0.59		0.87	0.65	0.39		1.00	0.85	0.62	0.92	0.78	0.71	n/a
10	(254)	0.87	0.80	0.72	0.63			0.91	0.66	0.73	0.67	0.64	0.60		1.00	0.76	0.46			0.91	0.66	0.97	0.82	0.75	n/a
11	(279)	0.90	0.83	0.74	0.65			0.98	0.69	0.76	0.69	0.65	0.61			0.88	0.53			0.98	0.69	1.00	0.86	0.78	n/a
12	(305)	0.94	0.86	0.77	0.66			1.00	0.73	0.78	0.70	0.67	0.62			1.00	0.60			1.00	0.73		0.90	0.82	n/a
14	(356)	1.00	0.91	0.81	0.69				0.81	0.83	0.74	0.69	0.64				0.76				0.81		0.97	0.88	0.74
16	(406)		0.97	0.86	0.71				0.89	0.87	0.77	0.72	0.66				0.92				0.89		1.00	0.94	0.80
18	(457)		1.00	0.90	0.74				0.97	0.92	0.80	0.75	0.68				1.00				0.97			1.00	0.84
20	(508)			0.94	0.77				1.00	0.97	0.84	0.78	0.70								1.00				0.89
22	(559)			0.99	0.79					1.00	0.87	0.81	0.72												0.93
24	(610)			1.00	0.82						0.90	0.83	0.74												0.97
26	(660)				0.85						0.94	0.86	0.76												1.00
28	(711)				0.87						0.97	0.89	0.78												
30	(762)				0.90						1.00	0.92	0.80												
36	(914)				0.98							1.00	0.86												
>48	(1219)				1.00								0.97												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d < s < 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 31 — Load adjustment factors for 3/4-in. diameter fractional 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}				Conc. 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	0.38	0.24	0.18	0.10	n/a	n/a	n/a	n/a	0.09	0.04	0.03	0.02	0.17	0.08	0.06	0.04	n/a	n/a	n/a	n/a
3-3/4 (95)	0.62	0.59	0.57	0.54	0.55	0.32	0.23	0.14	0.57	0.54	0.53	0.52	0.27	0.12	0.09	0.06	0.53	0.25	0.19	0.11	n/a	n/a	n/a	n/a
4 (102)	0.62	0.60	0.57	0.54	0.58	0.33	0.24	0.14	0.57	0.54	0.54	0.53	0.29	0.14	0.10	0.06	0.58	0.27	0.20	0.12	n/a	n/a	n/a	n/a
5 (127)	0.66	0.62	0.59	0.56	0.68	0.37	0.27	0.16	0.59	0.56	0.55	0.53	0.41	0.19	0.14	0.09	0.68	0.37	0.27	0.16	n/a	n/a	n/a	n/a
5-1/4 (133)	0.66	0.63	0.60	0.56	0.71	0.38	0.28	0.17	0.60	0.56	0.55	0.53	0.44	0.20	0.15	0.09	0.71	0.38	0.28	0.17	0.62	n/a	n/a	n/a
6 (152)	0.69	0.65	0.61	0.57	0.81	0.42	0.31	0.18	0.61	0.57	0.55	0.54	0.54	0.25	0.19	0.11	0.81	0.42	0.31	0.18	0.66	n/a	n/a	n/a
7 (178)	0.72	0.67	0.63	0.58	0.90	0.47	0.34	0.20	0.63	0.58	0.56	0.55	0.68	0.32	0.24	0.14	0.90	0.47	0.34	0.20	0.72	n/a	n/a	n/a
8 (203)	0.75	0.70	0.65	0.59	0.99	0.52	0.38	0.22	0.65	0.59	0.57	0.55	0.83	0.39	0.29	0.17	0.99	0.52	0.38	0.22	0.77	n/a	n/a	n/a
8-1/2 (216)	0.76	0.71	0.66	0.59	1.00	0.55	0.40	0.24	0.66	0.59	0.58	0.56	0.91	0.42	0.32	0.19	1.00	0.55	0.40	0.24	0.79	0.61	n/a	n/a
9 (229)	0.78	0.72	0.67	0.60		0.58	0.43	0.25	0.67	0.60	0.58	0.56	0.99	0.46	0.34	0.21		0.58	0.43	0.25	0.81	0.63	n/a	n/a
10 (254)	0.81	0.75	0.69	0.61		0.64	0.47	0.28	0.68	0.61	0.59	0.56	1.00	0.54	0.40	0.24		0.64	0.47	0.28	0.86	0.66	n/a	n/a
10-3/4 (273)	0.83	0.77	0.70	0.62		0.69	0.51	0.30	0.70	0.62	0.60	0.57		0.60	0.45	0.27		0.69	0.51	0.30	0.89	0.69	0.63	n/a
12 (305)	0.87	0.80	0.72	0.63		0.77	0.57	0.33	0.72	0.63	0.61	0.58		0.71	0.53	0.32		0.77	0.57	0.33	0.94	0.73	0.66	n/a
14 (356)	0.93	0.85	0.76	0.66		0.90	0.66	0.39	0.76	0.65	0.63	0.59		0.89	0.67	0.40		0.90	0.66	0.39	1.00	0.79	0.71	n/a
16 (406)	1.00	0.90	0.80	0.68		1.00	0.76	0.44	0.79	0.68	0.65	0.60		1.00	0.82	0.49		1.00	0.76	0.44		0.84	0.76	n/a
16-3/4 (425)		0.91	0.81	0.69			0.79	0.46	0.81	0.68	0.65	0.61			0.87	0.52			0.79	0.46		0.86	0.78	0.66
18 (457)		0.94	0.83	0.70			0.85	0.50	0.83	0.70	0.66	0.62			0.97	0.58			0.85	0.50		0.89	0.81	0.68
20 (508)		0.99	0.87	0.72			0.95	0.55	0.87	0.72	0.68	0.63			1.00	0.68			0.95	0.55		0.94	0.85	0.72
22 (559)		1.00	0.91	0.74			1.00	0.61	0.91	0.74	0.70	0.64				0.79			1.00	0.61		0.99	0.89	0.75
24 (610)			0.94	0.77				0.67	0.94	0.76	0.72	0.66				0.90				0.67		1.00	0.93	0.79
26 (660)			0.98	0.79				0.72	0.98	0.79	0.74	0.67				1.00				0.72			0.97	0.82
28 (711)			1.00	0.81				0.78	1.00	0.81	0.75	0.68								0.78			1.00	0.85
30 (762)				0.83				0.83		0.83	0.77	0.69								0.83				0.88
36 (914)				0.90				1.00		0.90	0.83	0.73								1.00				0.97
>48 (1219)				1.00						1.00	0.94	0.81												1.00

Table 32 — Load adjustment factors for 3/4-in. diameter fractional 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}				Conc. 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	0.47	0.44	0.42	0.39	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
3-3/4 (95)	0.62	0.59	0.57	0.54	0.62	0.56	0.50	0.44	0.58	0.55	0.54	0.53	0.32	0.18	0.14	0.08	0.62	0.37	0.28	0.17	n/a	n/a	n/a	n/a
4 (102)	0.62	0.60	0.57	0.54	0.64	0.57	0.51	0.44	0.58	0.56	0.55	0.53	0.36	0.20	0.15	0.09	0.64	0.40	0.30	0.18	n/a	n/a	n/a	n/a
5 (127)	0.66	0.62	0.59	0.56	0.72	0.63	0.56	0.47	0.60	0.57	0.56	0.54	0.50	0.28	0.21	0.13	0.72	0.56	0.42	0.25	n/a	n/a	n/a	n/a
5-1/4 (133)	0.66	0.63	0.60	0.56	0.74	0.65	0.57	0.47	0.61	0.58	0.56	0.54	0.54	0.30	0.23	0.14	0.74	0.61	0.46	0.27	0.66	n/a	n/a	n/a
6 (152)	0.69	0.65	0.61	0.57	0.81	0.70	0.60	0.49	0.63	0.59	0.57	0.55	0.66	0.37	0.28	0.17	0.81	0.70	0.56	0.33	0.71	n/a	n/a	n/a
7 (178)	0.72	0.67	0.63	0.58	0.90	0.77	0.65	0.52	0.65	0.60	0.58	0.56	0.83	0.47	0.35	0.21	0.90	0.77	0.65	0.42	0.77	n/a	n/a	n/a
8 (203)	0.75	0.70	0.65	0.59	0.99	0.84	0.70	0.55	0.67	0.61	0.59	0.57	1.00	0.57	0.43	0.26	0.99	0.84	0.70	0.51	0.82	n/a	n/a	n/a
8-1/2 (216)	0.76	0.71	0.66	0.59	1.00	0.88	0.72	0.56	0.68	0.62	0.60	0.57		0.63	0.47	0.28	1.00	0.88	0.72	0.56	0.84	0.70	n/a	n/a
9 (229)	0.78	0.72	0.67	0.60		0.91	0.75	0.57	0.69	0.63	0.61	0.58		0.68	0.51	0.31		0.91	0.75	0.57	0.87	0.72	n/a	n/a
10 (254)	0.81	0.75	0.69	0.61		0.99	0.80	0.60	0.71	0.64	0.62	0.58		0.80	0.60	0.36		0.99	0.80	0.60	0.92	0.76	n/a	n/a
10-3/4 (273)	0.83	0.77	0.70	0.62		1.00	0.84	0.62	0.73	0.65	0.63	0.59		0.89	0.67	0.40		1.00	0.84	0.62	0.95	0.79	0.71	n/a
12 (305)	0.87	0.80	0.72	0.63			0.91	0.66	0.75	0.67	0.64	0.60		1.00	0.79	0.47			0.91	0.66	1.00	0.83	0.75	n/a
14 (356)	0.93	0.85	0.76	0.66			1.00	0.72	0.79	0.70	0.67	0.62			0.99	0.60			1.00	0.72		0.90	0.81	n/a
16 (406)	1.00	0.90	0.80	0.68				0.78	0.84	0.73	0.69	0.63			1.00	0.73				0.78		0.96	0.87	n/a
16-3/4 (425)		0.91	0.81	0.69				0.81	0.85	0.74	0.70	0.64				0.78				0.81		0.98	0.89	0.75
18 (457)		0.94	0.83	0.70				0.85	0.88	0.76	0.71	0.65				0.87				0.85		1.00	0.92	0.78
20 (508)		0.99	0.87	0.72				0.91	0.92	0.79	0.74	0.67				1.00				0.91			0.97	0.82
22 (559)		1.00	0.91	0.74				0.98	0.96	0.82	0.76	0.69								0.98			1.00	0.86
24 (610)			0.94	0.77				1.00	1.00	0.84	0.78	0.70								1.00				0.90
26 (660)			0.98	0.79						0.87	0.81	0.72												0.94
28 (711)			1.00	0.81						0.90	0.83	0.74												0.97
30 (762)				0.83						0.93	0.86	0.75												1.00
36 (914)				0.90						1.00	0.93	0.80												
>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 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then f_{AV} = f_{AN}.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 33 — Load adjustment factors for 7/8-in. diameter fractional 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}				Conc. 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	0.03	n/a	n/a	n/a	n/a
4-3/8	(111)	0.62	0.59	0.57	0.54	0.62	0.32	0.24	0.14	0.58	0.54	0.53	0.52	0.35	0.12	0.09	0.05	0.62	0.24	0.18	0.11	n/a	n/a	n/a	n/a
5	(127)	0.64	0.61	0.58	0.55	0.66	0.34	0.25	0.15	0.59	0.55	0.54	0.53	0.43	0.14	0.11	0.07	0.66	0.29	0.22	0.13	n/a	n/a	n/a	n/a
5-1/2	(140)	0.65	0.62	0.59	0.55	0.70	0.36	0.27	0.16	0.60	0.55	0.54	0.53	0.50	0.17	0.13	0.08	0.70	0.33	0.25	0.15	0.65	n/a	n/a	n/a
6	(152)	0.66	0.63	0.60	0.56	0.74	0.38	0.28	0.16	0.61	0.56	0.55	0.53	0.57	0.19	0.14	0.09	0.74	0.38	0.28	0.16	0.68	n/a	n/a	n/a
7	(178)	0.69	0.65	0.61	0.57	0.81	0.42	0.31	0.18	0.63	0.56	0.55	0.54	0.71	0.24	0.18	0.11	0.81	0.42	0.31	0.18	0.73	n/a	n/a	n/a
8	(203)	0.72	0.67	0.63	0.58	0.90	0.46	0.34	0.20	0.65	0.57	0.56	0.54	0.87	0.29	0.22	0.13	0.90	0.46	0.34	0.20	0.78	n/a	n/a	n/a
9	(229)	0.74	0.69	0.64	0.59	0.98	0.51	0.37	0.22	0.67	0.58	0.57	0.55	1.00	0.35	0.26	0.16	0.98	0.51	0.37	0.22	0.83	n/a	n/a	n/a
9-7/8	(251)	0.77	0.71	0.66	0.59	1.00	0.55	0.41	0.24	0.69	0.59	0.57	0.55		0.40	0.30	0.18	1.00	0.55	0.41	0.24	0.87	0.60	n/a	n/a
10	(254)	0.77	0.71	0.66	0.60		0.56	0.41	0.24	0.69	0.59	0.58	0.55		0.41	0.31	0.18		0.56	0.41	0.24	0.87	0.61	n/a	n/a
11	(279)	0.80	0.73	0.67	0.60		0.61	0.45	0.26	0.71	0.60	0.58	0.56		0.47	0.35	0.21		0.61	0.45	0.26	0.91	0.64	n/a	n/a
12	(305)	0.82	0.75	0.69	0.61		0.67	0.49	0.29	0.73	0.61	0.59	0.56		0.54	0.40	0.24		0.67	0.49	0.29	0.95	0.66	n/a	n/a
12-1/2	(318)	0.84	0.76	0.70	0.62		0.70	0.51	0.30	0.74	0.61	0.59	0.57		0.57	0.43	0.26		0.70	0.51	0.30	0.97	0.68	0.62	n/a
14	(356)	0.88	0.80	0.72	0.63		0.78	0.58	0.34	0.77	0.63	0.61	0.58		0.68	0.51	0.31		0.78	0.58	0.34	1.00	0.72	0.65	n/a
16	(406)	0.93	0.84	0.75	0.65		0.89	0.66	0.39	0.80	0.65	0.62	0.59		0.83	0.62	0.37		0.89	0.66	0.39		0.77	0.70	n/a
18	(457)	0.99	0.88	0.79	0.67		1.00	0.74	0.43	0.84	0.67	0.64	0.60		0.99	0.74	0.44		1.00	0.74	0.43		0.81	0.74	n/a
19-1/2	(495)	1.00	0.91	0.81	0.69			0.80	0.47	0.87	0.68	0.65	0.61		1.00	0.84	0.50			0.80	0.47		0.85	0.77	0.65
20	(508)		0.92	0.82	0.69			0.82	0.48	0.88	0.68	0.65	0.61			0.87	0.52			0.82	0.48		0.86	0.78	0.66
22	(559)		0.97	0.85	0.71			0.90	0.53	0.92	0.70	0.67	0.62			1.00	0.60			0.90	0.53		0.90	0.82	0.69
24	(610)		1.00	0.88	0.73			0.99	0.58	0.96	0.72	0.68	0.63				0.68			0.99	0.58		0.94	0.85	0.72
26	(660)			0.91	0.75			1.00	0.63	0.99	0.74	0.70	0.64				0.77			1.00	0.63		0.98	0.89	0.75
28	(711)			0.94	0.77				0.67	1.00	0.76	0.71	0.65				0.86				0.67		1.00	0.92	0.78
30	(762)			0.98	0.79				0.72		0.78	0.73	0.66				0.96				0.72			0.95	0.80
36	(914)			1.00	0.84				0.87		0.83	0.77	0.69				1.00				0.87			1.00	0.88
>48	(1219)				0.96				1.00		0.94	0.86	0.76								1.00				1.00

Table 34 — Load adjustment factors for 7/8-in. diameter fractional 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}				Conc. 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	0.45	0.43	0.41	0.38	n/a	n/a	n/a	n/a	0.10	0.05	0.03	0.02	0.20	0.09	0.07	0.04	n/a	n/a	n/a	n/a
4-3/8	(111)	0.62	0.59	0.57	0.54	0.62	0.56	0.50	0.44	0.59	0.55	0.54	0.53	0.40	0.18	0.14	0.08	0.62	0.37	0.28	0.17	n/a	n/a	n/a	n/a
5	(127)	0.64	0.61	0.58	0.55	0.66	0.59	0.52	0.45	0.60	0.56	0.55	0.54	0.49	0.23	0.17	0.10	0.66	0.45	0.34	0.20	n/a	n/a	n/a	n/a
5-1/2	(140)	0.65	0.62	0.59	0.55	0.70	0.62	0.54	0.46	0.61	0.57	0.56	0.54	0.56	0.26	0.19	0.12	0.70	0.52	0.39	0.23	0.67	n/a	n/a	n/a
6	(152)	0.66	0.63	0.60	0.56	0.74	0.64	0.56	0.47	0.62	0.57	0.56	0.54	0.64	0.30	0.22	0.13	0.74	0.59	0.44	0.27	0.70	n/a	n/a	n/a
7	(178)	0.69	0.65	0.61	0.57	0.81	0.70	0.60	0.49	0.64	0.59	0.57	0.55	0.81	0.37	0.28	0.17	0.81	0.70	0.56	0.34	0.76	n/a	n/a	n/a
8	(203)	0.72	0.67	0.63	0.58	0.90	0.76	0.64	0.52	0.66	0.60	0.58	0.56	0.98	0.46	0.34	0.21	0.90	0.76	0.64	0.41	0.81	n/a	n/a	n/a
9	(229)	0.74	0.69	0.64	0.59	0.98	0.82	0.68	0.54	0.69	0.61	0.59	0.57	1.00	0.54	0.41	0.24	0.98	0.82	0.68	0.49	0.86	n/a	n/a	n/a
9-7/8	(251)	0.77	0.71	0.66	0.59	1.00	0.87	0.72	0.56	0.70	0.62	0.60	0.57		0.63	0.47	0.28	1.00	0.87	0.72	0.56	0.90	0.70	n/a	n/a
10	(254)	0.77	0.71	0.66	0.60		0.88	0.73	0.56	0.71	0.62	0.60	0.57		0.64	0.48	0.29		0.88	0.73	0.56	0.91	0.70	n/a	n/a
11	(279)	0.80	0.73	0.67	0.60		0.95	0.77	0.59	0.73	0.64	0.61	0.58		0.73	0.55	0.33		0.95	0.77	0.59	0.95	0.74	n/a	n/a
12	(305)	0.82	0.75	0.69	0.61		1.00	0.82	0.61	0.75	0.65	0.62	0.59		0.84	0.63	0.38		1.00	0.82	0.61	0.99	0.77	n/a	n/a
12-1/2	(318)	0.84	0.76	0.70	0.62			0.84	0.62	0.76	0.65	0.63	0.59		0.89	0.67	0.40			0.84	0.62	1.00	0.79	0.71	n/a
14	(356)	0.88	0.80	0.72	0.63			0.91	0.66	0.79	0.67	0.64	0.60		1.00	0.79	0.47			0.91	0.66		0.83	0.76	n/a
16	(406)	0.93	0.84	0.75	0.65			1.00	0.71	0.83	0.70	0.66	0.62			0.97	0.58			1.00	0.71		0.89	0.81	n/a
18	(457)	0.99	0.88	0.79	0.67				0.76	0.87	0.72	0.68	0.63			1.00	0.69				0.76		0.94	0.86	n/a
19-1/2	(495)	1.00	0.91	0.81	0.69				0.80	0.90	0.74	0.70	0.64				0.78				0.80		0.98	0.89	0.75
20	(508)		0.92	0.82	0.69				0.82	0.91	0.75	0.70	0.64				0.81				0.82		0.99	0.90	0.76
22	(559)		0.97	0.85	0.71				0.87	0.95	0.77	0.72	0.66				0.94				0.87		1.00	0.95	0.80
24	(610)		1.00	0.88	0.73				0.93	0.99	0.80	0.74	0.67				1.00				0.93			0.99	0.83
26	(660)			0.91	0.75				0.99	1.00	0.82	0.76	0.69								0.99			1.00	0.87
28	(711)			0.94	0.77				1.00		0.85	0.79	0.70								1.00				0.90
30	(762)			0.98	0.79						0.87	0.81	0.72												0.93
36	(914)			1.00	0.84						0.94	0.87	0.76												1.00
>48	(1219)				0.96						1.00	0.99	0.85												

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d < s < 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then f_{AV} = f_{AN}.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 35 — Load adjustment factors for 1-in. diameter fractional 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}				Conc. 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	0.04	0.02	n/a	n/a	n/a	n/a
5	(127)	0.62	0.59	0.57	0.54	0.62	0.32	0.24	0.14	0.59	0.54	0.53	0.52	0.37	0.11	0.09	0.05	0.62	0.23	0.17	0.10	n/a	n/a	n/a	n/a
6	(152)	0.64	0.61	0.58	0.55	0.69	0.35	0.26	0.15	0.60	0.55	0.54	0.53	0.48	0.15	0.11	0.07	0.69	0.30	0.22	0.13	n/a	n/a	n/a	n/a
6-1/4	(159)	0.65	0.62	0.59	0.55	0.70	0.36	0.27	0.16	0.61	0.55	0.54	0.53	0.51	0.16	0.12	0.07	0.70	0.32	0.24	0.14	0.65	n/a	n/a	n/a
7	(178)	0.67	0.63	0.60	0.56	0.75	0.39	0.29	0.17	0.62	0.55	0.55	0.53	0.61	0.19	0.14	0.09	0.75	0.38	0.28	0.17	0.69	n/a	n/a	n/a
8	(203)	0.69	0.65	0.61	0.57	0.82	0.42	0.31	0.18	0.64	0.56	0.55	0.54	0.74	0.23	0.17	0.10	0.82	0.42	0.31	0.18	0.74	n/a	n/a	n/a
9	(229)	0.72	0.67	0.63	0.58	0.89	0.46	0.34	0.20	0.65	0.57	0.56	0.54	0.89	0.28	0.21	0.12	0.89	0.46	0.34	0.20	0.78	n/a	n/a	n/a
10	(254)	0.74	0.69	0.64	0.58	0.97	0.50	0.37	0.21	0.67	0.58	0.56	0.55	1.00	0.32	0.24	0.15	0.97	0.50	0.37	0.21	0.83	n/a	n/a	n/a
11	(279)	0.76	0.70	0.65	0.59	1.00	0.54	0.40	0.23	0.69	0.59	0.57	0.55		0.37	0.28	0.17	1.00	0.54	0.40	0.23	0.87	n/a	n/a	n/a
11-1/4	(286)	0.77	0.71	0.66	0.59		0.56	0.41	0.24	0.69	0.59	0.57	0.55		0.38	0.29	0.17		0.56	0.41	0.24	0.88	0.59	n/a	n/a
12	(305)	0.79	0.72	0.67	0.60		0.59	0.44	0.26	0.70	0.59	0.58	0.56		0.42	0.32	0.19		0.59	0.44	0.26	0.91	0.61	n/a	n/a
13	(330)	0.81	0.74	0.68	0.61		0.64	0.47	0.28	0.72	0.60	0.58	0.56		0.48	0.36	0.22		0.64	0.47	0.28	0.94	0.64	n/a	n/a
14	(356)	0.84	0.76	0.69	0.62		0.69	0.51	0.30	0.74	0.61	0.59	0.56		0.53	0.40	0.24		0.69	0.51	0.30	0.98	0.66	n/a	n/a
14-1/4	(362)	0.84	0.76	0.70	0.62		0.70	0.52	0.30	0.74	0.61	0.59	0.57		0.55	0.41	0.25		0.70	0.52	0.30	0.99	0.67	0.61	n/a
16	(406)	0.88	0.80	0.72	0.63		0.79	0.58	0.34	0.77	0.63	0.60	0.57		0.65	0.49	0.29		0.79	0.58	0.34	1.00	0.71	0.64	n/a
18	(457)	0.93	0.83	0.75	0.65		0.89	0.65	0.38	0.81	0.64	0.62	0.58		0.78	0.58	0.35		0.89	0.65	0.38		0.75	0.68	n/a
20	(508)	0.98	0.87	0.78	0.67		0.99	0.73	0.43	0.84	0.66	0.63	0.59		0.91	0.68	0.41		0.99	0.73	0.43		0.79	0.72	n/a
22	(559)	1.00	0.91	0.81	0.68		1.00	0.80	0.47	0.88	0.67	0.64	0.60		1.00	0.79	0.47		1.00	0.80	0.47		0.83	0.75	n/a
22-1/4	(565)		0.91	0.81	0.69			0.81	0.47	0.88	0.67	0.64	0.60			0.80	0.48			0.81	0.47		0.84	0.76	0.64
24	(610)		0.94	0.83	0.70			0.87	0.51	0.91	0.69	0.66	0.61			0.90	0.54			0.87	0.51		0.87	0.79	0.66
26	(660)		0.98	0.86	0.72			0.94	0.55	0.94	0.70	0.67	0.62			1.00	0.61			0.94	0.55		0.90	0.82	0.69
28	(711)		1.00	0.89	0.73			1.00	0.60	0.98	0.72	0.68	0.63				0.68			1.00	0.60		0.94	0.85	0.72
30	(762)			0.92	0.75				0.64	1.00	0.74	0.69	0.64				0.75				0.64		0.97	0.88	0.74
36	(914)			1.00	0.80				0.77		0.78	0.73	0.67				0.99				0.77		1.00	0.97	0.81
>48	(1219)				0.90				1.00		0.88	0.81	0.72				1.00				1.00			1.00	0.94

Table 36 — Load adjustment factors for 1-in. diameter fractional 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}				Conc. 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	0.44	0.42	0.40	0.38	n/a	n/a	n/a	n/a	0.09	0.04	0.03	0.02	0.17	0.08	0.06	0.03	n/a	n/a	n/a	n/a
5	(127)	0.62	0.59	0.57	0.54	0.62	0.56	0.50	0.44	0.59	0.55	0.54	0.53	0.42	0.19	0.14	0.08	0.62	0.37	0.28	0.17	n/a	n/a	n/a	n/a
6	(152)	0.64	0.61	0.58	0.55	0.69	0.60	0.53	0.46	0.61	0.57	0.55	0.54	0.55	0.24	0.18	0.11	0.69	0.49	0.37	0.22	n/a	n/a	n/a	n/a
6-1/4	(159)	0.65	0.62	0.59	0.55	0.70	0.61	0.54	0.46	0.62	0.57	0.56	0.54	0.58	0.26	0.19	0.12	0.70	0.52	0.39	0.23	0.68	n/a	n/a	n/a
7	(178)	0.67	0.63	0.60	0.56	0.75	0.65	0.57	0.47	0.63	0.58	0.56	0.54	0.69	0.31	0.23	0.14	0.75	0.61	0.46	0.28	0.72	n/a	n/a	n/a
8	(203)	0.69	0.65	0.61	0.57	0.82	0.70	0.60	0.49	0.65	0.59	0.57	0.55	0.84	0.38	0.28	0.17	0.82	0.70	0.56	0.34	0.77	n/a	n/a	n/a
9	(229)	0.72	0.67	0.63	0.58	0.89	0.75	0.64	0.51	0.67	0.60	0.58	0.56	1.00	0.45	0.34	0.20	0.89	0.75	0.64	0.40	0.82	n/a	n/a	n/a
10	(254)	0.74	0.69	0.64	0.58	0.97	0.80	0.67	0.53	0.69	0.61	0.59	0.56		0.52	0.39	0.24	0.97	0.80	0.67	0.47	0.86	n/a	n/a	n/a
11	(279)	0.76	0.70	0.65	0.59	1.00	0.86	0.71	0.55	0.70	0.62	0.60	0.57		0.60	0.45	0.27	1.00	0.86	0.71	0.54	0.90	n/a	n/a	n/a
11-1/4	(286)	0.77	0.71	0.66	0.59		0.87	0.72	0.56	0.71	0.62	0.60	0.57		0.63	0.47	0.28		0.87	0.72	0.56	0.92	0.70	n/a	n/a
12	(305)	0.79	0.72	0.67	0.60		0.91	0.75	0.57	0.72	0.63	0.61	0.58		0.69	0.52	0.31		0.91	0.75	0.57	0.95	0.72	n/a	n/a
13	(330)	0.81	0.74	0.68	0.61		0.97	0.79	0.59	0.74	0.64	0.62	0.58		0.78	0.58	0.35		0.97	0.79	0.59	0.98	0.75	n/a	n/a
14	(356)	0.84	0.76	0.69	0.62		1.00	0.83	0.62	0.76	0.65	0.63	0.59		0.87	0.65	0.39		1.00	0.83	0.62	1.00	0.78	n/a	n/a
14-1/4	(362)	0.84	0.76	0.70	0.62			0.84	0.62	0.77	0.65	0.63	0.59		0.89	0.67	0.40			0.84	0.62		0.79	0.71	n/a
16	(406)	0.88	0.80	0.72	0.63			0.91	0.66	0.80	0.67	0.64	0.60		1.00	0.80	0.48			0.91	0.66		0.83	0.76	n/a
18	(457)	0.93	0.83	0.75	0.65			1.00	0.70	0.83	0.70	0.66	0.61			0.95	0.57			1.00	0.70		0.88	0.80	n/a
20	(508)	0.98	0.87	0.78	0.67				0.75	0.87	0.72	0.68	0.63			1.00	0.67				0.75		0.93	0.85	n/a
22	(559)	1.00	0.91	0.81	0.68				0.80	0.91	0.74	0.70	0.64				0.77				0.80		0.98	0.89	n/a
22-1/4	(565)		0.91	0.81	0.69				0.80	0.91	0.74	0.70	0.64				0.78				0.80		0.98	0.89	0.75
24	(610)		0.94	0.83	0.70				0.85	0.95	0.76	0.71	0.65				0.88				0.85		1.00	0.93	0.78
26	(660)		0.98	0.86	0.72				0.90	0.98	0.78	0.73	0.67				0.99				0.90			0.96	0.81
28	(711)		1.00	0.89	0.73				0.95	1.00	0.80	0.75	0.68				1.00				0.95			1.00	0.84
30	(762)			0.92	0.75				1.00		0.83	0.77	0.69								1.00				0.87
36	(914)			1.00	0.80						0.89	0.82	0.73												0.96
>48	(1219)				0.90						1.00	0.93	0.81												1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d < s < 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 37 — Load adjustment factors for 1-1/4-in. diameter fractional 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}				Conc. 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	0.53	0.52	0.43	0.13	0.09	0.06	0.67	0.26	0.19	0.11	n/a	n/a	n/a	n/a
8	(203)	0.66	0.62	0.59	0.55	0.72	0.37	0.27	0.16	0.61	0.55	0.54	0.53	0.53	0.16	0.12	0.07	0.72	0.31	0.23	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	0.55	0.54	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	0.83	0.43	0.31	0.18	0.64	0.56	0.55	0.54	0.74	0.22	0.16	0.10	0.83	0.43	0.31	0.18	0.74	n/a	n/a	n/a
11	(279)	0.72	0.66	0.62	0.57	0.89	0.46	0.34	0.20	0.65	0.57	0.55	0.54	0.86	0.25	0.19	0.11	0.89	0.46	0.34	0.20	0.78	n/a	n/a	n/a
12	(305)	0.74	0.68	0.63	0.58	0.95	0.49	0.36	0.21	0.66	0.57	0.56	0.54	0.98	0.29	0.21	0.13	0.95	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	0.52	0.38	0.23	0.68	0.58	0.56	0.55	1.00	0.33	0.24	0.14	1.00	0.52	0.38	0.23	0.84	n/a	n/a	n/a
14	(356)	0.77	0.71	0.66	0.59		0.56	0.41	0.24	0.69	0.59	0.57	0.55		0.36	0.27	0.16		0.56	0.41	0.24	0.87	0.58	n/a	n/a
14-1/4	(362)	0.78	0.71	0.66	0.60		0.57	0.42	0.25	0.69	0.59	0.57	0.55		0.37	0.27	0.16		0.57	0.42	0.25	0.88	0.59	n/a	n/a
15	(381)	0.79	0.72	0.67	0.60		0.60	0.44	0.26	0.70	0.59	0.57	0.55		0.40	0.30	0.18		0.60	0.44	0.26	0.91	0.60	n/a	n/a
16	(406)	0.81	0.74	0.68	0.61		0.64	0.47	0.28	0.72	0.60	0.58	0.56		0.45	0.33	0.20		0.64	0.47	0.28	0.94	0.62	n/a	n/a
17	(432)	0.83	0.75	0.69	0.61		0.68	0.50	0.29	0.73	0.60	0.58	0.56		0.49	0.36	0.21		0.68	0.50	0.29	0.96	0.64	n/a	n/a
18	(457)	0.85	0.77	0.70	0.62		0.72	0.53	0.31	0.75	0.61	0.59	0.56		0.53	0.39	0.23		0.72	0.53	0.31	0.99	0.66	0.60	n/a
20	(508)	0.89	0.80	0.72	0.63		0.80	0.59	0.35	0.77	0.62	0.60	0.57		0.62	0.46	0.27		0.80	0.59	0.35	1.00	0.70	0.63	n/a
22	(559)	0.93	0.83	0.74	0.65		0.88	0.65	0.38	0.80	0.63	0.61	0.58		0.72	0.53	0.32		0.88	0.65	0.38		0.73	0.66	n/a
24	(610)	0.97	0.86	0.77	0.66		0.96	0.71	0.42	0.83	0.65	0.62	0.58		0.82	0.60	0.36		0.96	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	0.68	0.41		1.00	0.77	0.45		0.79	0.72	n/a
28	(711)		0.91	0.81	0.69			0.83	0.48	0.88	0.67	0.64	0.60		1.00	0.76	0.45			0.83	0.48		0.82	0.74	0.63
30	(762)		0.94	0.83	0.70			0.89	0.52	0.91	0.68	0.65	0.61			0.84	0.50			0.89	0.52		0.85	0.77	0.65
36	(914)		1.00	0.90	0.74			1.00	0.62	0.99	0.72	0.68	0.63			1.00	0.66			1.00	0.62		0.94	0.84	0.71
>48	(1219)			1.00	0.82				0.83	1.00	0.79	0.74	0.67				1.00				0.83		1.00	0.97	0.82

Table 38 — Load adjustment factors for 1-1/4-in. diameter fractional threaded rods in cracked concrete [1,2,3]

1-1/4 in Cracked Concrete		Spacing Factor in Tension f_{AN}				Edge Distance Factor in Tension f_{RN}				Spacing Factor in Shear[4] f_{AV}				Edge Distance in Shear ⊥ Toward Edge f_{RV}				Edge Distance in Shear ‖ To Edge f_{RV}				Conc. 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	0.42	0.40	0.39	0.37	n/a	n/a	n/a	n/a	0.07	0.03	0.02	0.01	0.13	0.06	0.04	0.03	n/a	n/a	n/a	n/a
6-1/4	(159)	0.62	0.59	0.57	0.54	0.63	0.56	0.50	0.44	0.60	0.56	0.55	0.53	0.44	0.20	0.15	0.09	0.87	0.39	0.29	0.18	n/a	n/a	n/a	n/a
7	(178)	0.64	0.60	0.58	0.55	0.67	0.58	0.52	0.45	0.61	0.56	0.55	0.54	0.52	0.23	0.17	0.10	0.95	0.46	0.35	0.21	n/a	n/a	n/a	n/a
8	(203)	0.66	0.62	0.59	0.55	0.72	0.62	0.55	0.46	0.62	0.57	0.56	0.54	0.64	0.28	0.21	0.13	1.00	0.56	0.42	0.25	0.70	n/a	n/a	n/a
9	(229)	0.68	0.63	0.60	0.56	0.78	0.66	0.57	0.48	0.64	0.58	0.57	0.55	0.76	0.34	0.25	0.15		0.66	0.51	0.30	0.74	n/a	n/a	n/a
10	(254)	0.70	0.65	0.61	0.57	0.83	0.70	0.60	0.49	0.65	0.59	0.57	0.55	0.89	0.39	0.30	0.18		0.70	0.59	0.36	0.78	n/a	n/a	n/a
11	(279)	0.72	0.66	0.62	0.57	0.89	0.74	0.63	0.51	0.67	0.60	0.58	0.56	1.00	0.46	0.34	0.20		0.74	0.63	0.41	0.82	n/a	n/a	n/a
12	(305)	0.74	0.68	0.63	0.58	0.95	0.78	0.66	0.53	0.68	0.61	0.59	0.56		0.52	0.39	0.23		0.78	0.66	0.47	0.86	n/a	n/a	n/a
13	(330)	0.76	0.69	0.64	0.59	1.00	0.82	0.69	0.54	0.70	0.62	0.60	0.57		0.59	0.44	0.26		0.82	0.69	0.53	0.89	n/a	n/a	n/a
14	(356)	0.77	0.71	0.66	0.59		0.87	0.72	0.56	0.72	0.63	0.60	0.57		0.65	0.49	0.29		0.87	0.72	0.56	0.93	0.71	n/a	n/a
14-1/4	(362)	0.78	0.71	0.66	0.60		0.88	0.73	0.56	0.72	0.63	0.61	0.58		0.67	0.50	0.30		0.88	0.73	0.56	0.94	0.71	n/a	n/a
15	(381)	0.79	0.72	0.67	0.60		0.91	0.75	0.57	0.73	0.63	0.61	0.58		0.73	0.54	0.33		0.91	0.75	0.57	0.96	0.73	n/a	n/a
16	(406)	0.81	0.74	0.68	0.61		0.96	0.78	0.59	0.75	0.64	0.62	0.58		0.80	0.60	0.36		0.96	0.78	0.59	0.99	0.76	n/a	n/a
17	(432)	0.83	0.75	0.69	0.61		1.00	0.81	0.61	0.76	0.65	0.63	0.59		0.87	0.66	0.39		1.00	0.81	0.61	1.00	0.78	n/a	n/a
18	(457)	0.85	0.77	0.70	0.62			0.85	0.62	0.78	0.66	0.63	0.59		0.95	0.71	0.43			0.85	0.62		0.80	0.73	n/a
20	(508)	0.89	0.80	0.72	0.63			0.91	0.66	0.81	0.68	0.65	0.61		1.00	0.84	0.50			0.91	0.66		0.85	0.77	n/a
22	(559)	0.93	0.83	0.74	0.65			0.98	0.69	0.84	0.70	0.66	0.62			0.97	0.58			0.98	0.69		0.89	0.81	n/a
24	(610)	0.97	0.86	0.77	0.66			1.00	0.73	0.87	0.72	0.68	0.63			1.00	0.66			1.00	0.73		0.93	0.84	n/a
26	(660)	1.00	0.89	0.79	0.67				0.77	0.90	0.73	0.69	0.64				0.74				0.77		0.97	0.88	n/a
28	(711)		0.91	0.81	0.69				0.81	0.93	0.75	0.71	0.65				0.83				0.81		1.00	0.91	0.77
30	(762)		0.94	0.83	0.70				0.85	0.96	0.77	0.72	0.66				0.92				0.85			0.94	0.79
36	(914)		1.00	0.90	0.74				0.97	1.00	0.82	0.77	0.69				1.00				0.97			1.00	0.87
>48	(1219)			1.00	0.82				1.00	1.00	0.93	0.86	0.75								1.00				1.00

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided the installation torque is reduced to 0.30 T_{max} for 5d < s < 16-in. and to 0.5 T_{max} for s > 16-in.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from ACI 318-14 Chapter 17 and CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

2.4.10 Canadian Limit State design

Limit State Design of anchors is described in the provisions of CSA A23.3 -14 (2014) Annex D for post-installed anchors tested and assessed in accordance with ACI 355.2 for mechanical anchors and ACI 355.4 for adhesive anchors. This section contains the Limit State Design tables with unfactored characteristic loads that are based on the published loads in ICC Evaluation Services ESR-3829. 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 (2014) Annex D, refer to Section 3.1.8. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.ca

Table 39 — Specifications for CA Rebar installed with HIT-RE 100

Setting information		Symbol	Units	Rebar Size				
				10 M	15 M	20 M	25 M	30 M
Nominal bit diameter		d_o	in.	9/16	3/4	1	1-1/4	1-1/2
Effective Embedment	minimum	$h_{ef,min}$	mm	60	80	90	100	120
	maximum	$h_{ef,max}$	mm	226	320	390	504	598
Minimum Concrete Thickness		h_{min}	mm.	h_{ef} + 30	h_{ef} + $2d_o$			

Table 40 — Specifications for CA Rebar installed with HIT-RE 100

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)
10 M	7,245 (32.2)	4.035 17.9)	2.825 (12.6)
15 M	14,525 (64.6)	8,090 (36.0)	5,665 (25.2)
20 M	21,570 (95.9)	12,020 (53.5)	8,415 (37.4)
25 M	36,025 (160.2)	20,070 (89.3)	14,050 (62.5)
30 M	50,715 (225.6)	28,255 (125.7)	19,780 (88.0)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 CSA-G30.18 Grade 400 rebar are considered ductile steel elements.
3 Tensile = $A_{se,N}$ ϕs – R as noted in CSA A23.3-14 Annex D
4 Shear = $A_{se,V}$ ϕs 0.60 f_{uta} R as noted in CSA A23.3-14 Annex D.
5 Seismic Shear = $\alpha_{V,seis}$ V_{sar} : Reduction factor for seismic shear only. See section 3.1.8.7 for additional information on seismic applications.

HIT-RE 100 adhesive anchoring system

Table 41 — Hilti HIT-RE 100 adhesive design information with CA rebar in hammer drilled holes in accordance with CSA A23.3-14 Annex D [1,9]

Design parameter		Symbol	Units	Rebar Size 10 M	15 M	20 M	25 M	30 M	Ref A23.3-14
Anchor O.D.		d_a	mm	11.3	16.0	19.5	25.2	29.9	
Effective minimum embedment [2]		h_{ef}	mm	60	80	90	101	120	
Effective maximum embedment [2]		h_{ef}	mm	226	320	390	504	598	
Minimum concrete thickness [2]		h_{min}	mm	h_{ef} + 30	$h_{ef} + 2d_0$				
Critical edge distance		c_{ac}	mm	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		ϕc	-	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)
Dry Concrete									
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	476 (3.3)	476 (3.3)	476 (3.3)	476 (3.3)	416 (2.9	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,272 (8.8)	1,204 (8.3)	1,156 (8.0)	1,100 (7.6)	1,056 (7.3	D.6.5.2
Anchor category, dry concrete		-	-	2	2	2	2	2	D.5.3 (c)
Resistance modification factor		R_{dry}	-	0.85	0.85	0.85	0.85	0.85	
Water Saturated Concrete									
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	424 (2.9)	420 (2.9)	405 (2.8)	360 (2.5)	319 (2.2	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,133 (7.8)	1,061 (7.3)	986 (6.8)	878 (6.1)	803 (5.5)	D.6.5.2
Anchor category, water-saturated concrete		-	-	3	3	3	3	3	D.5.3 (c)
Resistance modification factor		R_{ws}	-	0.75	0.75	0.75	0.75	0.75	
Water-Filled Hole									
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	424 (2.9)	420 (2.9)	405 (2.8)	360 (2.5)	319 (2.2)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,133 (7.8)	1,061 (7.3)	986 (6.8)	878 (6.1)	803 (5.5)	D.6.5.2
Anchor category, water-filled hole		-	-	3	3	3	3	3	D.5.3 (c)
Resistance modification factor		R_{wf}	-	0.75	0.75	0.75	0.75	0.75	
Underwater Application									
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	424 (2.9)	420 (2.9)	405 (2.8)	360 (2.5)	319 (2.2)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,133 (7.8)	1,061 (7.3)	986 (6.8)	878 (6.1)	803 (5.5)	D.6.5.2
Anchor category, underwater		-	-	3	3	3	3	3	D.5.3 (c)
Resistance modification factor		R_{uw}	-	0.75	0.75	0.75	0.75	0.75	

1 Design information in this table is taken from ICC-ES ESR-3829, dated January, 2016, table 32 and 33, and converted for use with CSA A23.3-14 Annex D.
2 See figure 2.
3 Minimum edge distance may be reduced to 45mm provided rebar remains untorqued. See ESR-3829 section 4.1.9.
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).
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: $(f'_c / 17.2)0.1$].
8 Bond strength values are for sustained loads including dead and live loads. For load combinations consisting of short-term loads only such as wind and seismic, bond strengths may be increased by 40 percent.
9 For structures assigned to Seismic Design Categories C, D, E, or F, bond strength values must be multiplied by $\alpha_{N,seis}$ = 0.9.

HIT-RE 100 adhesive anchoring system

Table 42 — Hilti HIT-RE 100 adhesive factored resistance with concrete / bond failure for CA rebar in uncracked concrete [1,2,3,4,5,6,7,8,9,10]

Rebar Size	Effective Embedment Depth 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)
10 M	4-1/2 (115)	4,515 (20.1)	4,620 (20.5)	4,705 (20.9)	4,840 (21.5)	9,030 (40.2)	9,235 (41.1)	9,405 (41.8)	9,680 (43.1)
	7-1/16 (180)	7,070 (31.4)	7,230 (32.2)	7,360 (32.7)	7,575 (33.7)	14,135 (62.9)	14,455 (64.3)	14,720 (65.5)	15,150 (67.4)
	8-7/8 (226)	8,875 (39.5)	9,075 (40.4)	9,240 (41.1)	9,510 (42.3)	17,750 (79.0)	18,150 (80.7)	18,485 (82.2)	19,025 (84.6)
15 M	5-11/16 (145)	7,630 (33.9)	7,805 (34.7)	7,945 (35.3)	8,180 (36.4)	15,260 (67.9)	15,605 (69.4)	15,895 (70.7)	16,360 (72.8)
	9-13/16 (250)	13,155 (58.5)	13,455 (59.8)	13,700 (60.9)	14,100 (62.7)	26,315 (117.1)	26,910 (119.7)	27,405 (121.9)	28,205 (125.5)
	12-5/8 (320)	16,840 (74.9)	17,220 (76.6)	17,540 (78.0)	18,050 (80.3)	33,685 (149.8)	34,445 (153.2)	35,075 (156.0)	36,100 (160.6)
20 M	7-7/8 (200)	12,315 (54.8)	12,595 (56.0)	12,825 (57.1)	13,200 (58.7)	24,635 (109.6)	25,190 (112.0)	25,655 (114.1)	26,400 (117.4)
	14 (355)	21,865 (97.2)	22,355 (99.4)	22,765 (101.3)	23,430 (104.2)	43,725 (194.5)	44,710 (198.9)	45,535 (202.5)	46,865 (208.5)
	15-3/8 (390)	24,020 (106.8)	24,560 (109.2)	25,010 (111.3)	25,740 (114.5)	48,035 (213.7)	49,120 (218.5)	50,025 (222.5)	51,485 (229.0)
25 M	9-1/16 (230)	17,420 (77.5)	17,810 (79.2)	18,140 (80.7)	18,670 (83.0)	34,835 (155.0)	35,620 (158.5)	36,280 (161.4)	37,335 (166.1)
	15-15/16 (405)	30,670 (136.4)	31,365 (139.5)	31,940 (142.1)	32,870 (146.2)	61,340 (272.9)	62,725 (279.0)	63,880 (284.2)	65,745 (292.4)
	19-13/16 (504)	38,170 (169.8)	39,030 (173.6)	39,750 (176.8)	40,910 (182.0)	76,335 (339.6)	78,060 (347.2)	79,495 (353.6)	81,815 (363.9)
30 M	10-1/4 (260)	22,430 (99.8)	22,935 (102.0)	23,355 (103.9)	24,040 (106.9)	44,855 (199.5)	45,870 (204.0)	46,710 (207.8)	48,075 (213.8)
	17-15/16 (455)	39,250 (174.6)	40,135 (178.5)	40,875 (181.8)	42,065 (187.1)	78,500 (349.2)	80,270 (357.1)	81,745 (363.6)	84,130 (374.2)
	23-9/16 (598)	51,585 (229.5)	52,750 (234.6)	53,720 (239.0)	55,285 (245.9)	103,170 (458.9)	105,495 (469.3)	107,435 (477.9)	110,575 (491.9)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 5-20 as necessary. Compare to the steel values in table 40. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.4.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

HIT-RE 100 adhesive anchoring system

Table 43 — Hilti HIT-RE 100 adhesive factored resistance with concrete / bond failure for CA rebar in cracked concrete [1,2,3,4,5,6,7,8,9,10]

Rebar Size	Effective Embedment Depth 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)
10 M	4-1/2 (115)	1,690 (7.5)	1,730 (7.7)	1,760 (7.8)	1,810 (8.1)	3,380 (15.0)	3,455 (15.4)	3,520 (15.7)	3,620 (16.1)
	7-1/16 (180)	2,645 (11.8)	2,705 (12.0)	2,755 (12.3)	2,835 (12.6)	5,290 (23.5)	5,410 (24.1)	5,510 (24.5)	5,670 (25.2)
	8-7/8 (226)	3,320 (14.8)	3,395 (15.1)	3,460 (15.4)	3,560 (15.8)	6,640 (29.5)	6,790 (30.2)	6,915 (30.8)	7,120 (31.7)
15 M	5-11/16 (145)	3,015 (13.4)	3,085 (13.7)	3,140 (14.0)	3,235 (14.4)	6,035 (26.8)	6,170 (27.4)	6,285 (28.0)	6,465 (28.8)
	9-13/16 (250)	5,200 (23.1)	5,320 (23.7)	5,415 (24.1)	5,575 (24.8)	10,405 (46.3)	10,640 (47.3)	10,835 (48.2)	11,150 (49.6)
	12-5/8 (320)	6,660 (29.6)	6,810 (30.3)	6,935 (30.8)	7,135 (31.7)	13,315 (59.2)	13,615 (60.6)	13,865 (61.7)	14,270 (63.5)
20 M	7-7/8 (200)	5,070 (22.6)	5,185 (23.1)	5,280 (23.5)	5,435 (24.2)	10,145 (45.1)	10,370 (46.1)	10,565 (47.0)	10,870 (48.4)
	14 (355)	9,000 (40.0)	9,205 (40.9)	9,375 (41.7)	9,650 (42.9)	18,005 (80.1)	18,410 (81.9)	18,750 (83.4)	19,295 (85.8)
	15-3/8 (390)	9,890 (44.0)	10,115 (45.0)	10,300 (45.8)	10,600 (47.1)	19,780 (88.0)	20,225 (90.0)	20,600 (91.6)	21,200 (94.3)
25 M	9-1/16 (230)	7,535 (33.5)	7,705 (34.3)	7,850 (34.9)	8,080 (35.9)	15,075 (67.1)	15,415 (68.6)	15,700 (69.8)	16,155 (71.9)
	15-15/16 (405)	13,270 (59.0)	13,570 (60.4)	13,820 (61.5)	14,225 (63.3)	26,545 (118.1)	27,145 (120.7)	27,645 (123.0)	28,450 (126.5)
	19-13/16 (504)	16,515 (73.5)	16,890 (75.1)	17,200 (76.5)	17,700 (78.7)	33,035 (146.9)	33,780 (150.3)	34,400 (153.0)	35,405 (157.5)
30 M	10-1/4 (260)	8,835 (39.3)	9,035 (40.2)	9,200 (40.9)	9,470 (42.1)	17,670 (78.6)	18,070 (80.4)	18,400 (81.9)	18,940 (84.2)
	17-15/16 (455)	15,460 (68.8)	15,810 (70.3)	16,100 (71.6)	16,570 (73.7)	30,925 (137.6)	31,620 (140.7)	32,205 (143.2)	33,145 (147.4)
	23-9/16 (598)	20,320 (90.4)	20,780 (92.4)	21,160 (94.1)	21,780 (96.9)	40,640 (180.8)	41,560 (184.9)	42,325 (188.3)	43,560 (193.8)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 5-20 as necessary. Compare to the steel values in table 40. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.4.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.675. See section 2.4.5 for additional information on seismic applications

HIT-RE 100 adhesive anchoring system

Table 45 — Load adjustment factors for 10M rebar in uncracked concrete [1,2,3]

10 M 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)		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	0.09	0.06	0.05	0.18	0.12	0.09	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	0.53	0.12	0.08	0.06	0.25	0.16	0.13	n/a	n/a	n/a
	3 (76)	0.61	0.57	0.56	0.33	0.20	0.16	0.56	0.54	0.54	0.20	0.13	0.10	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	0.58	0.56	0.55	0.31	0.20	0.16	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	0.60	0.57	0.56	0.43	0.28	0.22	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	0.61	0.58	0.57	0.53	0.34	0.27	0.53	0.33	0.26	0.66	n/a	n/a
	6 (152)	0.72	0.64	0.61	0.56	0.35	0.27	0.61	0.59	0.57	0.57	0.37	0.29	0.56	0.35	0.27	0.68	n/a	n/a
	7 (178)	0.76	0.66	0.63	0.65	0.40	0.32	0.63	0.60	0.59	0.72	0.46	0.37	0.65	0.40	0.32	0.73	n/a	n/a
	8 (203)	0.79	0.69	0.65	0.74	0.46	0.36	0.65	0.61	0.60	0.88	0.56	0.45	0.74	0.46	0.36	0.78	n/a	n/a
	8-1/4 (210)	0.80	0.69	0.65	0.77	0.48	0.38	0.66	0.62	0.60	0.92	0.59	0.47	0.77	0.48	0.38	0.80	0.69	n/a
	9 (229)	0.83	0.71	0.67	0.84	0.52	0.41	0.67	0.63	0.61	1.00	0.67	0.53	0.84	0.52	0.41	0.83	0.71	n/a
	10-1/16 (256)	0.87	0.74	0.69	0.94	0.58	0.46	0.69	0.64	0.62		0.80	0.63	0.94	0.58	0.46	0.88	0.76	0.70
	11 (279)	0.90	0.76	0.71	1.00	0.63	0.50	0.71	0.66	0.63		0.91	0.72	1.00	0.63	0.50	0.92	0.79	0.73
	12 (305)	0.94	0.78	0.72		0.69	0.54	0.73	0.67	0.65		1.00	0.82		0.69	0.54	0.96	0.83	0.77
	14 (356)	1.00	0.83	0.76		0.81	0.64	0.77	0.70	0.67			1.00		0.81	0.64	1.00	0.89	0.83
	16 (406)		0.88	0.80		0.92	0.73	0.81	0.73	0.70					0.92	0.73		0.95	0.88
	18 (457)		0.92	0.84		1.00	0.82	0.84	0.76	0.72					1.00	0.82		1.00	0.94
	24 (610)		1.00	0.95			1.00	0.96	0.84	0.79						1.00			1.00
	30 (762)			1.00				1.00	0.93	0.87									
	36 (914)								1.00	0.94									
	>48 (1219)									1.00									

Table 46 — Load adjustment factors for 10M rebar in cracked concrete [1,2,3]

10 M 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)		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	0.17	0.11	0.09	0.34	0.22	0.17	n/a	n/a	n/a
	2-3/16 (55)	0.58	0.55	0.54	0.52	0.46	0.43	0.56	0.55	0.54	0.24	0.15	0.12	0.47	0.30	0.24	n/a	n/a	n/a
	3 (76)	0.61	0.57	0.56	0.60	0.50	0.47	0.59	0.57	0.56	0.39	0.25	0.20	0.60	0.49	0.39	n/a	n/a	n/a
	4 (102)	0.65	0.59	0.57	0.70	0.56	0.51	0.62	0.59	0.58	0.59	0.38	0.30	0.70	0.56	0.51	n/a	n/a	n/a
	5 (127)	0.68	0.62	0.59	0.80	0.62	0.56	0.65	0.61	0.59	0.83	0.53	0.42	0.80	0.62	0.56	n/a	n/a	n/a
	5-11/16 (145)	0.71	0.63	0.61	0.88	0.66	0.59	0.67	0.62	0.61	1.00	0.65	0.52	0.88	0.66	0.59	0.82	n/a	n/a
	6 (152)	0.72	0.64	0.61	0.91	0.68	0.61	0.68	0.63	0.61		0.70	0.56	0.91	0.68	0.61	0.84	n/a	n/a
	7 (178)	0.76	0.66	0.63	1.00	0.74	0.65	0.71	0.65	0.63		0.88	0.70	1.00	0.74	0.65	0.91	n/a	n/a
	8 (203)	0.79	0.69	0.65		0.81	0.70	0.74	0.67	0.65		1.00	0.85		0.81	0.70	0.97	n/a	n/a
	8-1/4 (210)	0.80	0.69	0.65		0.83	0.72	0.74	0.68	0.66			0.90		0.83	0.72	0.99	0.85	n/a
	9 (229)	0.83	0.71	0.67		0.88	0.76	0.77	0.70	0.67			1.00		0.88	0.76	1.00	0.89	n/a
	10-1/16 (256)	0.87	0.74	0.69		0.96	0.81	0.80	0.72	0.69					0.96	0.81		0.94	0.87
	11 (279)	0.90	0.76	0.71		1.00	0.86	0.82	0.74	0.71					1.00	0.86		0.98	0.91
	12 (305)	0.94	0.78	0.72			0.92	0.85	0.76	0.73						0.92		1.00	0.95
	14 (356)	1.00	0.83	0.76			1.00	0.91	0.81	0.76						1.00			1.00
	16 (406)		0.88	0.80				0.97	0.85	0.80									
	18 (457)		0.92	0.84				1.00	0.89	0.84									
	24 (610)		1.00	0.95					1.00	0.95									
	30 (762)			1.00						1.00									
	36 (914)																		
	>48 (1219)																		

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 47 — Load adjustment factors for 15M rebar in uncracked concrete [1,2,3]

15 M 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	0.25	0.14	0.11	n/a	n/a	n/a	0.06	0.04	0.03	0.13	0.07	0.06	n/a	n/a	n/a
3-1/8	(80)	0.59	0.55	0.54	0.32	0.18	0.14	0.55	0.53	0.53	0.15	0.09	0.07	0.31	0.18	0.14	n/a	n/a	n/a
4	(102)	0.62	0.57	0.55	0.36	0.20	0.16	0.56	0.54	0.54	0.22	0.13	0.10	0.36	0.20	0.16	n/a	n/a	n/a
5	(127)	0.65	0.58	0.57	0.41	0.23	0.18	0.58	0.55	0.54	0.31	0.18	0.14	0.41	0.23	0.18	n/a	n/a	n/a
6	(152)	0.68	0.60	0.58	0.47	0.26	0.20	0.59	0.56	0.55	0.40	0.23	0.18	0.47	0.26	0.20	n/a	n/a	n/a
7	(178)	0.70	0.62	0.59	0.53	0.30	0.23	0.61	0.57	0.56	0.51	0.29	0.23	0.53	0.30	0.23	n/a	n/a	n/a
7-1/4	(184)	0.71	0.62	0.60	0.55	0.31	0.24	0.61	0.58	0.56	0.53	0.31	0.24	0.55	0.31	0.24	0.66	n/a	n/a
8	(203)	0.73	0.64	0.61	0.60	0.34	0.26	0.62	0.58	0.57	0.62	0.36	0.28	0.60	0.34	0.26	0.70	n/a	n/a
9	(229)	0.76	0.65	0.62	0.68	0.38	0.29	0.64	0.59	0.58	0.74	0.43	0.34	0.68	0.38	0.29	0.74	n/a	n/a
10	(254)	0.79	0.67	0.63	0.75	0.42	0.33	0.65	0.61	0.59	0.87	0.50	0.39	0.75	0.42	0.33	0.78	n/a	n/a
11-3/8	(289)	0.83	0.69	0.65	0.86	0.48	0.37	0.67	0.62	0.60	1.00	0.61	0.48	0.86	0.48	0.37	0.83	0.69	n/a
12	(305)	0.85	0.70	0.66	0.90	0.51	0.39	0.68	0.63	0.61		0.66	0.52	0.90	0.51	0.39	0.85	0.71	n/a
14-1/8	(359)	0.91	0.74	0.69	1.00	0.60	0.46	0.71	0.65	0.63		0.84	0.66	1.00	0.60	0.46	0.93	0.77	0.71
16	(406)	0.97	0.77	0.71		0.68	0.52	0.74	0.67	0.64		1.00	0.79		0.68	0.52	0.98	0.82	0.76
18	(457)	1.00	0.80	0.74		0.76	0.59	0.77	0.69	0.66			0.95		0.76	0.59	1.00	0.87	0.80
20	(508)		0.84	0.76		0.84	0.65	0.80	0.71	0.68			1.00		0.84	0.65		0.92	0.85
22	(559)		0.87	0.79		0.93	0.72	0.83	0.73	0.70					0.93	0.72		0.96	0.89
24	(610)		0.91	0.82		1.00	0.78	0.86	0.75	0.71					1.00	0.78		1.00	0.93
30	(762)		1.00	0.90			0.98	0.95	0.82	0.77						0.98			1.00
36	(914)			0.98			1.00	1.00	0.88	0.82						1.00			
>48	(1219)			1.00					1.00	0.93									

Table 48 — Load adjustment factors for 15M rebar in cracked concrete [1,2,3]

15 M 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	0.46	0.41	0.40	n/a	n/a	n/a	0.11	0.07	0.05	0.23	0.13	0.10	n/a	n/a	n/a
3-1/8	(80)	0.59	0.55	0.54	0.55	0.46	0.44	0.57	0.55	0.54	0.28	0.16	0.13	0.55	0.32	0.25	n/a	n/a	n/a
4	(102)	0.62	0.57	0.55	0.62	0.50	0.46	0.59	0.56	0.55	0.40	0.23	0.18	0.62	0.46	0.36	n/a	n/a	n/a
5	(127)	0.65	0.58	0.57	0.69	0.54	0.49	0.61	0.58	0.57	0.55	0.32	0.25	0.69	0.54	0.49	n/a	n/a	n/a
6	(152)	0.68	0.60	0.58	0.77	0.58	0.52	0.63	0.59	0.58	0.73	0.42	0.33	0.77	0.58	0.52	n/a	n/a	n/a
7	(178)	0.70	0.62	0.59	0.86	0.62	0.56	0.66	0.61	0.59	0.92	0.53	0.42	0.86	0.62	0.56	n/a	n/a	n/a
7-1/4	(184)	0.71	0.62	0.60	0.88	0.63	0.56	0.66	0.61	0.60	0.96	0.56	0.44	0.88	0.63	0.56	0.81	n/a	n/a
8	(203)	0.73	0.64	0.61	0.95	0.66	0.59	0.68	0.63	0.61	1.00	0.65	0.51	0.95	0.66	0.59	0.85	n/a	n/a
9	(229)	0.76	0.65	0.62	1.00	0.71	0.62	0.70	0.64	0.62		0.78	0.61	1.00	0.71	0.62	0.90	n/a	n/a
10	(254)	0.79	0.67	0.63		0.76	0.66	0.72	0.66	0.63		0.91	0.71		0.76	0.66	0.95	n/a	n/a
11-3/8	(289)	0.83	0.69	0.65		0.82	0.71	0.76	0.68	0.65		1.00	0.86		0.82	0.71	1.00	0.84	n/a
12	(305)	0.85	0.70	0.66		0.86	0.73	0.77	0.69	0.66			0.93		0.86	0.73		0.87	n/a
14-1/8	(359)	0.91	0.74	0.69		0.97	0.81	0.82	0.72	0.69			1.00		0.97	0.81		0.94	0.87
16	(406)	0.97	0.77	0.71		1.00	0.88	0.86	0.75	0.71					1.00	0.88		1.00	0.92
18	(457)	1.00	0.80	0.74			0.96	0.90	0.78	0.74						0.96			0.98
20	(508)		0.84	0.76			1.00	0.95	0.81	0.77						1.00			1.00
22	(559)		0.87	0.79				0.99	0.84	0.79									
24	(610)		0.91	0.82				1.00	0.88	0.82									
30	(762)		1.00	0.90					0.97	0.90									
36	(914)			0.98					1.00	0.98									
>48	(1219)			1.00						1.00									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 49 — Load adjustment factors for 20M rebar in uncracked concrete [1,2,3]

20 M 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	0.21	0.11	0.10	n/a	n/a	n/a	0.04	0.02	0.02	0.08	0.05	0.04	n/a	n/a	n/a
3-7/8	(98)	0.58	0.55	0.54	0.28	0.15	0.14	0.54	0.53	0.53	0.14	0.08	0.07	0.27	0.15	0.14	n/a	n/a	n/a
4	(102)	0.58	0.55	0.54	0.29	0.16	0.14	0.55	0.53	0.53	0.14	0.08	0.07	0.29	0.16	0.14	n/a	n/a	n/a
5	(127)	0.61	0.56	0.55	0.32	0.18	0.16	0.56	0.54	0.54	0.20	0.11	0.10	0.32	0.18	0.16	n/a	n/a	n/a
6	(152)	0.63	0.57	0.57	0.36	0.20	0.18	0.57	0.55	0.54	0.27	0.15	0.14	0.36	0.20	0.18	n/a	n/a	n/a
7	(178)	0.65	0.58	0.58	0.40	0.22	0.20	0.58	0.55	0.55	0.34	0.19	0.17	0.40	0.22	0.20	n/a	n/a	n/a
8	(203)	0.67	0.60	0.59	0.44	0.24	0.22	0.59	0.56	0.56	0.41	0.23	0.21	0.44	0.24	0.22	n/a	n/a	n/a
9	(229)	0.69	0.61	0.60	0.50	0.27	0.25	0.60	0.57	0.57	0.49	0.28	0.25	0.50	0.27	0.25	n/a	n/a	n/a
10	(254)	0.71	0.62	0.61	0.55	0.30	0.27	0.61	0.58	0.57	0.57	0.32	0.29	0.55	0.30	0.27	0.68	n/a	n/a
11	(279)	0.73	0.63	0.62	0.61	0.33	0.30	0.63	0.59	0.58	0.66	0.37	0.34	0.61	0.33	0.30	0.71	n/a	n/a
12	(305)	0.75	0.64	0.63	0.66	0.36	0.33	0.64	0.59	0.59	0.75	0.42	0.39	0.66	0.36	0.33	0.74	n/a	n/a
14	(356)	0.80	0.67	0.65	0.77	0.42	0.38	0.66	0.61	0.60	0.95	0.53	0.49	0.77	0.42	0.38	0.80	n/a	n/a
16	(406)	0.84	0.69	0.67	0.88	0.48	0.44	0.68	0.63	0.62	1.00	0.65	0.59	0.88	0.48	0.44	0.86	0.71	n/a
18	(457)	0.88	0.71	0.70	1.00	0.54	0.49	0.71	0.64	0.63		0.78	0.71	1.00	0.54	0.49	0.91	0.75	0.73
20	(508)	0.92	0.74	0.72		0.60	0.55	0.73	0.66	0.65		0.91	0.83		0.60	0.55	0.96	0.79	0.77
22	(559)	0.97	0.76	0.74		0.66	0.60	0.75	0.67	0.66		1.00	0.96		0.66	0.60	1.00	0.83	0.80
24	(610)	1.00	0.79	0.76		0.72	0.66	0.78	0.69	0.68			1.00		0.72	0.66		0.87	0.84
26	(660)		0.81	0.78		0.78	0.71	0.80	0.70	0.69					0.78	0.71		0.90	0.87
28	(711)		0.83	0.80		0.84	0.76	0.82	0.72	0.71					0.84	0.76		0.94	0.91
30	(762)		0.86	0.83		0.90	0.82	0.84	0.74	0.72					0.90	0.82		0.97	0.94
36	(914)		0.93	0.89		1.00	0.98	0.91	0.78	0.76					1.00	0.98		1.00	1.00
>48	(1219)		1.00	1.00			1.00	1.00	0.88	0.85						1.00			

Table 50 — Load adjustment factors for 20M rebar in cracked concrete [1,2,3]

20 M 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	0.43	0.39	0.39	n/a	n/a	n/a	0.07	0.04	0.04	0.15	0.08	0.07	n/a	n/a	n/a
3-7/8	(98)	0.58	0.55	0.54	0.53	0.45	0.44	0.56	0.54	0.54	0.24	0.13	0.12	0.48	0.27	0.24	n/a	n/a	n/a
4	(102)	0.58	0.55	0.54	0.54	0.45	0.44	0.57	0.55	0.54	0.25	0.14	0.13	0.50	0.28	0.26	n/a	n/a	n/a
5	(127)	0.61	0.56	0.55	0.59	0.48	0.47	0.58	0.56	0.55	0.35	0.20	0.18	0.59	0.40	0.36	n/a	n/a	n/a
6	(152)	0.63	0.57	0.57	0.64	0.51	0.49	0.60	0.57	0.56	0.46	0.26	0.24	0.64	0.51	0.47	n/a	n/a	n/a
7	(178)	0.65	0.58	0.58	0.70	0.53	0.52	0.62	0.58	0.57	0.58	0.33	0.30	0.70	0.53	0.52	n/a	n/a	n/a
8	(203)	0.67	0.60	0.59	0.76	0.56	0.54	0.63	0.59	0.59	0.71	0.40	0.36	0.76	0.56	0.54	n/a	n/a	n/a
9	(229)	0.69	0.61	0.60	0.82	0.59	0.57	0.65	0.60	0.60	0.85	0.48	0.43	0.82	0.59	0.57	n/a	n/a	n/a
10	(254)	0.71	0.62	0.61	0.88	0.62	0.60	0.67	0.61	0.61	0.99	0.56	0.51	0.88	0.62	0.60	0.81	n/a	n/a
11	(279)	0.73	0.63	0.62	0.95	0.65	0.62	0.68	0.62	0.62	1.00	0.65	0.59	0.95	0.65	0.62	0.85	n/a	n/a
12	(305)	0.75	0.64	0.63	1.00	0.69	0.65	0.70	0.64	0.63		0.74	0.67	1.00	0.69	0.65	0.89	n/a	n/a
14	(356)	0.80	0.67	0.65		0.75	0.71	0.73	0.66	0.65		0.93	0.84		0.75	0.71	0.96	n/a	n/a
16	(406)	0.84	0.69	0.67		0.82	0.77	0.77	0.68	0.67		1.00	1.00		0.82	0.77	1.00	0.85	n/a
18	(457)	0.88	0.71	0.70		0.89	0.83	0.80	0.70	0.69					0.89	0.83		0.90	0.87
20	(508)	0.92	0.74	0.72		0.96	0.90	0.83	0.73	0.71					0.96	0.90		0.95	0.92
22	(559)	0.97	0.76	0.74		1.00	0.96	0.86	0.75	0.73					1.00	0.96		1.00	0.97
24	(610)	1.00	0.79	0.76			1.00	0.90	0.77	0.76						1.00			1.00
26	(660)		0.81	0.78				0.93	0.79	0.78									
28	(711)		0.83	0.80				0.96	0.82	0.80									
30	(762)		0.86	0.83				1.00	0.84	0.82									
36	(914)		0.93	0.89					0.91	0.88									
>48	(1219)		1.00	1.00					1.00	1.00									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 51 — Load adjustment factors for 25M rebar in uncracked concrete [1,2,3]

25 M Cracked Concrete		Spacing Factor in Tension f_{AN}			Edge Distance Factor in Tension f_{RN}			Spacing Factor in Shear[4] f_{AV}			Edge Distance in Shear ⊥ Toward Edge f_{RV}			Edge Distance in Shear ‖ To Edge f_{RV}			Concrete Thickness Factor in Shear[5] f_{HV}		
Embedment h_{ef} in (mm)		9-1/16 (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	0.03	0.02	0.01	0.06	0.03	0.03	n/a	n/a	n/a
5	(127)	0.59	0.55	0.54	0.32	0.18	0.14	0.55	0.53	0.53	0.14	0.08	0.07	0.29	0.16	0.13	n/a	n/a	n/a
6	(152)	0.61	0.56	0.55	0.35	0.19	0.15	0.55	0.54	0.53	0.19	0.11	0.09	0.35	0.19	0.15	n/a	n/a	n/a
7	(178)	0.63	0.57	0.56	0.39	0.21	0.17	0.56	0.54	0.54	0.24	0.13	0.11	0.39	0.21	0.17	n/a	n/a	n/a
8	(203)	0.65	0.58	0.57	0.42	0.23	0.18	0.57	0.55	0.54	0.29	0.16	0.13	0.42	0.23	0.18	n/a	n/a	n/a
9	(229)	0.67	0.59	0.58	0.46	0.25	0.20	0.58	0.56	0.55	0.35	0.20	0.16	0.46	0.25	0.20	n/a	n/a	n/a
10	(254)	0.68	0.60	0.58	0.50	0.27	0.22	0.59	0.56	0.55	0.40	0.23	0.18	0.50	0.27	0.22	n/a	n/a	n/a
11-9/16	(294)	0.71	0.62	0.60	0.57	0.31	0.25	0.61	0.57	0.56	0.50	0.29	0.23	0.57	0.31	0.25	0.65	n/a	n/a
12	(305)	0.72	0.63	0.60	0.59	0.32	0.26	0.61	0.58	0.56	0.53	0.30	0.24	0.59	0.32	0.26	0.66	n/a	n/a
14	(356)	0.76	0.65	0.62	0.69	0.38	0.30	0.63	0.59	0.58	0.67	0.38	0.31	0.69	0.38	0.30	0.71	n/a	n/a
16	(406)	0.79	0.67	0.63	0.79	0.43	0.34	0.65	0.60	0.59	0.82	0.47	0.37	0.79	0.43	0.34	0.76	n/a	n/a
18	(457)	0.83	0.69	0.65	0.89	0.49	0.39	0.66	0.61	0.60	0.98	0.56	0.45	0.89	0.49	0.39	0.81	n/a	n/a
18-7/16	(469)	0.84	0.69	0.66	0.91	0.50	0.40	0.67	0.62	0.60	1.00	0.58	0.46	0.91	0.50	0.40	0.82	0.68	n/a
20	(508)	0.87	0.71	0.67	0.99	0.54	0.43	0.68	0.63	0.61		0.65	0.52	0.99	0.54	0.43	0.85	0.71	n/a
22-3/8	(568)	0.91	0.73	0.69	1.00	0.60	0.48	0.70	0.64	0.62		0.77	0.62	1.00	0.60	0.48	0.90	0.75	0.70
24	(610)	0.94	0.75	0.70		0.65	0.52	0.72	0.65	0.63		0.85	0.69		0.65	0.52	0.94	0.77	0.72
26	(660)	0.98	0.77	0.72		0.70	0.56	0.74	0.66	0.64		0.96	0.77		0.70	0.56	0.97	0.81	0.75
28	(711)	1.00	0.79	0.74		0.76	0.60	0.76	0.68	0.65		1.00	0.87		0.76	0.60	1.00	0.84	0.78
30	(762)		0.81	0.75		0.81	0.65	0.77	0.69	0.66			0.96		0.81	0.65		0.87	0.81
36	(914)		0.88	0.80		0.97	0.78	0.83	0.73	0.69			1.00		0.97	0.78		0.95	0.88
>48	(1219)		1.00	0.90		1.00	1.00	0.94	0.80	0.76					1.00	1.00		1.00	1.00

Table 52 — Load adjustment factors for 25M rebar in cracked concrete [1,2,3]

25 M 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	0.42	0.39	0.38	n/a	n/a	n/a	0.05	0.03	0.02	0.10	0.06	0.04	n/a	n/a	n/a
5	(127)	0.59	0.55	0.54	0.55	0.46	0.44	0.56	0.54	0.54	0.24	0.13	0.11	0.47	0.27	0.22	n/a	n/a	n/a
6	(152)	0.61	0.56	0.55	0.60	0.48	0.46	0.58	0.55	0.55	0.31	0.18	0.14	0.60	0.35	0.28	n/a	n/a	n/a
7	(178)	0.63	0.57	0.56	0.65	0.51	0.48	0.59	0.56	0.55	0.39	0.22	0.18	0.65	0.44	0.36	n/a	n/a	n/a
8	(203)	0.65	0.58	0.57	0.70	0.53	0.50	0.60	0.57	0.56	0.48	0.27	0.22	0.70	0.53	0.44	n/a	n/a	n/a
9	(229)	0.67	0.59	0.58	0.75	0.56	0.51	0.61	0.58	0.57	0.57	0.32	0.26	0.75	0.56	0.51	n/a	n/a	n/a
10	(254)	0.68	0.60	0.58	0.80	0.59	0.53	0.63	0.59	0.58	0.67	0.38	0.30	0.80	0.59	0.53	n/a	n/a	n/a
11-9/16	(294)	0.71	0.62	0.60	0.89	0.63	0.57	0.65	0.60	0.59	0.83	0.47	0.38	0.89	0.63	0.57	0.77	n/a	n/a
12	(305)	0.72	0.63	0.60	0.91	0.64	0.58	0.65	0.60	0.59	0.88	0.50	0.40	0.91	0.64	0.58	0.78	n/a	n/a
14	(356)	0.76	0.65	0.62	1.00	0.69	0.62	0.68	0.62	0.61	1.00	0.63	0.51	1.00	0.69	0.62	0.84	n/a	n/a
16	(406)	0.79	0.67	0.63		0.75	0.66	0.70	0.64	0.62		0.77	0.62		0.75	0.66	0.90	n/a	n/a
18	(457)	0.83	0.69	0.65		0.81	0.71	0.73	0.66	0.64		0.92	0.74		0.81	0.71	0.96	n/a	n/a
18-7/16	(469)	0.84	0.69	0.66		0.83	0.72	0.74	0.66	0.64		0.95	0.76		0.83	0.72	0.97	0.80	n/a
20	(508)	0.87	0.71	0.67		0.87	0.75	0.75	0.67	0.65		1.00	0.86		0.87	0.75	1.00	0.84	n/a
22-3/8	(568)	0.91	0.73	0.69		0.95	0.81	0.78	0.70	0.67			1.00		0.95	0.81		0.88	0.82
24	(610)	0.94	0.75	0.70		1.00	0.85	0.81	0.71	0.68					1.00	0.85		0.92	0.85
26	(660)	0.98	0.77	0.72			0.90	0.83	0.73	0.70						0.90		0.95	0.89
28	(711)	1.00	0.79	0.74			0.95	0.86	0.74	0.71						0.95		0.99	0.92
30	(762)		0.81	0.75			1.00	0.88	0.76	0.73						1.00		1.00	0.95
36	(914)		0.88	0.80				0.96	0.81	0.77									1.00
>48	(1219)		1.00	0.90				1.00	0.92	0.86									

1 Linear interpolation not permitted
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from CSA A23.3-14 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

HIT-RE 100 adhesive anchoring system

Table 53 — Load adjustment factors for 30M rebar in uncracked concrete [1,2,3]

30 M 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	0.23	0.13	0.09	n/a	n/a	n/a	0.02	0.01	0.01	0.05	0.03	0.02	n/a	n/a	n/a
5-7/8	(150)	0.60	0.55	0.54	0.34	0.19	0.14	0.55	0.53	0.53	0.14	0.08	0.06	0.29	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	0.15	0.08	0.06	0.29	0.17	0.13	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	0.11	0.08	0.37	0.20	0.15	n/a	n/a	n/a
8	(203)	0.63	0.57	0.56	0.40	0.22	0.17	0.56	0.54	0.54	0.22	0.13	0.10	0.40	0.22	0.17	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	0.27	0.15	0.12	0.43	0.24	0.18	n/a	n/a	n/a
10	(254)	0.66	0.59	0.57	0.47	0.26	0.19	0.58	0.55	0.54	0.31	0.18	0.14	0.47	0.26	0.19	n/a	n/a	n/a
11	(279)	0.68	0.60	0.58	0.50	0.28	0.21	0.58	0.56	0.55	0.36	0.21	0.16	0.50	0.28	0.21	n/a	n/a	n/a
12	(305)	0.70	0.61	0.58	0.54	0.29	0.22	0.59	0.56	0.55	0.41	0.24	0.18	0.54	0.29	0.22	n/a	n/a	n/a
13-1/4	(337)	0.72	0.62	0.59	0.59	0.33	0.24	0.60	0.57	0.56	0.48	0.27	0.21	0.59	0.33	0.24	0.64	n/a	n/a
14	(356)	0.73	0.63	0.60	0.63	0.34	0.26	0.61	0.57	0.56	0.52	0.30	0.23	0.63	0.34	0.26	0.66	n/a	n/a
16	(406)	0.76	0.65	0.61	0.71	0.39	0.30	0.62	0.58	0.57	0.64	0.36	0.28	0.71	0.39	0.30	0.70	n/a	n/a
18	(457)	0.79	0.67	0.63	0.80	0.44	0.33	0.64	0.60	0.58	0.76	0.43	0.33	0.80	0.44	0.33	0.74	n/a	n/a
20	(508)	0.83	0.69	0.64	0.89	0.49	0.37	0.65	0.61	0.59	0.89	0.51	0.39	0.89	0.49	0.37	0.79	n/a	n/a
20-7/8	(531)	0.84	0.69	0.65	0.93	0.51	0.39	0.66	0.61	0.59	0.95	0.54	0.41	0.93	0.51	0.39	0.80	n/a	n/a
22	(559)	0.86	0.70	0.66	0.98	0.54	0.41	0.67	0.62	0.60	1.00	0.59	0.45	0.98	0.54	0.41	0.82	0.68	n/a
24	(610)	0.89	0.72	0.67	1.00	0.59	0.44	0.68	0.63	0.61		0.67	0.51	1.00	0.59	0.44	0.86	0.71	n/a
26-9/16	(675)	0.93	0.75	0.69		0.65	0.49	0.70	0.64	0.62		0.78	0.59		0.65	0.49	0.91	0.75	0.69
28	(711)	0.96	0.76	0.70		0.69	0.52	0.72	0.65	0.62		0.84	0.64		0.69	0.52	0.93	0.77	0.70
30	(762)	0.99	0.78	0.71		0.74	0.55	0.73	0.66	0.63		0.93	0.71		0.74	0.55	0.96	0.80	0.73
36	(914)	1.00	0.83	0.75		0.88	0.66	0.78	0.69	0.66		1.00	0.93		0.88	0.66	1.00	0.87	0.80
>48	(1219)		0.95	0.84		1.00	0.89	0.87	0.75	0.71			1.00		1.00	0.89	1.00	1.00	0.92

Table 54 — Load adjustment factors for 30M rebar in cracked concrete [1,2,3]

30 M 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)		10-1/4 (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	0.04	0.02	0.02	0.08	0.05	0.04	n/a	n/a	n/a
5-7/8	(150)	0.60	0.55	0.54	0.56	0.47	0.44	0.57	0.55	0.54	0.26	0.15	0.11	0.52	0.30	0.22	n/a	n/a	n/a
6	(152)	0.60	0.56	0.54	0.57	0.47	0.44	0.57	0.55	0.54	0.26	0.15	0.12	0.53	0.30	0.23	n/a	n/a	n/a
7	(178)	0.61	0.57	0.55	0.61	0.49	0.46	0.58	0.56	0.55	0.33	0.19	0.15	0.61	0.38	0.29	n/a	n/a	n/a
8	(203)	0.63	0.57	0.56	0.65	0.51	0.47	0.59	0.56	0.55	0.41	0.23	0.18	0.65	0.47	0.35	n/a	n/a	n/a
9	(229)	0.65	0.58	0.56	0.69	0.53	0.49	0.60	0.57	0.56	0.49	0.28	0.21	0.69	0.53	0.42	n/a	n/a	n/a
10	(254)	0.66	0.59	0.57	0.74	0.56	0.50	0.61	0.58	0.57	0.57	0.33	0.25	0.74	0.56	0.50	n/a	n/a	n/a
11	(279)	0.68	0.60	0.58	0.79	0.58	0.52	0.63	0.59	0.57	0.66	0.38	0.29	0.79	0.58	0.52	n/a	n/a	n/a
12	(305)	0.70	0.61	0.58	0.83	0.60	0.54	0.64	0.59	0.58	0.75	0.43	0.33	0.83	0.60	0.54	n/a	n/a	n/a
13-1/4	(337)	0.72	0.62	0.59	0.89	0.63	0.56	0.65	0.60	0.59	0.87	0.50	0.38	0.89	0.63	0.56	0.78	n/a	n/a
14	(356)	0.73	0.63	0.60	0.93	0.65	0.57	0.66	0.61	0.59	0.94	0.54	0.41	0.93	0.65	0.57	0.80	n/a	n/a
16	(406)	0.76	0.65	0.61	1.00	0.70	0.61	0.68	0.63	0.61	1.00	0.66	0.50	1.00	0.70	0.61	0.86	n/a	n/a
18	(457)	0.79	0.67	0.63		0.75	0.64	0.71	0.64	0.62		0.79	0.60		0.75	0.64	0.91	n/a	n/a
20	(508)	0.83	0.69	0.64		0.81	0.68	0.73	0.66	0.63		0.92	0.70		0.81	0.68	0.96	n/a	n/a
20-7/8	(531)	0.84	0.69	0.65		0.83	0.70	0.74	0.66	0.64		0.98	0.75		0.83	0.70	0.98	n/a	n/a
22	(559)	0.86	0.70	0.66		0.86	0.72	0.75	0.67	0.64		1.00	0.81		0.86	0.72	1.00	0.83	n/a
24	(610)	0.89	0.72	0.67		0.92	0.76	0.77	0.69	0.66			0.92		0.92	0.76		0.87	n/a
26-9/16	(675)	0.93	0.75	0.69		0.99	0.81	0.80	0.71	0.67			1.00		0.99	0.81		0.92	0.84
28	(711)	0.96	0.76	0.70		1.00	0.84	0.82	0.72	0.68					1.00	0.84		0.94	0.86
30	(762)	0.99	0.78	0.71			0.88	0.84	0.74	0.70						0.88		0.97	0.89
36	(914)	1.00	0.83	0.75			1.00	0.91	0.78	0.74						1.00		1.00	0.97
>48	(1219)		0.95	0.84				1.00	0.88	0.82									1.00

1 Linear interpolation not permitted.
2 Shaded area with reduced edge distance is permitted provided rebar has no installation torque.
3 When combining multiple load adjustment factors (e.g. for a four-anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Anchor Design software or perform anchor calculation using design equations from CSA A23.3 Annex D.
4 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
5 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

HIT-RE 100 adhesive anchoring system

Table 55 — Hilti HIT-RE 100 design information with HAS threaded rods in hammer drilled holes in accordance with CSA A23.3-14 Annex D [1,9]

Design parameter		Symbol	Units	Nominal rod diameter (in.) 3/8	1/2	5/8	3/4	7/8	1	1-1/4	Ref A23.3-14
Anchor O.D.		d_a	mm	9.5	12.7	15.9	19.1	22.2	25.4	31.8	
Effective minimum embedment [2]		h_{ef}	mm	60	70	79	89	89	102	127	
Effective maximum embedment [2]		h_{ef}	mm	191	254	318	381	445	508	635	
Minimum concrete thickness [2]		h_{min}	mm	h_{ef} + 30		h_{ef} + 2d_0					
Critical edge distance		c_{ac}	mm	See ESR-3829, 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		ϕc	-	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)
Dry Concrete											
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	616 (4.2)	592 (4.1)	592 (4.1)	560 (3.9)	*516 (3.6)*	*480 (3.3)*	408 (2.8	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,272 (8.8)	1,256 (8.7)	1,204 (8.3)	1,164 (8.0)	*1,124 (7.8)*	*1,092 (7.5)*	1,048 (7.2)	D.6.5.2
Anchor category, dry concrete		-	-	2	2	2	2	2	2	2	
Resistance modification factor		R_{dry}	-	0.85	0.85	0.85	0.85	0.85	0.85	0.85	
Water Saturated Concrete											
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	548 (3.8)	521 (3.6)	521 (3.6)	476 (3.3)	416 (2.9)	375 (2.6)	300 (2.1)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,133 (7.8)	1,106 (7.6)	1,061 (7.3)	994 (6.9)	915 (6.3)	859 (5.9)	776 (5.4)	D.6.5.2
Anchor category, water-saturated concrete		-	-	2	2	2	2	2	2	2	
Resistance modification factor		R_{ws}	-	0.85	0.85	0.85	0.85	0.85	0.85	0.85	
Water-Filled Hole											
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	548 (3.8)	521 (3.6)	521 (3.6)	476 (3.3)	*416 (2.9)*	*375 (2.6)*	300 (2.1)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,133 (7.8)	1,106 (7.6)	1,061 (7.3)	994 (6.9)	*915 (6.3)*	*859 (5.9)*	776 (5.4)	D.6.5.2
Anchor category, water-filled hole		-	-	3	3	3	3	3	3	3	D.5.3 (c)
Resistance modification factor		R_{wf}	-	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
Underwater Application											
Temp. range A [6]	Characteristic bond stress in cracked concrete [7,8]	τ_{cr}	psi (MPa)	548 (3.8)	521 (3.6)	521 (3.6)	476 (3.3)	416 (2.9)	375 (2.6)	300 (2.1)	D.6.5.2
	Characteristic bond stress in uncracked concrete [7,8]	τ_{uncr}	psi (MPa)	1,133 (7.8)	1,106 (7.6)	1,061 (7.3)	994 (6.9)	915 (6.3)	859 (5.9)	776 (5.4)	D.6.5.2
Anchor category, underwater		-	-	3	3	3	3	3	3	3	
Resistance modification factor		R_{uw}	-	0.75	0.75	0.75	0.75	0.75	0.75	0.75	

1 Design information in this table is taken from ICC-ES ESR-3829, dated January, 2016, table 8 and 9, and converted for use with CSA A23.3-14 Annex D.
2 See figure 4.
3 Minimum edge distance may be reduced to 45mm < cai < 5d provided Tinst is reduced. See ESR-3829 section 4.1.9.
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).
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].
8 Bond strength values are for sustained loads including dead and live loads. For load combinations consisting of short-term loads only such as wind and seismic, bond strengths may be increased by 40 percent.
9 For structures assigned to Seismic Design Categories C, D, E, or F, bond strength values must be multiplied by $\alpha_{N,seis}$ = 0.9.

HIT-RE 100 adhesive anchoring system

Table 56 — Hilti HIT-RE 100 adhesive factored resistance with concrete / bond failure for threaded rod in uncracked concrete [1,2,3,4,5,6,7,8,9,10]

Nominal Anchor Diameter in. (mm)	Nominal anchor diameter 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	2-3/8 (60)	1,995 (8.9)	2,040 (9.1)	2,080 (9.2)	2,140 (9.5)	1,995 (8.9)	2,040 (9.1)	2,080 (9.2)	2,140 (9.5)
	3-3/8 (86)	2,840 (12.6)	2,900 (12.9)	2,955 (13.1)	3,040 (13.5)	5,675 (25.2)	5,805 (25.8)	5,910 (26.3)	6,080 (27.1)
	4-1/2 (114)	3,785 (16.8)	3,870 (17.2)	3,940 (17.5)	4,055 (18.0)	7,565 (33.7)	7,735 (34.4)	7,880 (35.1)	8,110 (36.1)
	7-1/2 (191)	6,305 (28.0)	6,450 (28.7)	6,565 (29.2)	6,760 (30.1)	12,610 (56.1)	12,895 (57.4)	13,135 (58.4)	13,515 (60.1)
1/2	2-3/4 (70)	3,045 (13.5)	3,115 (13.8)	3,170 (14.1)	3,260 (14.5)	6,090 (27.1)	6,225 (27.7)	6,340 (28.2)	6,525 (29.0)
	4-1/2 (114)	4,980 (22.2)	5,095 (22.7)	5,185 (23.1)	5,340 (23.7)	9,960 (44.3)	10,185 (45.3)	10,375 (46.1)	10,675 (47.5)
	6 (152)	6,640 (29.5)	6,790 (30.2)	6,915 (30.8)	7,120 (31.7)	13,285 (59.1)	13,580 (60.4)	13,830 (61.5)	14,235 (63.3)
	10 (254)	11,070 (49.2)	11,320 (50.3)	11,525 (51.3)	11,865 (52.8)	22,140 (98.5)	22,635 (100.7)	23,055 (102.5)	23,725 (105.5)
5/8	3-1/8 (79)	4,145 (18.4)	4,240 (18.9)	4,315 (19.2)	4,440 (19.8)	8,290 (36.9)	8,475 (37.7)	8,635 (38.4)	8,885 (39.5)
	5-5/8 (143)	7,460 (33.2)	7,630 (33.9)	7,770 (34.6)	7,995 (35.6)	14,920 (66.4)	15,260 (67.9)	15,540 (69.1)	15,990 (71.1)
	7-1/2 (191)	9,950 (44.2)	10,170 (45.2)	10,360 (46.1)	10,660 (47.4)	19,895 (88.5)	20,345 (90.5)	20,720 (92.2)	21,325 (94.8)
	12-1/2 (318)	16,580 (73.7)	16,955 (75.4)	17,265 (76.8)	17,770 (79.0)	33,160 (147.5)	33,905 (150.8)	34,530 (153.6)	35,540 (158.1)
3/4	3-1/2 (89)	5,385 (24.0)	5,505 (24.5)	5,610 (24.9)	5,770 (25.7)	10,770 (47.9)	11,015 (49.0)	11,215 (49.9)	11,545 (51.4)
	6-3/4 (171)	10,385 (46.2)	10,620 (47.2)	10,815 (48.1)	11,130 (49.5)	20,775 (92.4)	21,240 (94.5)	21,630 (96.2)	22,265 (99.0)
	9 (229)	13,850 (61.6)	14,160 (63.0)	14,420 (64.2)	14,845 (66.0)	27,695 (123.2)	28,320 (126.0)	28,845 (128.3)	29,685 (132.0)
	15 (381)	23,080 (102.7)	23,600 (105.0)	24,035 (106.9)	24,740 (110.0)	46,160 (205.3)	47,205 (210.0)	48,070 (213.8)	49,475 (220.1)
7/8	3-1/2 (89)	5,480 (24.4)	6,125 (27.2)	6,320 (28.1)	6,505 (28.9)	10,955 (48.7)	12,250 (54.5)	12,635 (56.2)	13,005 (57.9)
	7-7/8 (200)	13,650 (60.7)	13,960 (62.1)	14,215 (63.2)	14,630 (65.1)	27,300 (121.4)	27,920 (124.2)	28,430 (126.5)	29,260 (130.2)
	10-1/2 (267)	18,200 (81.0)	18,610 (82.8)	18,955 (84.3)	19,510 (86.8)	36,405 (161.9)	37,225 (165.6)	37,910 (168.6)	39,015 (173.6)
	17-1/2 (445)	30,335 (134.9)	31,020 (138.0)	31,590 (140.5)	32,515 (144.6)	60,670 (269.9)	62,040 (276.0)	63,185 (281.0)	65,025 (289.3)
1	4 (102)	6,690 (29.8)	7,480 (33.3)	8,020 (35.7)	8,250 (36.7)	13,385 (59.5)	14,965 (66.6)	16,035 (71.3)	16,505 (73.4)
	9 (229)	17,325 (77.1)	17,715 (78.8)	18,040 (80.2)	18,565 (82.6)	34,645 (154.1)	35,425 (157.6)	36,080 (160.5)	37,130 (165.2)
	12 (305)	23,095 (102.7)	23,620 (105.1)	24,055 (107.0)	24,755 (110.1)	46,195 (205.5)	47,235 (210.1)	48,105 (214.0)	49,510 (220.2)
	20 (508)	38,495 (171.2)	39,365 (175.1)	40,090 (178.3)	41,260 (183.5)	76,990 (342.5)	78,725 (350.2)	80,175 (356.6)	82,515 (367.0)
1-1/4	5 (127)	9,355 (41.6)	10,455 (46.5)	11,455 (51.0)	12,375 (55.0)	18,705 (83.2)	20,915 (93.0)	22,910 (101.9)	24,745 (110.1)
	11-1/4 (286)	25,975 (115.5)	26,560 (118.2)	27,050 (120.3)	27,840 (123.8)	51,950 (231.1)	53,125 (236.3)	54,100 (240.7)	55,680 (247.7)
	15 (381)	34,635 (154.1)	35,415 (157.5)	36,070 (160.4)	37,120 (165.1)	69,270 (308.1)	70,830 (315.1)	72,135 (320.9)	74,240 (330.2)
	25 (635)	57,725 (256.8)	59,025 (262.6)	60,115 (267.4)	61,865 (275.2)	115,450 (513.5)	118,055 (525.1)	120,225 (534.8)	123,735 (550.4)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 26 - 38 as necessary. Compare to the steel values in table 24. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.5.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

HIT-RE 100 adhesive anchoring system

Table 57 — Hilti HIT-RE 100 adhesive factored resistance with concrete / bond failure for threaded rod in cracked concrete [1,2,3,4,5,6,7,8,9,10]

Nominal Anchor Diameter in. (mm)	Nominal anchor diameter 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	2-3/8 (60)	965 (4.3)	990 (4.4)	1,005 (4.5)	1,035 (4.6)	965 (4.3)	990 (4.4)	1,005 (4.5)	1,035 (4.6)
	3-3/8 (86)	1,375 (6.1)	1,405 (6.3)	1,430 (6.4)	1,475 (6.6)	2,750 (12.2)	2,810 (12.5)	2,860 (12.7)	2,945 (13.1)
	4-1/2 (114)	1,830 (8.1)	1,875 (8.3)	1,910 (8.5)	1,965 (8.7)	3,665 (16.3)	3,745 (16.7)	3,815 (17.0)	3,925 (17.5)
	7-1/2 (191)	3,055 (13.6)	3,125 (13.9)	3,180 (14.1)	3,275 (14.6)	6,105 (27.2)	6,245 (27.8)	6,360 (28.3)	6,545 (29.1)
1/2	2-3/4 (70)	1,435 (6.4)	1,465 (6.5)	1,495 (6.6)	1,540 (6.8)	2,870 (12.8)	2,935 (13.1)	2,990 (13.3)	3,075 (13.7)
	4-1/2 (114)	2,350 (10.4)	2,400 (10.7)	2,445 (10.9)	2,515 (11.2)	4,695 (20.9)	4,800 (21.4)	4,890 (21.8)	5,035 (22.4)
	6 (152)	3,130 (13.9)	3,200 (14.2)	3,260 (14.5)	3,355 (14.9)	6,260 (27.8)	6,400 (28.5)	6,520 (29.0)	6,710 (29.8)
	10 (254)	5,215 (23.2)	5,335 (23.7)	5,435 (24.2)	5,590 (24.9)	10,435 (46.4)	10,670 (47.5)	10,865 (48.3)	11,185 (49.7)
5/8	3-1/8 (79)	2,040 (9.1)	2,085 (9.3)	2,120 (9.4)	2,185 (9.7)	4,075 (18.1)	4,170 (18.5)	4,245 (18.9)	4,370 (19.4)
	5-5/8 (143)	3,670 (16.3)	3,750 (16.7)	3,820 (17.0)	3,930 (17.5)	7,335 (32.6)	7,500 (33.4)	7,640 (34.0)	7,865 (35.0)
	7-1/2 (191)	4,890 (21.8)	5,000 (22.2)	5,095 (22.7)	5,240 (23.3)	9,780 (43.5)	10,005 (44.5)	10,185 (45.3)	10,485 (46.6)
	12-1/2 (318)	8,150 (36.3)	8,335 (37.1)	8,490 (37.8)	8,735 (38.9)	16,305 (72.5)	16,670 (74.2)	16,980 (75.5)	17,475 (77.7)
3/4	3-1/2 (89)	2,590 (11.5)	2,650 (11.8)	2,700 (12.0)	2,775 (12.4)	5,180 (23.1)	5,300 (23.6)	5,395 (24.0)	5,555 (24.7)
	6-3/4 (171)	4,995 (22.2)	5,110 (22.7)	5,205 (23.1)	5,355 (23.8)	9,995 (44.5)	10,220 (45.5)	10,405 (46.3)	10,710 (47.6)
	9 (229)	6,665 (29.6)	6,815 (30.3)	6,940 (30.9)	7,140 (31.8)	13,325 (59.3)	13,625 (60.6)	13,875 (61.7)	14,280 (63.5)
	15 (381)	11,105 (49.4)	11,355 (50.5)	11,565 (51.4)	11,900 (52.9)	22,210 (98.8)	22,710 (101.0)	23,125 (102.9)	23,800 (105.9)
7/8	3-1/2 (89)	2,785 (12.4)	2,850 (12.7)	2,900 (12.9)	2,985 (13.3)	5,570 (24.8)	5,695 (25.3)	5,800 (25.8)	5,970 (26.6)
	7-7/8 (200)	6,265 (27.9)	6,410 (28.5)	6,525 (29.0)	6,715 (29.9)	12,535 (55.8)	12,815 (57.0)	13,055 (58.1)	13,435 (59.8)
	10-1/2 (267)	8,355 (37.2)	8,545 (38.0)	8,700 (38.7)	8,955 (39.8)	16,710 (74.3)	17,090 (76.0)	17,405 (77.4)	17,910 (79.7)
	17-1/2 (445)	13,925 (61.9)	14,240 (63.3)	14,505 (64.5)	14,925 (66.4)	27,855 (123.9)	28,480 (126.7)	29,005 (129.0)	29,850 (132.8)
1	4 (102)	3,385 (15.1)	3,460 (15.4)	3,525 (15.7)	3,625 (16.1)	6,770 (30.1)	6,920 (30.8)	7,050 (31.4)	7,255 (32.3)
	9 (229)	7,615 (33.9)	7,785 (34.6)	7,930 (35.3)	8,160 (36.3)	15,230 (67.7)	15,570 (69.3)	15,860 (70.5)	16,320 (72.6)
	12 (305)	10,150 (45.2)	10,380 (46.2)	10,575 (47.0)	10,880 (48.4)	20,305 (90.3)	20,765 (92.4)	21,145 (94.1)	21,760 (96.8)
	20 (508)	16,920 (75.3)	17,305 (77.0)	17,620 (78.4)	18,135 (80.7)	33,840 (150.5)	34,605 (153.9)	35,240 (156.8)	36,270 (161.3)
1-1/4	5 (127)	4,495 (20.0)	4,595 (20.4)	4,680 (20.8)	4,815 (21.4)	8,990 (40.0)	9,190 (40.9)	9,360 (41.6)	9,635 (42.9)
	11-1/4 (286)	10,115 (45.0)	10,340 (46.0)	10,530 (46.8)	10,840 (48.2)	20,225 (90.0)	20,680 (92.0)	21,060 (93.7)	21,675 (96.4)
	15 (381)	13,485 (60.0)	13,790 (61.3)	14,040 (62.5)	14,450 (64.3)	26,965 (120.0)	27,575 (122.7)	28,085 (124.9)	28,905 (128.6)
	25 (635)	22,475 (100.0)	22,980 (102.2)	23,405 (104.1)	24,085 (107.1)	44,945 (199.9)	45,960 (204.4)	46,805 (208.2)	48,170 (214.3)

1 See Section 2.4.1 for explanation on development of load values.
2 See Section 2.4.4 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 26 - 38 as necessary. Compare to the steel values in table 24. The lesser of the values is to be used for the design.
5 Values are for the following temperature range: maximum short term temperature = 130°F (55°C), maximum long term temperature = 110°F (43°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 Tabular values are for dry concrete conditions. For water saturated concrete, water-filled drilled holes, or submurged (underwater) applications multiply design strength by 0.61.
7 Tabular values are for short term loads only. For sustained loads including overhead use, see Section 2.5.6
8 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.
9 Tabular values are for holes drilled in concrete with carbide tipped hammer drill bit. Diamond core drilling is not permitted.
10 Tabular values are for static loads only. For seismic loads, multiply cracked concrete tabular values in tension and shear by α_{seis} = 0.675. See section 2.4.5 for additional information on seismic applications.

HIT-RE 100 adhesive anchoring system

2.4.11 Installation Instructions

Installation Instructions For Use (IFU) are included with each product package. They can also be viewed or downloaded on-line at **www.us.hilti.com (US)** and **www.hilti.ca (Canada)** — "Service/Technical Info >> Technical Downloads >> Anchoring Systems". 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.

2.4.12 Working Time and Cure Time (approx.)

[°C]	[°F]	t_{work}	$t_{cure, ini}$	$t_{cure, full}$
5	41	2 ½ h	≥ 18 h	≥ 72 h
10	50	2 h	≥ 12 h	≥ 48 h
15	59	1 ½ h	≥ 8 h	≥ 24 h
20	68	30 min	≥ 6 h	≥ 12 h
30	86	20 min	≥ 4 h	≥ 8 h
40	104	12 min	≥ 2 h	≥ 4 h

2.4.13 Materials Specifications

Table 60 — Material properties of fully cured HIT-RE 100 adhesive

Bond Strength ASTM C882-12[1] 2 day cure 14 day cure	 20.1 Mpa 21.0 Mpa	 2,920 psi 3,050 psi
Compressive Strength ASTM D695-10[1]	74.3 Mpa	10,780 psi
Compressive Modulus ASTM D695-10[1]	3,731 Mpa	0.541×10^6 psi
Tensile Strength 7 day ASTM D638-10	11.7 Mpa	1,690 psi
Elongation at break ASTM D638-10	0.10%	
Heat Deflection Temperature ASTM D648-07	56.8°C	134.3°F
Absorption ASTM D570-10	0.06%	
Linear Coefficient of Shrinkage on Cure ASTM D2566-86	0.0001	

1 Minimum values obtained as the result of tests at 35°F, 50°F, 75°F and 110°F.

2.4.14 Resistance of Cured HIT-RE 100 to Chemicals

Table 59 — Resistance of HIT-RE 100 to chemicals

Chemical	Chemicals Tested	Resistant	Not Resistant
Alkaline	Concrete drilling mud (10%) pH=12.6	+	
	Concrete drilling mud (10%) pH=13.2	+	
	Concrete potash solution (10%) pH=14.0	+	
Alkaline	Acetic acid (10%)[1]		-
	Nitric acid (10%)[1]		-
	Hydrochloric acid (10%) 3 month		-
	Sulfuric acid (10%)		-
Solvents	Benzyl alcohol		-
	Ethanol		-
	Ethyl acetate		-
	Methyl ethyl ketone (MEK)		-
	Trichlorethylene		-
	Xylene (mixture)	+	
Chemicals used on job sites	Chemicals Concrete plasticizer	+	
	used on job Diesel oil	+	
	sites Oil	+	
	Petrol	+	
	Oil for form work (forming oil)	+	
Environmental chemicals	Environmental Salt water	+	
	chemicals de-mineralized water	+	
	salt spraying test	+	
	SO2	+	
	Environment/weather	+	

1 Concrete was dissolved by acid

Samples of the HIT-RE 100 resin were immersed in the various chemical compounds for up to one year. At the time of the test period, the samples were analyzed. Any samples showing no visible damage and having less than a 25% reduction in bending (flexural) strength were classified as **"Resistant."** Samples that were heavily damaged or destroyed were classified as **"Not Resistant."**

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

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