KWIK-X DUAL ACTION ANCHOR

Technical Supplement

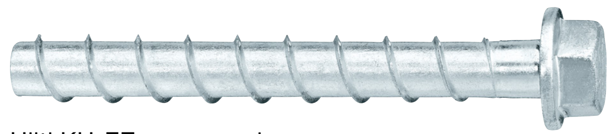
KWIK-X DUAL ACTION ANCHOR SYSTEM

KWIK-X Dual Action Anchor consisting of KHC Capsule and KH-EZ / KH-EZ CRC screw anchors

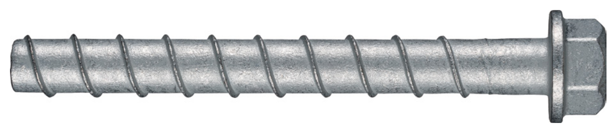
Features and Benefits

- Combines the high performance of adhesive anchors with the speed and simplicity of screw anchors
- Evaluated by ICC Evaluation Services for cracked concrete and seismic service
- No hole cleaning required – helping save time and eliminating the need for accessories like air compressors and brushes
- OSHA Table 1926.1153 Table 1 compliant installation when installed with Hilti vacuum and DRS system or Hilti SafeSet™ hollow drill bit technology
- Suitable for real jobsite conditions – including water saturated concrete and low installation temperatures
- Screw is fully removable and reusable in the same borehole (one time remove and reuse only, not covered in ESR-5065)
- Immediate loading possible

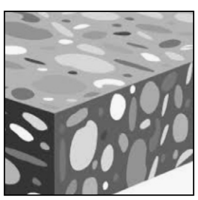
Hilti KHC Kwik-X capsule



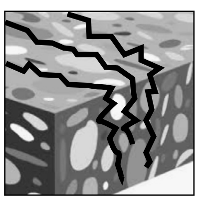
Hilti KH-EZ screw anchor



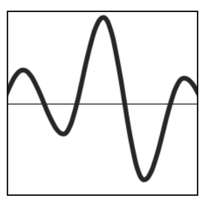
Hilti KH-EZ CRC (Corrosion Resistant Coating) screw anchor



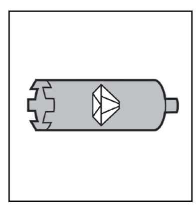
Uncracked concrete



Cracked concrete



Seismic design categories A-F



Diamond core drilling permitted

safe set

Hollow drill bit

PROFIS Engineering Design Software

Approvals / Listings

ICC-ES (International Code Council)	ESR-5065 in concrete per ACI 318 Ch. 17 / ACI 355.4 / ICC-ES AC308
NSF/ANSI Std 61	Certification for use in potable water
City of Los Angeles	2020 LABC Supplement (within ESR-5065)
Florida Building Code	2020 FBC Supplement (within ESR-5065) w/ HVHZ
U.S. Green Building Council	LEED® Credit 4.1-Low Emitting Materials

ICC ES   LA DBS DEPARTMENT OF BUILDING AND SAFETY

DESIGN DATA IN CONCRETE PER ACI 318

ACI 318 Chapter 17 Design

The load values contained in this section are Hilti Simplified Design Tables. The load tables in this section were developed using the Strength Design parameters and variables of ESR-5065 and the equations within ACI 318 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to section 3.1.8 of the North American Product Technical Guide, Volume 2: Anchor Fastening Technical Guide, Edition 22 (PTG Ed. 22). Data tables from ESR-5065 are not contained in this section but can be found at www.icc-es.org or at www.hilti.com.

Figure 1 — Hilti Kwik-X Dual Action Anchor installation conditions

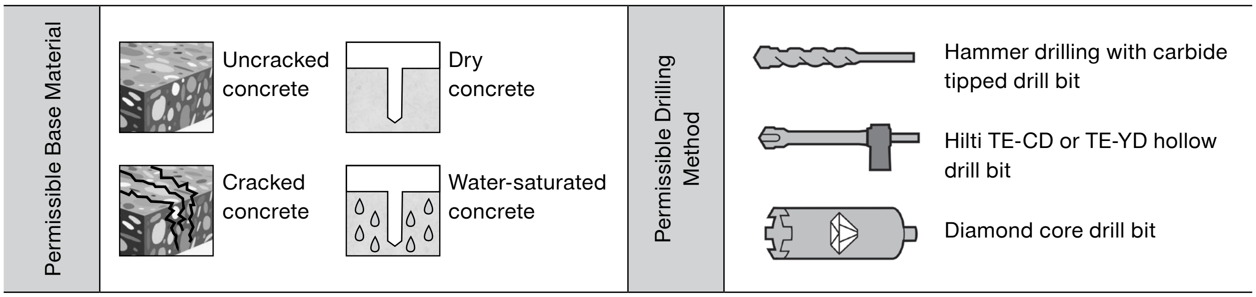


Table 1 - Hilti Kwik-X Dual Action Anchor installation specifications

Design information		Symbol	Units	KH-EZ / KH-EZ CRC anchor diameter (in.)							
				3/8		1/2		5/8		3/4	
Drill hole diameter		d_o	in. (mm)	3/8 (10)		1/2 (13)		5/8 (16)		3/4 (19)	
Minimum fixture hole diameter		d_f	in.	1/2		5/8		3/4		7/8	
Nominal embedment[2]		h_{nom}	in. (mm)	2-1/2 – 3 (64 – 76)	3 – 4-1/2 (76 – 114)	3 – 4-1/4 (76 – 108)	4-1/4 – 5-1/2 (108 - 140)	3-1/4 – 4-1/2 (83 – 114)	4-1/2 - 6 (114 – 152)	4 – 4-1/2 (102 – 114)	4-1/2 – 7-1/4 (114 – 184)
KHC capsule size		-	-	3/8" Small	3/8" Large	1/2" Small	1/2" Large	5/8" Small	5/8" Large	3/4" Small	3/4" Large
Drilled hole depth[1]	Hole condition 1	h_1	in. (mm)	h_{nom} + 3/4 (h_{nom} + 19)	h_{nom} + 1-1/4 (h_{nom} + 32)	h_{nom} + 3/4 (h_{nom} + 19)	h_{nom} + 1 (h_{nom} + 25)	h_{nom} + 1 (h_{nom} + 25)		h_{nom} + 1 (h_{nom} + 25)	
	Hole condition 2	h_2	in. (mm)	h_{nom} + 3/8 (h_{nom} + 10)		h_{nom} + 3/8 (h_{nom} + 10)		h_{nom} + 3/8 (h_{nom} + 10)		h_{nom} + 3/8 (h_{nom} + 10)	
Minimum anchor spacing		s_{min}	in. (mm)	3 (76)		3 (76)		4 (102)		4 (102)	
Minimum edge distance		c_{min}	in. (mm)	1-1/2 (38)		1-3/4 (44)		1-3/4 (44)		1-3/4 (44)	
Minimum concrete thickness		h_{min}	in. (mm)	h_1 + 1-1/4 (h_1 + 32)		h_1 + 1-1/4 (h_1 + 32)		h_1 + 1-1/4 (h_1 + 32)		h_1 + 1-1/2 (h_1 + 38)	

[1] See Figure 2 for description of drilled hole conditions.
[2] Nominal embedment (h_{nom}) = effective embedment (h_{ef}).

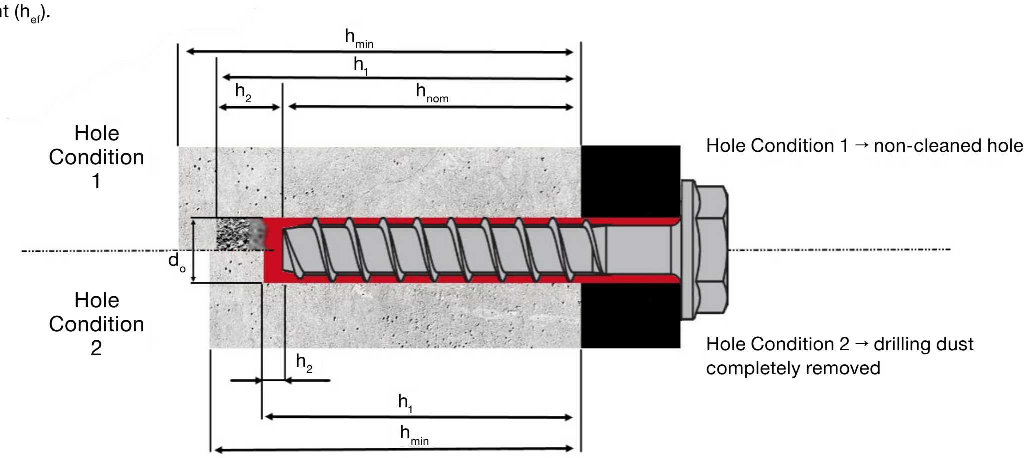


Figure 2 – Drilled hole conditions for Kwik-X Dual Action Anchors

Table 2 - Hilti Kwik-X Dual Action Anchor design strength with concrete / bond failure in uncracked concrete [1,2,3,4,5,6,7]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
		f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
3/8	2-1/2 (64)	3,085 (13.7)	3,375 (15.0)	3,900 (17.3)	4,775 (21.2)	6,640 (29.5)	7,275 (32.4)	8,400 (37.4)	10,290 (45.8)
	3-1/4 (83)	4,570 (20.3)	5,005 (22.3)	5,780 (25.7)	6,510 (29.0)	9,845 (43.8)	10,785 (48.0)	12,450 (55.4)	14,025 (62.4)
	4-1/2 (114)	7,445 (33.1)	7,960 (35.4)	8,380 (37.3)	9,015 (40.1)	16,035 (71.3)	17,140 (76.2)	18,055 (80.3)	19,420 (86.3)
1/2	3 (76)	4,055 (18.0)	4,440 (19.8)	5,125 (22.8)	6,280 (27.9)	8,730 (38.8)	9,565 (42.5)	11,040 (49.1)	13,525 (60.2)
	4-1/4 (108)	6,835 (30.4)	7,485 (33.3)	8,645 (38.5)	10,585 (47.1)	14,720 (65.5)	16,125 (71.7)	18,620 (82.8)	22,805 (101.4)
	5-1/2 (140)	10,060 (44.7)	11,020 (49.0)	12,725 (56.6)	13,970 (62.2)	21,670 (96.4)	23,740 (105.6)	27,410 (121.9)	30,090 (134.0)
5/8	3-1/4 (83)	4,570 (20.3)	5,005 (22.3)	5,780 (25.7)	7,080 (31.5)	9,845 (43.8)	10,785 (48.0)	12,450 (55.4)	15,250 (67.8)
	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	6 (152)	11,465 (51.0)	12,560 (55.9)	14,500 (64.5)	17,760 (79.0)	24,690 (109.8)	27,045 (120.3)	31,230 (138.9)	38,250 (170.1)
3/4	4 (102)	6,240 (27.8)	6,835 (30.4)	7,895 (35.1)	9,665 (43.0)	13,440 (59.8)	14,725 (65.5)	17,000 (75.6)	20,820 (92.6)
	5 (127)	8,720 (38.8)	9,555 (42.5)	11,030 (49.1)	13,510 (60.1)	18,785 (83.6)	20,575 (91.5)	23,760 (105.7)	29,100 (129.4)
	6-1/4 (159)	12,190 (54.2)	13,350 (59.4)	15,415 (68.6)	18,880 (84.0)	26,250 (116.8)	28,755 (127.9)	33,205 (147.7)	40,665 (180.9)
	7-1/4 (184)	15,225 (67.7)	16,680 (74.2)	19,260 (85.7)	23,590 (104.9)	32,795 (145.9)	35,925 (159.8)	41,485 (184.5)	50,805 (226.0)

[1] See PTG Ed. 22 Section 3.1.8 to convert design strength value to ASD value.
[2] Linear interpolation between embedment depths and concrete compressive strengths are not permitted.
[3] Apply spacing, edge distance, and concrete thickness factors in Tables 5 through 12 as necessary. Compare to the steel values in Table 4. The lesser of the values is to be used for the design.
[4] Data is for max. short term temperature = 176°F (80°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.
[5] Tabular values are for dry and water saturated concrete conditions.
[6] Tabular values are for short term loads only. For sustained loads including overhead use, see PTG Ed. 22 Section 3.1.8.
[7] Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

Table 3 - Hilti Kwik-X Dual Action Anchor design strength with concrete / bond failure in cracked concrete [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
		f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)	f'_c = 2500 psi (17.2 MPa) lb (kN)	f'_c = 3000 psi (20.7 MPa) lb (kN)	f'_c = 4000 psi (27.6 MPa) lb (kN)	f'_c = 6000 psi (41.4 MPa) lb (kN)
3/8	2-1/2 (64)	2,000 (8.9)	2,050 (9.1)	2,135 (9.5)	2,260 (10.1)	4,310 (19.2)	4,420 (19.7)	4,600 (20.5)	4,870 (21.7)
	3-1/4 (83)	3,235 (14.4)	3,545 (15.8)	4,095 (18.2)	5,015 (22.3)	6,970 (31.0)	7,640 (34.0)	8,820 (39.2)	10,800 (48.0)
	4-1/2 (114)	5,275 (23.5)	5,780 (25.7)	6,670 (29.7)	7,790 (34.7)	11,360 (50.5)	12,445 (55.4)	14,370 (63.9)	16,780 (74.7)
1/2	3 (76)	2,870 (12.8)	3,145 (14.0)	3,630 (16.1)	4,450 (19.8)	6,185 (27.5)	6,775 (30.1)	7,820 (34.8)	9,580 (42.6)
	4-1/4 (108)	4,840 (21.5)	5,305 (23.6)	6,125 (27.2)	7,500 (33.4)	10,425 (46.4)	11,420 (50.8)	13,190 (58.7)	16,150 (71.8)
	5-1/2 (140)	7,125 (31.7)	7,805 (34.7)	9,015 (40.1)	11,040 (49.1)	15,350 (68.3)	16,815 (74.8)	19,415 (86.4)	23,780 (105.8)
5/8	3-1/4 (83)	3,235 (14.4)	3,545 (15.8)	4,095 (18.2)	5,015 (22.3)	6,970 (31.0)	7,640 (34.0)	8,820 (39.2)	10,800 (48.0)
	4 (102)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,520 (42.3)	10,430 (46.4)	12,040 (53.6)	14,750 (65.6)
	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	9,570 (42.6)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	20,610 (91.7)
	6 (152)	8,120 (36.1)	8,895 (39.6)	10,270 (45.7)	12,580 (56.0)	17,490 (77.8)	19,160 (85.2)	22,120 (98.4)	27,095 (120.5)
3/4	4 (102)	4,420 (19.7)	4,840 (21.5)	5,590 (24.9)	6,845 (30.4)	9,520 (42.3)	10,430 (46.4)	12,040 (53.6)	14,750 (65.6)
	5 (127)	6,175 (27.5)	6,765 (30.1)	7,815 (34.8)	9,570 (42.6)	13,305 (59.2)	14,575 (64.8)	16,830 (74.9)	20,610 (91.7)
	6-1/4 (159)	8,635 (38.4)	9,455 (42.1)	10,920 (48.6)	13,375 (59.5)	18,595 (82.7)	20,370 (90.6)	23,520 (104.6)	28,805 (128.1)
	7-1/4 (184)	10,785 (48.0)	11,815 (52.6)	13,645 (60.7)	16,710 (74.3)	23,230 (103.3)	25,445 (113.2)	29,385 (130.7)	35,990 (160.1)

1 See PTG Ed. 22 Section 3.1.8 to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.
3 Apply spacing, edge distance, and concrete thickness factors in Tables 5 through 12 as necessary. Compare to the steel values in Table 4. The lesser of the values is to be used for the design.
4 Data is for max. short term temperature = 176°F (80°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.
5 Tabular values are for dry and water saturated concrete conditions.
6 Tabular values are for short term loads only. For sustained loads including overhead use, see PTG Ed. 22 Section 3.1.8.
7 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.
8 Tabular values are for static loads only. Seismic design in not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tubular values in tension and shear by α_{seis} = 0.75. See PTG Ed. 22 Section 3.1.8 for additional information on seismic applications.

Table 4 - Steel design strength for Hilti KH-EZ / KH-EZ CRC anchors [1,2]

Anchor diameter in. (mm)	Nominal embedment depth in. (mm)		Tensile[3] ϕN_{sa} lb (kN)	Shear[4] ϕV_{sa} lb (kN)	Seismic Shear[5] ϕV_{sa} lb (kN)
3/8 (9.5)	2-1/2 (64)	4-1/2 (114)	6,720 (29.9)	3,110 (13.8)	1,865 (8.3)
1/2 (12.7)	2-1/4 (57)	4-1/4 (108)	11,780 (52.4)	5,545 (24.7)	3,330 (14.8)
5/8 (15.9)	3-1/4 (83)	5 (127)	15,735 (70.0)	6,735 (30.0)	4,040 (18.0)
3/4 (19.1)	4 (102)	6-1/4 (159)	20,810 (92.6)	9,995 (44.5)	6,935 (30.8)

1 See PTG Ed. 22 Section 3.1.8 to convert design strength value to ASD value.
2 Hilti KH-EZ / KH-EZ CRC anchors are to be considered brittle steel elements.
3 Tensile $\phi N_{sa} = \phi A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17.
4 Shear values determined by static shear tests with $\phi V_{sa} < \phi\ 0.60 A_{se,V} f_{uta}$ as noted in ACI 318 Chapter 17.
5 Seismic shear values determined by seismic shear tests with $\phi V_{sa} < \phi\ 0.60 A_{se,V} f_{uta}$ as noted in ACI 318 Chapter 17.
See PTG Ed. 22 Section 3.1.8 for additional information on seismic applications.

The Kwik-X Dual Action Anchor system will provide greater load capacities with greater flexibility. This includes immediate loading in a vast range of temperatures. The amount of load capacity immediately available after installation of the Kwik-X Dual Action Anchor system will vary depending on the concrete temperature at the time of installation. As shown in Figure 3 below, in the very cold spectrum of temperatures the immediate load capacity available will be that of the Hilti KH-EZ / KH-EZ CRC screw anchor until the full cure time has elapsed. For the load capacity of the Hilti KH-EZ / KH-EZ CRC screw anchor please refer to ESR-3027 or Section 3.3.6 of PTG Ed. 22.

˚C	˚F	˚C	˚F	$t_{cure,full}$
-28 ... -10	-18 ... 14	5 ... 40	41 ... 104	24 h
-10 ... 5	14 ... 41	5 ... 40	41 ... 104	30 min
5 ... 40	41 ... 104	5 ... 40	41 ... 104	0.5 min

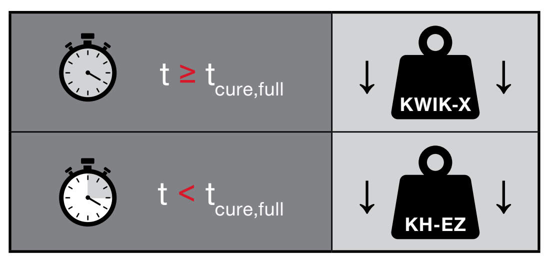


Figure 3 – Cure time and immediate load allowances

Table 5 - Load adjustment factors for 3/8-in. Kwik-X Dual Action Anchors in uncracked concrete [1,2]

3/8-in. uncracked concrete			Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ∥ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Effective embedment h_{ef} in. (mm)			2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm)	1-1/2	(38)	n/a	n/a	n/a	0.31	0.27	0.21	n/a	n/a	n/a	0.08	0.06	0.04	0.17	0.12	0.07	n/a	n/a	n/a
	2	(51)	n/a	n/a	n/a	0.36	0.30	0.23	n/a	n/a	n/a	0.13	0.09	0.06	0.26	0.18	0.11	n/a	n/a	n/a
	2-1/4	(57)	n/a	n/a	n/a	0.38	0.32	0.24	n/a	n/a	n/a	0.16	0.11	0.07	0.31	0.22	0.13	n/a	n/a	n/a
	3	(76)	0.63	0.63	0.61	0.46	0.37	0.28	0.56	0.55	0.54	0.24	0.17	0.10	0.46	0.34	0.21	n/a	n/a	n/a
	3-1/2	(89)	0.66	0.66	0.63	0.52	0.41	0.30	0.58	0.56	0.54	0.30	0.21	0.13	0.52	0.41	0.26	n/a	n/a	n/a
	4	(102)	0.68	0.68	0.65	0.58	0.45	0.33	0.59	0.57	0.55	0.37	0.26	0.16	0.58	0.45	0.32	n/a	n/a	n/a
	4-1/2	(114)	0.70	0.70	0.67	0.65	0.49	0.36	0.60	0.58	0.55	0.44	0.31	0.19	0.65	0.49	0.36	0.62	n/a	n/a
	5	(127)	0.72	0.72	0.69	0.72	0.54	0.38	0.61	0.58	0.56	0.52	0.36	0.22	0.72	0.54	0.38	0.66	n/a	n/a
	5-1/2	(140)	0.75	0.75	0.70	0.80	0.59	0.41	0.62	0.59	0.57	0.60	0.42	0.26	0.80	0.59	0.41	0.69	0.61	n/a
	6	(152)	0.77	0.77	0.72	0.87	0.64	0.45	0.63	0.60	0.57	0.68	0.48	0.29	0.87	0.64	0.45	0.72	0.64	n/a
	6-1/2	(165)	0.79	0.79	0.74	0.94	0.70	0.49	0.64	0.61	0.58	0.77	0.54	0.33	0.94	0.70	0.49	0.75	0.66	0.56
	7	(178)	0.81	0.81	0.76	1.00	0.75	0.52	0.65	0.62	0.59	0.86	0.60	0.37	1.00	0.75	0.52	0.78	0.69	0.58
	8	(203)	0.86	0.86	0.80		0.86	0.60	0.67	0.64	0.60	1.00	0.73	0.45		0.86	0.60	0.83	0.74	0.63
	9	(229)	0.90	0.90	0.83		0.97	0.67	0.69	0.65	0.61		0.87	0.54		0.97	0.67	0.88	0.78	0.66
	10	(254)	0.95	0.95	0.87		1.00	0.75	0.71	0.67	0.62		1.00	0.63		1.00	0.75	0.93	0.82	0.70
	11	(279)	0.99	0.99	0.91			0.82	0.74	0.69	0.63			0.72			0.82	0.97	0.86	0.73
	12	(305)	1.00	1.00	0.94			0.90	0.76	0.70	0.65			0.83			0.90	1.00	0.90	0.77
	14	(356)			1.00			1.00	0.80	0.74	0.67			1.00			1.00		0.97	0.83
	16	(406)							0.84	0.77	0.70								1.00	0.88
	18	(457)							0.89	0.80	0.72									0.94
	24	(610)							1.00	0.91	0.79									1.00
	30	(762)								1.00	0.87									
	36	(914)									0.94									
	> 48	(1219)									1.00									

Table 6 - Load adjustment factors for 3/8-in. Kwik-X Dual Action Anchors in cracked concrete [1,2]

3/8-in. cracked concrete			Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ∥ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Effective embedment h_{ef} in. (mm)			2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)	2-1/2 (64)	3-1/4 (83)	4-1/2 (114)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm)	1-1/2	(38)	n/a	n/a	n/a	0.50	0.50	0.47	n/a	n/a	n/a	0.09	0.06	0.04	0.19	0.12	0.07	n/a	n/a	n/a
	2	(51)	n/a	n/a	n/a	0.55	0.55	0.51	n/a	n/a	n/a	0.14	0.09	0.06	0.29	0.18	0.11	n/a	n/a	n/a
	2-1/4	(57)	n/a	n/a	n/a	0.58	0.58	0.53	n/a	n/a	n/a	0.17	0.11	0.07	0.34	0.22	0.14	n/a	n/a	n/a
	3	(76)	0.63	0.63	0.61	0.66	0.66	0.60	0.57	0.55	0.54	0.26	0.17	0.10	0.53	0.34	0.21	n/a	n/a	n/a
	3-1/2	(89)	0.66	0.66	0.63	0.72	0.72	0.65	0.58	0.56	0.54	0.33	0.21	0.13	0.67	0.43	0.26	n/a	n/a	n/a
	4	(102)	0.68	0.68	0.65	0.79	0.79	0.70	0.59	0.57	0.55	0.41	0.26	0.16	0.79	0.52	0.32	n/a	n/a	n/a
	4-1/2	(114)	0.70	0.70	0.67	0.85	0.85	0.75	0.60	0.58	0.56	0.49	0.31	0.19	0.85	0.62	0.38	0.64	n/a	n/a
	5	(127)	0.72	0.72	0.69	0.92	0.92	0.80	0.61	0.59	0.56	0.57	0.36	0.22	0.92	0.73	0.45	0.68	n/a	n/a
	5-1/2	(140)	0.75	0.75	0.70	0.99	0.99	0.86	0.63	0.59	0.57	0.66	0.42	0.26	0.99	0.84	0.52	0.71	0.61	n/a
	6	(152)	0.77	0.77	0.72	1.00	1.00	0.91	0.64	0.60	0.57	0.75	0.48	0.29	1.00	0.96	0.59	0.74	0.64	n/a
	6-1/2	(165)	0.79	0.79	0.74			0.97	0.65	0.61	0.58	0.84	0.54	0.33		1.00	0.66	0.77	0.67	0.57
	7	(178)	0.81	0.81	0.76			1.00	0.66	0.62	0.59	0.94	0.60	0.37			0.74	0.80	0.69	0.59
	8	(203)	0.86	0.86	0.80				0.68	0.64	0.60	1.00	0.74	0.45			0.91	0.86	0.74	0.63
	9	(229)	0.90	0.90	0.83				0.71	0.65	0.61		0.88	0.54			1.00	0.91	0.78	0.67
	10	(254)	0.95	0.95	0.87				0.73	0.67	0.62		1.00	0.63				0.96	0.82	0.70
	11	(279)	0.99	0.99	0.91				0.75	0.69	0.64			0.73				1.00	0.87	0.74
	12	(305)	1.00	1.00	0.94				0.77	0.70	0.65			0.83					0.90	0.77
	14	(356)			1.00				0.82	0.74	0.67			1.00					0.98	0.83
	16	(406)							0.87	0.77	0.70								1.00	0.89
	18	(457)							0.91	0.81	0.72									0.94
	24	(610)							1.00	0.91	0.79									1.00
	30	(762)								1.00	0.87									
	36	(914)									0.94									
	> 48	(1219)									1.00									

1 Linear interpolation is not permitted.

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

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

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

Table 7 - Load adjustment factors for 1/2-in. Kwik-X Dual Action Anchors in uncracked concrete [1,2]

1/2-in. uncracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ∥ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Effective embedment h_{ef} in. (mm)		3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm): 1-3/4	(44)	n/a	n/a	n/a	0.32	0.26	0.21	n/a	n/a	n/a	0.09	0.06	0.04	0.18	0.12	0.08	n/a	n/a	n/a
2	(51)	n/a	n/a	n/a	0.34	0.27	0.22	n/a	n/a	n/a	0.11	0.07	0.05	0.22	0.14	0.10	n/a	n/a	n/a
2-1/2	(64)	n/a	n/a	n/a	0.38	0.29	0.24	n/a	n/a	n/a	0.16	0.10	0.07	0.31	0.20	0.13	n/a	n/a	n/a
3	(76)	0.60	0.60	0.59	0.42	0.32	0.26	0.56	0.54	0.53	0.21	0.13	0.09	0.41	0.26	0.18	n/a	n/a	n/a
3-1/2	(89)	0.62	0.62	0.61	0.47	0.35	0.28	0.57	0.55	0.54	0.26	0.16	0.11	0.47	0.33	0.22	n/a	n/a	n/a
4	(102)	0.64	0.64	0.62	0.52	0.37	0.30	0.58	0.56	0.54	0.32	0.20	0.14	0.52	0.37	0.27	n/a	n/a	n/a
4-1/2	(114)	0.65	0.65	0.64	0.57	0.40	0.32	0.59	0.56	0.55	0.38	0.24	0.16	0.57	0.40	0.32	0.59	n/a	n/a
5	(127)	0.67	0.67	0.65	0.63	0.43	0.34	0.60	0.57	0.56	0.44	0.28	0.19	0.63	0.43	0.34	0.62	n/a	n/a
5-1/2	(140)	0.69	0.69	0.67	0.69	0.46	0.36	0.61	0.58	0.56	0.51	0.32	0.22	0.69	0.46	0.36	0.65	0.56	n/a
6	(152)	0.71	0.71	0.68	0.76	0.49	0.39	0.62	0.59	0.57	0.58	0.37	0.25	0.76	0.49	0.39	0.68	0.58	n/a
6-1/2	(165)	0.72	0.72	0.70	0.82	0.53	0.41	0.63	0.59	0.57	0.66	0.41	0.28	0.82	0.53	0.41	0.71	0.61	n/a
7	(178)	0.74	0.74	0.71	0.88	0.57	0.43	0.64	0.60	0.58	0.74	0.46	0.31	0.88	0.57	0.43	0.74	0.63	0.56
8	(203)	0.78	0.78	0.74	1.00	0.65	0.49	0.66	0.61	0.59	0.90	0.57	0.38	1.00	0.65	0.49	0.79	0.68	0.59
9	(229)	0.81	0.81	0.77		0.73	0.55	0.67	0.63	0.60	1.00	0.67	0.46		0.73	0.55	0.84	0.72	0.63
10	(254)	0.84	0.84	0.80		0.81	0.61	0.69	0.64	0.61		0.79	0.54		0.81	0.61	0.88	0.75	0.66
12	(305)	0.91	0.91	0.86		0.98	0.74	0.73	0.67	0.63		1.00	0.71		0.98	0.74	0.97	0.83	0.73
14	(356)	0.98	0.98	0.92		1.00	0.86	0.77	0.70	0.65			0.89		1.00	0.86	1.00	0.89	0.78
16	(406)	1.00	1.00	0.98			0.98	0.81	0.73	0.68			1.00			0.98		0.95	0.84
20	(508)			1.00			1.00	0.89	0.78	0.72						1.00		1.00	0.94
24	(610)							0.97	0.84	0.76									1.00
30	(762)							1.00	0.93	0.83									
36	(914)								1.00	0.90									
> 48	(1219)									1.00									

Table 8 - Load adjustment factors for 1/2-in. Kwik-X Dual Action Anchors in cracked concrete [1,2]

1/2-in. cracked concrete		Spacing factor in tension f_{AN}			Edge distance factor in tension f_{RN}			Spacing factor in shear[3] f_{AV}			Edge distance in shear: ⊥ Toward edge f_{RV}			Edge distance in shear: ∥ To edge f_{RV}			Concrete thickness factor in shear[4] f_{HV}		
Effective embedment h_{ef} in. (mm)		3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)	3 (76)	4-1/4 (108)	5-1/2 (140)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm): 1-3/4	(44)	n/a	n/a	n/a	0.48	0.48	0.46	n/a	n/a	n/a	0.09	0.06	0.04	0.19	0.12	0.08	n/a	n/a	n/a
2	(51)	n/a	n/a	n/a	0.50	0.50	0.48	n/a	n/a	n/a	0.11	0.07	0.05	0.23	0.14	0.10	n/a	n/a	n/a
2-1/2	(64)	n/a	n/a	n/a	0.54	0.54	0.52	n/a	n/a	n/a	0.16	0.10	0.07	0.32	0.20	0.14	n/a	n/a	n/a
3	(76)	0.60	0.60	0.59	0.58	0.58	0.55	0.56	0.54	0.53	0.21	0.13	0.09	0.42	0.26	0.18	n/a	n/a	n/a
3-1/2	(89)	0.62	0.62	0.61	0.63	0.63	0.59	0.57	0.55	0.54	0.26	0.16	0.11	0.53	0.33	0.22	n/a	n/a	n/a
4	(102)	0.64	0.64	0.62	0.67	0.67	0.63	0.58	0.56	0.54	0.32	0.20	0.14	0.64	0.40	0.27	n/a	n/a	n/a
4-1/2	(114)	0.65	0.65	0.64	0.72	0.72	0.67	0.59	0.56	0.55	0.38	0.24	0.16	0.72	0.48	0.33	0.59	n/a	n/a
5	(127)	0.67	0.67	0.65	0.77	0.77	0.71	0.60	0.57	0.56	0.45	0.28	0.19	0.77	0.56	0.38	0.62	n/a	n/a
5-1/2	(140)	0.69	0.69	0.67	0.81	0.81	0.75	0.61	0.58	0.56	0.52	0.32	0.22	0.81	0.65	0.44	0.66	0.56	n/a
6	(152)	0.71	0.71	0.68	0.87	0.87	0.79	0.62	0.59	0.57	0.59	0.37	0.25	0.87	0.74	0.50	0.68	0.59	n/a
6-1/2	(165)	0.72	0.72	0.70	0.92	0.92	0.84	0.63	0.59	0.57	0.66	0.42	0.28	0.92	0.83	0.57	0.71	0.61	n/a
7	(178)	0.74	0.74	0.71	0.97	0.97	0.88	0.64	0.60	0.58	0.74	0.47	0.32	0.97	0.93	0.63	0.74	0.63	0.56
8	(203)	0.78	0.78	0.74	1.00	1.00	0.98	0.66	0.61	0.59	0.91	0.57	0.39	1.00	1.00	0.77	0.79	0.68	0.60
9	(229)	0.81	0.81	0.77			1.00	0.68	0.63	0.60	1.00	0.68	0.46			0.92	0.84	0.72	0.63
10	(254)	0.84	0.84	0.80				0.70	0.64	0.61		0.80	0.54			1.00	0.88	0.76	0.67
12	(305)	0.91	0.91	0.86				0.73	0.67	0.63		1.00	0.71				0.97	0.83	0.73
14	(356)	0.98	0.98	0.92				0.77	0.70	0.65			0.90				1.00	0.90	0.79
16	(406)	1.00	1.00	0.98				0.81	0.73	0.68			1.00					0.96	0.84
20	(508)			1.00				0.89	0.79	0.72								1.00	0.94
24	(610)							0.97	0.84	0.77									1.00
30	(762)							1.00	0.93	0.83									
36	(914)								1.00	0.90									
> 48	(1219)									1.00									

1 Linear interpolation is not permitted.

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

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

4 Concrete thickness reduction factor in shear, f_{HV}, is applicable when edge distance, c < 3*h_{ef}. If c ≥ 3*h_{ef}, then f_{HV} = 1.0.

Table 9 - Load adjustment factors for 5/8-in. Kwik-X Dual Action Anchors in uncracked concrete [1,2]

5/8-in. uncracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[3] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[4] f_{HV}			
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm)	Effective embedment h_{ef} in. (mm)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)
1-3/4	(44)	n/a	n/a	n/a	n/a	0.34	0.29	0.26	0.23	n/a	n/a	n/a	n/a	0.09	0.07	0.05	0.04	0.18	0.14	0.10	0.08	n/a	n/a	n/a	n/a
2	(51)	n/a	n/a	n/a	n/a	0.36	0.31	0.27	0.24	n/a	n/a	n/a	n/a	0.11	0.08	0.06	0.05	0.22	0.17	0.12	0.09	n/a	n/a	n/a	n/a
2-1/2	(64)	n/a	n/a	n/a	n/a	0.40	0.34	0.29	0.26	n/a	n/a	n/a	n/a	0.15	0.12	0.09	0.07	0.30	0.23	0.17	0.13	n/a	n/a	n/a	n/a
3	(76)	n/a	n/a	n/a	n/a	0.44	0.37	0.31	0.28	n/a	n/a	n/a	n/a	0.20	0.15	0.11	0.09	0.40	0.30	0.23	0.17	n/a	n/a	n/a	n/a
3-1/2	(89)	n/a	n/a	n/a	n/a	0.49	0.40	0.33	0.29	n/a	n/a	n/a	n/a	0.25	0.19	0.14	0.11	0.49	0.38	0.29	0.22	n/a	n/a	n/a	n/a
4	(102)	0.61	0.61	0.61	0.61	0.53	0.43	0.36	0.31	0.58	0.56	0.55	0.54	0.31	0.23	0.18	0.13	0.53	0.43	0.35	0.27	n/a	n/a	n/a	n/a
4-1/2	(114)	0.63	0.63	0.63	0.63	0.58	0.47	0.38	0.33	0.59	0.57	0.56	0.55	0.37	0.28	0.21	0.16	0.58	0.47	0.38	0.32	n/a	n/a	n/a	n/a
5	(127)	0.64	0.64	0.64	0.64	0.63	0.50	0.40	0.35	0.59	0.58	0.57	0.55	0.43	0.33	0.24	0.19	0.63	0.50	0.40	0.35	0.62	n/a	n/a	n/a
5-1/2	(140)	0.66	0.66	0.66	0.65	0.70	0.54	0.43	0.37	0.60	0.59	0.57	0.56	0.49	0.38	0.28	0.21	0.70	0.54	0.43	0.37	0.65	0.59	n/a	n/a
6	(152)	0.67	0.67	0.67	0.67	0.76	0.58	0.46	0.39	0.61	0.59	0.58	0.57	0.56	0.43	0.32	0.24	0.76	0.58	0.46	0.39	0.67	0.62	n/a	n/a
6-1/2	(165)	0.68	0.68	0.68	0.68	0.80	0.62	0.48	0.41	0.62	0.60	0.58	0.57	0.63	0.48	0.36	0.28	0.80	0.62	0.48	0.41	0.70	0.64	0.58	n/a
7	(178)	0.70	0.70	0.70	0.69	0.84	0.67	0.51	0.43	0.63	0.61	0.59	0.58	0.71	0.54	0.41	0.31	0.84	0.67	0.51	0.43	0.73	0.67	0.60	n/a
8	(203)	0.73	0.73	0.73	0.72	0.92	0.77	0.57	0.47	0.65	0.63	0.60	0.59	0.87	0.66	0.50	0.38	0.92	0.77	0.57	0.47	0.78	0.71	0.65	0.59
9	(229)	0.75	0.75	0.75	0.75	1.00	0.87	0.65	0.52	0.67	0.64	0.62	0.60	1.00	0.79	0.59	0.45	1.00	0.87	0.65	0.52	0.83	0.75	0.69	0.63
10	(254)	0.78	0.78	0.78	0.78		0.96	0.72	0.58	0.69	0.66	0.63	0.61		0.92	0.69	0.53		0.96	0.72	0.58	0.87	0.80	0.72	0.66
11	(279)	0.81	0.81	0.81	0.81		1.00	0.79	0.64	0.71	0.67	0.64	0.62		1.00	0.80	0.61		1.00	0.79	0.64	0.91	0.83	0.76	0.69
12	(305)	0.84	0.84	0.84	0.83			0.86	0.70	0.73	0.69	0.66	0.63			0.91	0.69			0.86	0.70	0.95	0.87	0.79	0.72
14	(356)	0.90	0.90	0.90	0.89			1.00	0.81	0.77	0.72	0.68	0.65			1.00	0.87			1.00	0.81	1.00	0.94	0.85	0.78
16	(406)	0.95	0.95	0.95	0.94				0.93	0.80	0.75	0.71	0.67				1.00				0.93		1.00	0.91	0.83
18	(457)	1.00	1.00	1.00	1.00				1.00	0.84	0.78	0.73	0.70								1.00			0.97	0.88
24	(610)									0.95	0.88	0.81	0.76											1.00	1.00
30	(762)									1.00	0.97	0.89	0.83												
36	(914)										1.00	0.97	0.89												
> 48	(1219)											1.00	1.00												

Table 10 - Load adjustment factors for 5/8-in. Kwik-X Dual Action Anchors in cracked concrete [1,2]

5/8-in. cracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[3] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ‖ To edge f_{RV}				Concrete thickness factor in shear[4] f_{HV}			
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm)	Effective embedment h_{ef} in. (mm)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)	3-1/4 (83)	4 (102)	5 (127)	6 (152)
1-3/4	(44)	n/a	n/a	n/a	n/a	0.45	0.45	0.45	0.45	n/a	n/a	n/a	n/a	0.09	0.07	0.05	0.04	0.18	0.14	0.10	0.08	n/a	n/a	n/a	n/a
2	(51)	n/a	n/a	n/a	n/a	0.47	0.47	0.47	0.47	n/a	n/a	n/a	n/a	0.11	0.08	0.06	0.05	0.22	0.17	0.12	0.09	n/a	n/a	n/a	n/a
2-1/2	(64)	n/a	n/a	n/a	n/a	0.50	0.50	0.50	0.50	n/a	n/a	n/a	n/a	0.15	0.12	0.09	0.07	0.31	0.23	0.17	0.13	n/a	n/a	n/a	n/a
3	(76)	n/a	n/a	n/a	n/a	0.54	0.54	0.54	0.53	n/a	n/a	n/a	n/a	0.20	0.15	0.11	0.09	0.40	0.31	0.23	0.17	n/a	n/a	n/a	n/a
3-1/2	(89)	n/a	n/a	n/a	n/a	0.57	0.57	0.57	0.57	n/a	n/a	n/a	n/a	0.25	0.19	0.14	0.11	0.51	0.39	0.29	0.22	n/a	n/a	n/a	n/a
4	(102)	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.60	0.58	0.56	0.55	0.54	0.31	0.24	0.18	0.13	0.61	0.47	0.35	0.27	n/a	n/a	n/a	n/a
4-1/2	(114)	0.63	0.63	0.63	0.63	0.64	0.64	0.64	0.64	0.59	0.57	0.56	0.55	0.37	0.28	0.21	0.16	0.64	0.56	0.42	0.32	n/a	n/a	n/a	n/a
5	(127)	0.64	0.64	0.64	0.64	0.68	0.68	0.68	0.67	0.60	0.58	0.57	0.55	0.43	0.33	0.25	0.19	0.68	0.66	0.49	0.38	0.62	n/a	n/a	n/a
5-1/2	(140)	0.66	0.66	0.66	0.65	0.72	0.72	0.72	0.71	0.60	0.59	0.57	0.56	0.50	0.38	0.28	0.22	0.72	0.72	0.57	0.43	0.65	0.59	n/a	n/a
6	(152)	0.67	0.67	0.67	0.67	0.76	0.76	0.76	0.75	0.61	0.60	0.58	0.57	0.57	0.43	0.32	0.25	0.76	0.76	0.65	0.49	0.68	0.62	n/a	n/a
6-1/2	(165)	0.68	0.68	0.68	0.68	0.80	0.80	0.80	0.79	0.62	0.60	0.59	0.57	0.64	0.49	0.37	0.28	0.80	0.80	0.73	0.56	0.70	0.64	0.58	n/a
7	(178)	0.70	0.70	0.70	0.69	0.84	0.84	0.84	0.83	0.63	0.61	0.59	0.58	0.72	0.55	0.41	0.31	0.84	0.84	0.82	0.62	0.73	0.67	0.61	n/a
8	(203)	0.73	0.73	0.73	0.72	0.92	0.92	0.92	0.91	0.65	0.63	0.60	0.59	0.87	0.67	0.50	0.38	0.92	0.92	0.92	0.76	0.78	0.71	0.65	0.59
9	(229)	0.75	0.75	0.75	0.75	1.00	1.00	1.00	1.00	0.67	0.64	0.62	0.60	1.00	0.80	0.60	0.45	1.00	1.00	1.00	0.91	0.83	0.76	0.69	0.63
10	(254)	0.78	0.78	0.78	0.78					0.69	0.66	0.63	0.61		0.93	0.70	0.53				1.00	0.87	0.80	0.72	0.66
11	(279)	0.81	0.81	0.81	0.81					0.71	0.68	0.64	0.62		1.00	0.81	0.61					0.92	0.84	0.76	0.69
12	(305)	0.84	0.84	0.84	0.83					0.73	0.69	0.66	0.63			0.92	0.70					0.96	0.87	0.79	0.72
14	(356)	0.90	0.90	0.90	0.89					0.77	0.72	0.68	0.65			1.00	0.88					1.00	0.94	0.86	0.78
16	(406)	0.95	0.95	0.95	0.94					0.80	0.75	0.71	0.67				1.00						1.00	0.92	0.84
18	(457)	1.00	1.00	1.00	1.00					0.84	0.79	0.74	0.70											0.97	0.89
24	(610)									0.96	0.88	0.81	0.76											1.00	1.00
30	(762)									1.00	0.98	0.89	0.83												
36	(914)										1.00	0.97	0.89												
> 48	(1219)											1.00	1.00												

1 Linear interpolation is not permitted.

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

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

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

Table 11 - Load adjustment factors for 3/4-in. Kwik-X Dual Action Anchors in uncracked concrete [1,2]

3/4-in. uncracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[3] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ∥ To edge f_{RV}				Concrete thickness factor in shear[4] f_{HV}			
Effective embedment h_{ef} in. (mm)		4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)
Spacing (s) / Edge distance (c_a) / Concrete thickness (h) - in. (mm)																									
1-3/4	(44)	n/a	n/a	n/a	n/a	0.32	0.28	0.25	0.22	n/a	n/a	n/a	n/a	0.07	0.05	0.04	0.03	0.14	0.11	0.08	0.06	n/a	n/a	n/a	n/a
2	(51)	n/a	n/a	n/a	n/a	0.34	0.29	0.26	0.23	n/a	n/a	n/a	n/a	0.09	0.07	0.05	0.04	0.17	0.13	0.10	0.08	n/a	n/a	n/a	n/a
2-1/2	(64)	n/a	n/a	n/a	n/a	0.37	0.31	0.27	0.24	n/a	n/a	n/a	n/a	0.12	0.09	0.07	0.05	0.24	0.18	0.13	0.11	n/a	n/a	n/a	n/a
3	(76)	n/a	n/a	n/a	n/a	0.40	0.34	0.29	0.26	n/a	n/a	n/a	n/a	0.16	0.12	0.09	0.07	0.32	0.24	0.17	0.14	n/a	n/a	n/a	n/a
3-1/2	(89)	n/a	n/a	n/a	n/a	0.44	0.36	0.31	0.27	n/a	n/a	n/a	n/a	0.20	0.15	0.11	0.09	0.40	0.30	0.22	0.18	n/a	n/a	n/a	n/a
4	(102)	0.60	0.60	0.60	0.59	0.48	0.39	0.33	0.29	0.57	0.55	0.54	0.54	0.25	0.18	0.13	0.11	0.48	0.37	0.27	0.22	n/a	n/a	n/a	n/a
4-1/2	(114)	0.61	0.61	0.61	0.60	0.51	0.41	0.34	0.30	0.57	0.56	0.55	0.54	0.29	0.22	0.16	0.13	0.51	0.41	0.32	0.26	n/a	n/a	n/a	n/a
5	(127)	0.62	0.62	0.62	0.61	0.55	0.44	0.36	0.32	0.58	0.57	0.55	0.55	0.35	0.26	0.19	0.15	0.55	0.44	0.36	0.30	n/a	n/a	n/a	n/a
5-1/2	(140)	0.63	0.63	0.63	0.63	0.59	0.47	0.38	0.33	0.59	0.57	0.56	0.55	0.40	0.30	0.22	0.17	0.59	0.47	0.38	0.33	n/a	n/a	n/a	n/a
6	(152)	0.65	0.65	0.65	0.64	0.63	0.50	0.40	0.35	0.60	0.58	0.57	0.56	0.45	0.34	0.25	0.20	0.63	0.50	0.40	0.35	0.63	n/a	n/a	n/a
6-1/2	(165)	0.66	0.66	0.66	0.65	0.69	0.53	0.42	0.37	0.61	0.59	0.57	0.56	0.51	0.38	0.28	0.22	0.69	0.53	0.42	0.37	0.65	n/a	n/a	n/a
7	(178)	0.67	0.67	0.67	0.66	0.74	0.56	0.44	0.38	0.61	0.59	0.58	0.57	0.57	0.43	0.31	0.25	0.74	0.56	0.44	0.38	0.68	0.62	n/a	n/a
7-1/4	(184)	0.68	0.68	0.68	0.67	0.77	0.57	0.45	0.39	0.62	0.60	0.58	0.57	0.60	0.45	0.33	0.26	0.77	0.57	0.45	0.39	0.69	0.63	n/a	n/a
8	(203)	0.69	0.69	0.69	0.68	0.83	0.63	0.49	0.42	0.63	0.61	0.59	0.58	0.70	0.52	0.38	0.30	0.83	0.63	0.49	0.42	0.72	0.66	0.59	n/a
9	(229)	0.72	0.72	0.72	0.71	0.90	0.71	0.53	0.45	0.65	0.62	0.60	0.58	0.83	0.62	0.45	0.36	0.90	0.71	0.53	0.45	0.77	0.70	0.63	0.58
10	(254)	0.74	0.74	0.74	0.73	0.97	0.78	0.59	0.49	0.66	0.64	0.61	0.59	0.98	0.73	0.53	0.43	0.97	0.78	0.59	0.49	0.81	0.74	0.66	0.61
12	(305)	0.79	0.79	0.79	0.78	1.00	0.94	0.70	0.59	0.70	0.66	0.63	0.61	1.00	0.96	0.70	0.56	1.00	0.94	0.70	0.59	0.89	0.81	0.72	0.67
14	(356)	0.84	0.84	0.84	0.82		1.00	0.82	0.68	0.73	0.69	0.65	0.63		1.00	0.88	0.70		1.00	0.82	0.68	0.96	0.87	0.78	0.73
16	(406)	0.89	0.89	0.89	0.87			0.94	0.78	0.76	0.72	0.67	0.65			1.00	0.86			0.94	0.78	1.00	0.93	0.84	0.78
20	(508)	0.98	0.98	0.98	0.96			1.00	0.98	0.83	0.77	0.72	0.69				1.00			1.00	0.98		1.00	0.94	0.87
24	(610)	1.00	1.00	1.00	1.00				1.00	0.89	0.82	0.76	0.73								1.00			1.00	0.95
28	(711)									0.96	0.88	0.81	0.76												1.00
32	(813)									1.00	0.93	0.85	0.80												
36	(914)										0.99	0.89	0.84												
> 48	(1219)										1.00	1.00	0.95												

Table 12 - Load adjustment factors for 3/4-in. Kwik-X Dual Action Anchors in cracked concrete [1,2]

3/4-in. cracked concrete		Spacing factor in tension f_{AN}				Edge distance factor in tension f_{RN}				Spacing factor in shear[3] f_{AV}				Edge distance in shear: ⊥ Toward edge f_{RV}				Edge distance in shear: ∥ To edge f_{RV}				Concrete thickness factor in shear[4] f_{HV}			
Effective embedment h_{ef} in. (mm)		4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)	4 (102)	5 (127)	6-1/4 (159)	7-1/4 (184)
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	0.44	0.44	0.43	n/a	n/a	n/a	n/a	0.07	0.05	0.04	0.03	0.14	0.11	0.08	0.06	n/a	n/a	n/a	n/a
2	(51)	n/a	n/a	n/a	n/a	0.45	0.45	0.45	0.45	n/a	n/a	n/a	n/a	0.09	0.07	0.05	0.04	0.18	0.13	0.10	0.08	n/a	n/a	n/a	n/a
2-1/2	(64)	n/a	n/a	n/a	n/a	0.48	0.48	0.48	0.47	n/a	n/a	n/a	n/a	0.12	0.09	0.07	0.05	0.25	0.18	0.13	0.11	n/a	n/a	n/a	n/a
3	(76)	n/a	n/a	n/a	n/a	0.51	0.51	0.51	0.50	n/a	n/a	n/a	n/a	0.16	0.12	0.09	0.07	0.32	0.24	0.18	0.14	n/a	n/a	n/a	n/a
3-1/2	(89)	n/a	n/a	n/a	n/a	0.54	0.54	0.54	0.53	n/a	n/a	n/a	n/a	0.20	0.15	0.11	0.09	0.41	0.31	0.22	0.18	n/a	n/a	n/a	n/a
4	(102)	0.60	0.60	0.60	0.59	0.57	0.57	0.57	0.55	0.57	0.55	0.54	0.54	0.25	0.19	0.14	0.11	0.50	0.37	0.27	0.22	n/a	n/a	n/a	n/a
4-1/2	(114)	0.61	0.61	0.61	0.60	0.60	0.60	0.60	0.58	0.57	0.56	0.55	0.54	0.30	0.22	0.16	0.13	0.59	0.44	0.32	0.26	n/a	n/a	n/a	n/a
5	(127)	0.62	0.62	0.62	0.61	0.63	0.63	0.63	0.61	0.58	0.57	0.55	0.55	0.35	0.26	0.19	0.15	0.63	0.52	0.38	0.30	n/a	n/a	n/a	n/a
5-1/2	(140)	0.63	0.63	0.63	0.63	0.66	0.66	0.66	0.64	0.59	0.57	0.56	0.55	0.40	0.30	0.22	0.17	0.66	0.60	0.44	0.35	n/a	n/a	n/a	n/a
6	(152)	0.65	0.65	0.65	0.64	0.69	0.69	0.69	0.67	0.60	0.58	0.57	0.56	0.46	0.34	0.25	0.20	0.69	0.69	0.50	0.40	0.63	n/a	n/a	n/a
6-1/2	(165)	0.66	0.66	0.66	0.65	0.72	0.72	0.72	0.70	0.61	0.59	0.57	0.56	0.52	0.39	0.28	0.22	0.72	0.72	0.56	0.45	0.65	n/a	n/a	n/a
7	(178)	0.67	0.67	0.67	0.66	0.76	0.76	0.76	0.73	0.62	0.60	0.58	0.57	0.58	0.43	0.31	0.25	0.76	0.76	0.63	0.50	0.68	0.62	n/a	n/a
7-1/4	(184)	0.68	0.68	0.68	0.67	0.77	0.77	0.77	0.75	0.62	0.60	0.58	0.57	0.61	0.45	0.33	0.26	0.77	0.77	0.66	0.53	0.69	0.63	n/a	n/a
8	(203)	0.69	0.69	0.69	0.68	0.83	0.83	0.83	0.80	0.63	0.61	0.59	0.58	0.70	0.53	0.38	0.31	0.83	0.83	0.77	0.61	0.73	0.66	0.59	n/a
9	(229)	0.72	0.72	0.72	0.71	0.90	0.90	0.90	0.87	0.65	0.62	0.60	0.59	0.84	0.63	0.46	0.37	0.90	0.90	0.90	0.73	0.77	0.70	0.63	0.58
10	(254)	0.74	0.74	0.74	0.73	0.97	0.97	0.97	0.94	0.67	0.64	0.61	0.59	0.99	0.74	0.54	0.43	0.97	0.97	0.97	0.86	0.81	0.74	0.66	0.62
12	(305)	0.79	0.79	0.79	0.78	1.00	1.00	1.00	1.00	0.70	0.66	0.63	0.61	1.00	0.97	0.70	0.56	1.00	1.00	1.00	1.00	0.89	0.81	0.73	0.67
14	(356)	0.84	0.84	0.84	0.82					0.73	0.69	0.65	0.63		1.00	0.89	0.71					0.96	0.87	0.78	0.73
16	(406)	0.89	0.89	0.89	0.87					0.76	0.72	0.68	0.65			1.00	0.87					1.00	0.93	0.84	0.78
20	(508)	0.98	0.98	0.98	0.96					0.83	0.77	0.72	0.69				1.00						1.00	0.94	0.87
24	(610)	1.00	1.00	1.00	1.00					0.90	0.83	0.76	0.73											1.00	0.95
28	(711)									0.96	0.88	0.81	0.77												1.00
32	(813)									1.00	0.94	0.85	0.80												
36	(914)										0.99	0.90	0.84												
> 48	(1219)										1.00	1.00	0.95												

1 Linear interpolation is not permitted.

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

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

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

DESIGN DATA IN CONCRETE PER CSA A23.3

CSA A23.3 Annex D Design

This section contains the Limit State Design tables with un-factored characteristic loads and pre-calculated factored resistance tables based on the published loads in ICC Evaluation Services ESR-5065 and testing per ACI 355.4.

For a detailed explanation of the tables developed in accordance with CSA A23.3 Annex D, refer to Section 3.1.8 of the 2022 PTG Ed. 22. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.com.

Table 13 - Hilti Kwik-X Dual Action Anchor design information in hammer drilled and/or core drilled holes in accordance with CSA A23.3 Annex D[1]

Design parameter	Symbol	Units	KH-EZ / KH-EZ CRC Anchor diameter (in.)				Ref A23.3
			3/8	1/2	5/8	3/4	
Nominal anchor diameter	d_a	mm	9.5	12.7	15.9	19.1	
Effective minimum embedment[2]	$h_{ef,min}$	mm	64	76	83	102	
Effective maximum embedment[2]	$h_{ef,max}$	mm	114	140	152	184	
Minimum concrete thickness[2]	h_{min}	mm	See Table 1 and Figure 2 of this section				
Critical edge distance	c_{ac}	-	See ESR-5065, section 4.1.10				
Minimum edge distance	c_{min}	mm	38	44	44	44	
Minimum anchor spacing	s_{min}	mm	76	76	102	102	
Coeff. for factored concrete breakout resistance, uncracked concrete	$k_{c,uncr}$[3]	-	10				D.6.2.2
Coeff. for factored concrete breakout resistance, cracked concrete	$k_{c,cr}$[3]	-	7				D.6.2.2
Concrete material resistance factor	ϕ_c	-	65				8.4.2
Resistance modification factor for tension and shear, concrete failure modes, Condition B[4]	R_{conc}	-	100				D.5.3 (c)
Minimum specified ultimate strength	f_{uta}	psi (N/mm²)	120,300 (830)	112,540 (776)	90,180 (622)	81,600 (563)	
Effective tensile stress area	$A_{se,N}$	in² (mm²)	0.086 (55.5)	0.161 (103.9)	0.268 (172.9)	0.392 (252.9)	
Steel embedment material resistance factor for reinforcement	ϕ_s	-	0.85				8.4.3
Resistance modification factor for tension, steel failure modes[4]	R	-	0.70				D.5.3
Resistance modification factor for shear, steel failure modes[4]	R	-	0.65				D.5.3
Factored steel resistance in tension	N_{sar}	lb (kN)	6,150 (27.4)	10,780 (48.0)	14,405 (64.1)	19,050 (84.7)	D.6.1.2
Effective tensile stress area	V_{sar}	lb (kN)	2,865 (12.7)	5,110 (22.7)	6,200 (64.1)	9,205 (40.9)	D.7.1.2
Effective tensile stress area	$V_{sar,eq}$	lb (kN)	1,720 (7.7)	3,065 (13.6)	3,720 (16.5)	6,385 (28.4)	
Temperature Range[5]: Characteristic bond stress in cracked concrete[6]	τ_{cr}	psi (MPa)	1,045[7] (7.2)	1,900 (13.1)	1,800 (12.4)	1,700 (11.7)	D.6.5.2
Temperature Range[5]: Characteristic bond stress in uncracked concrete[6]	τ_{uncr}	psi (MPa)	2,235 (15.4)	2,125 (14.7)	2,020 (13.9)	1,915 (13.2)	D.6.5.2
Reduction for seismic tension	$\alpha_{N.seis}$	-	1.00				
Permissible installation conditions: Resistance modification factor tension and shear, bond failure dry and water saturated concrete	Anchor category	-	1				D.5.3(c)
	$R_{dry,ws}$	-	1.00				

[1] Design information in this table is taken from ICC-ES ESR-5065 and converted for use with CSA A23.3 Annex D.
[2] See Table 1 and Figure 2 of this section.
[3] For all design cases, $\psi_{c,N}$ = 1.0. The appropriate coefficient for breakout resistance for cracked concrete ($k_{c,cr}$) or uncracked concrete ($k_{c,uncr}$) must be used.
[4] For use with the load combinations of CSA A23.3 chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3 section D.5.3 is not provided, or where pullout or pryout strength governs. For cases where the presence of supplementary reinforcement can be verified, the resistance modification factors associated with Condition A may be used.
[5] Temperature range max. short term temperature = 176°F (80°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.
[6] Bond strength values corresponding to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c/2,500)^n$ [for SI: $(f'_c / 17.2)^n$].
where n = 0.18 for uncracked and n = 0.14 for cracked concrete.
[7] For effective embedments greater than 76mm use a bond stress of 2,000 psi (13.8 MPa).

Table 14 - Hilti Kwik-X Dual Action Anchor factored resistance with concrete / bond failure in uncracked concrete [1,2,3,4,5,6,7]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	2-1/2 (64)	3,305 (14.7)	3,695 (16.4)	4,050 (18.0)	4,655 (20.7)	3,305 (14.7)	3,695 (16.4)	4,050 (18.0)	4,655 (20.7)
	3-1/4 (83)	4,900 (21.8)	5,480 (24.4)	5,880 (26.2)	6,055 (26.9)	9,805 (43.6)	10,960 (48.8)	11,760 (52.3)	12,105 (53.9)
	4-1/2 (114)	7,820 (34.8)	7,995 (35.6)	8,145 (36.2)	8,380 (37.3)	15,640 (69.6)	15,995 (71.1)	16,290 (72.5)	16,765 (74.6)
1/2	3 (76)	4,345 (19.3)	4,860 (21.6)	5,325 (23.7)	6,145 (27.3)	8,695 (38.7)	9,720 (43.2)	10,650 (47.4)	12,295 (54.7)
	4-1/4 (108)	7,330 (32.6)	8,195 (36.5)	8,975 (39.9)	10,035 (44.6)	14,660 (65.2)	16,390 (72.9)	17,955 (79.9)	20,070 (89.3)
	5-1/2 (140)	10,790 (48.0)	12,065 (53.7)	12,620 (56.1)	2,985 (57.8)	21,580 (96.0)	24,130 (107.3)	25,240 (112.3)	5,975 (115.5)
5/8	3-1/4 (83)	4,900 (21.8)	5,480 (24.4)	6,005 (26.7)	6,930 (30.8)	9,805 (43.6)	10,960 (48.8)	12,005 (53.4)	13,865 (61.7)
	4 (102)	6,690 (29.8)	7,480 (33.3)	8,195 (36.5)	9,465 (42.1)	13,385 (59.5)	14,965 (66.6)	16,395 (72.9)	18,930 (84.2)
	5 (127)	9,355 (41.6)	10,455 (46.5)	11,455 (51.0)	13,225 (58.8)	18,705 (83.2)	20,915 (93.0)	22,910 (101.9)	26,455 (117.7)
	6 (152)	12,295 (54.7)	13,745 (61.1)	15,060 (67.0)	16,843 (74.9)	24,590 (109.4)	27,490 (122.3)	30,115 (134.0)	33,670 (149.8)
3/4	4 (102)	6,690 (29.8)	7,480 (33.3)	8,195 (36.5)	9,465 (42.1)	13,385 (59.5)	14,965 (66.6)	16,395 (72.9)	18,930 (84.2)
	5 (127)	9,355 (41.6)	10,455 (46.5)	11,455 (51.0)	13,225 (58.8)	18,705 (83.2)	20,915 (93.0)	22,910 (101.9)	26,455 (117.7)
	6-1/4 (159)	13,070 (58.1)	14,615 (65.0)	16,010 (71.2)	18,485 (82.2)	26,140 (116.3)	29,230 (130.0)	32,020 (142.4)	36,970 (164.5)
	7-1/4 (184)	16,330 (67.7)	18,260 (81.2)	20,000 (89.0)	23,095 (102.7)	32,660 (145.3)	36,515 (162.4)	40,000 (177.9)	46,190 (205.5)

1 See PTG Ed. 22 Section 3.1.8 to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths are not permitted.
3 Apply spacing, edge distance, and concrete thickness factors in Tables 5 through 12 as necessary. Compare to the steel values in Table 16. The lesser of the values is to be used for the design.
4 Data is for max. short term temperature = 176°F (80°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.
5 Tabular values are for dry and water saturated concrete conditions.
6 Tabular values are for short term loads only. For sustained loads including overhead use, see PTG Ed. 22 Section 3.1.8.
7 Tabular values are for normal weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: For sand-lightweight, λ_a = 0.51. For all-lightweight, λ_a = 0.45.

Table 15 - Hilti Kwik-X Dual Action Anchor factored resistance with concrete / bond failure in cracked concrete [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Effective embedment in. (mm)	Tension - N_r				Shear - V_r			
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 25 MPa (3,625 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	2-1/2 (64)	2,030 (9.0)	2,075 (9.2)	2,115 (9.4)	2,175 (9.7)	2,030 (9.0)	2,075 (9.2)	2,115 (9.4)	2,175 (9.7)
	3-1/4 (83)	3,430 (15.3)	3,835 (17.1)	4,200 (18.7)	4,850 (21.6)	6,860 (30.5)	7,670 (34.1)	8,405 (37.4)	9,705 (43.2)
	4-1/2 (114)	5,590 (24.9)	6,250 (27.8)	6,845 (30.5)	7,500 (33.4)	11,180 (49.7)	12,500 (55.6)	13,695 (60.9)	15,000 (66.7)
1/2	3 (76)	3,045 (13.5)	3,400 (15.1)	3,725 (16.6)	4,305 (19.1)	6,085 (27.1)	6,805 (30.3)	7,455 (33.2)	8,605 (38.3)
	4-1/4 (108)	5,130 (22.8)	5,735 (25.5)	6,285 (28.0)	7,255 (32.3)	10,260 (45.6)	11,475 (51.0)	12,570 (55.9)	14,510 (64.6)
	5-1/2 (140)	7,555 (33.6)	8,445 (37.6)	9,250 (41.1)	10,680 (47.5)	15,105 (67.2)	16,890 (75.1)	18,500 (82.3)	21,365 (95.0)
5/8	3-1/4 (83)	3,430 (15.3)	3,835 (17.1)	4,200 (18.7)	4,850 (21.6)	6,860 (30.5)	7,670 (34.1)	8,405 (37.4)	9,705 (43.2)
	4 (102)	4,685 (20.8)	5,240 (23.3)	5,740 (25.5)	6,625 (29.5)	9,370 (41.7)	10,475 (46.6)	11,475 (51.0)	13,250 (58.9)
	5 (127)	6,545 (29.1)	7,320 (32.6)	8,020 (35.7)	9,260 (41.2)	13,095 (58.2)	14,640 (65.1)	16,035 (71.3)	18,520 (82.4)
	6 (152)	8,605 (38.3)	9,620 (42.8)	10,540 (46.9)	12,170 (54.1)	17,215 (76.6)	19,245 (85.6)	21,080 (93.8)	24,340 (108.3)
3/4	4 (102)	4,685 (20.8)	5,240 (23.3)	5,740 (25.5)	6,625 (29.5)	9,370 (41.7)	10,475 (46.6)	11,475 (51.0)	13,250 (58.9)
	5 (127)	6,545 (29.1)	7,320 (32.6)	8,020 (35.7)	9,260 (41.2)	13,095 (58.2)	14,640 (65.1)	16,035 (71.3)	18,520 (82.4)
	6-1/4 (159)	9,150 (40.7)	10,230 (45.5)	11,205 (49.8)	12,940 (57.6)	18,300 (81.4)	20,460 (91.0)	22,410 (99.7)	25,880 (115.1)
	7-1/4 (184)	11,430 (50.8)	12,780 (56.9)	14,000 (62.3)	16,165 (71.9)	22,865 (101.7)	25,560 (113.7)	28,000 (124.6)	32,335 (143.8)

1 See PTG Ed. 22 Section 3.1.8 to convert design strength value to ASD value.
2 Linear interpolation between embedment depths and concrete compressive strengths are not permitted.
3 Apply spacing, edge distance, and concrete thickness factors in Tables 5 through 12 as necessary. Compare to the steel values in Table 16. The lesser of the values is to be used for the design.
4 Data is for max. short term temperature = 176°F (80°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.
5 Tabular values are for dry and water saturated concrete conditions.
6 Tabular values are for short term loads only. For sustained loads including overhead use, see PTG Ed. 22 Section 3.1.8.
7 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.
8 Tabular values are for static loads only. Seismic design in not permitted for uncracked concrete. For seismic loads, multiply cracked concrete tubular values in tension and shear by α_{seis} = 0.75. See PTG Ed. 22 Section 3.1.8 for additional information on seismic applications.

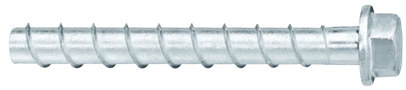
Table 16 - Steel resistance for Hilti KH-EZ / KH-EZ CRC carbon steel screw anchor [1,2]

Nominal anchor diameter in.	Tensile[3] N_{sar} lb (kN)	Shear[4] V_{sar} lb (kN)	Seismic Shear[5] $V_{sar,eq}$ lb (kN)
3/8	6,150 (27.4)	2,865 (12.7)	1,720 (7.7)
1/2	10,780 (48.0)	5,110 (22.7)	3,065 (13.6)
5/8	14,405 (64.1)	6,200 (27.6)	3,720 (16.5)
3/4	19,050 (84.7)	9,205 (40.9)	6,385 (28.4)

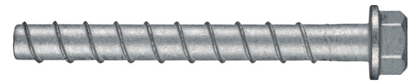
1 See PTG Ed. 22 Section 3.1.8 to convert design strength value to ASD value.
2 Hilti KH-EZ / KH-EZ CRC carbon steel screw anchors are to be considered brittle steel elements.
3 Tensile $N_{sar} = A_{se,N}\, \phi_s\, f_{uta}\, R$ as noted in CSA A23.3 Annex D.
4 Shear determined by static shear tests with $V_{sar} < 0.6\, A_{se,V}\, \phi_s\, f_{uta}\, R$ as noted in CSA A23.3 Annex D.
5 Seismic shear values determined by seismic shear tests with $V_{sar,eq} \leq 0.60\, A_{se,V}\, \phi_s\, f_{uta}\, R$ as noted in CSA A23.3 Annex D. See PTG Ed. 22 Section 3.1.8 for additional information on seismic applications.

Product Portfolio

KHC 3/4" Large



Hilti KH-EZ screw anchor



Hilti KH-EZ CRC screw anchor

KHC Kwik-X Adhesive Capsule

Description	Hole diameter in.	Minimum embedment	Maximum embedment	Qty / Box
KHC Kwik-X Capsule 3/8" SMALL	3/8"	2-1/2	3	50
KHC Kwik-X Capsule 3/8" LARGE	3/8"	3	4-1/2	50
KHC Kwik-X Capsule 1/2" SMALL	1/2"	3	4-1/4	25
KHC Kwik-X Capsule 1/2" LARGE	1/2"	4-1/4	5-1/2	25
KHC Kwik-X Capsule 5/8" SMALL	5/8"	3-1/4	4-1/2	24
KHC Kwik-X Capsule 5/8" LARGE	5/8"	4-1/2	6	24
KHC Kwik-X Capsule 3/4" SMALL	3/4"	4	4-1/2	24
KHC Kwik-X Capsule 3/4" LARGE	3/4"	4-1/2	7-1/4	24

KH-EZ Screw Anchor

Description	Hole diameter in.	Minimum embedment	Maximum embedment	Qty / Box
KH-EZ 3/8"x3"	3/8"	2-1/2	3	50
KH-EZ 3/8"x3 1/2"	3/8"	2-1/2	3-1/2	50
KH-EZ 3/8"x4"	3/8"	2 -/2	4	50
KH-EZ 3/8"x5"	3/8"	2-1/2	5	30
KH-EZ 1/2"x3 1/2"	1/2"	3	3-1/4	25
KH-EZ 1/2"x4"	1/2"	3	4	25
KH-EZ 1/2"x4 1/2"	1/2"	3	4 1/2	25
KH-EZ 1/2"x5"	1/2"	3	5	25
KH-EZ 1/2"x6"	1/2"	3	6	25
KH-EZ 5/8"x3 1/2"	1/2"	3	3-1/2	15
KH-EZ 5/8"x4"	5/8"	3-1/4	4	15
KH-EZ 5/8"x5 1/2"	5/8"	3-1/4	5-1/2	15
KH-EZ 5/8"x6 1/2"	5/8"	3-1/4	6-1/2	15
KH-EZ 5/8"x8"	5/8"	3-1/4	8	15
KH-EZ 3/4"x4 1/2"	3/4"	4	4-1/2	10
KH-EZ 3/4"x5 1/2"	3/4"	4	5-1/2	10
KH-EZ 3/4"x7"	3/4"	4	7	10
KH-EZ 3/4"x8"	3/4"	4	8	10
KH-EZ 3/4"x9"	3/4"	4	9	10

KH-EZ CRC Screw Anchor

Description	Hole diameter in.	Minimum embedment	Maximum embedment	Qty / Box
KH-EZ CRC 3/8"x3"	3/8"	2-1/2	3	50
KH-EZ CRC 3/8"x4"	3/8"	2-1/2	4	50
KH-EZ CRC 3/8"x5"	3/8"	2-1/2	5	30
KH-EZ CRC 1/2"x4"	1/2"	3	4	25
KH-EZ CRC 1/2"x5"	1/2"	3	5	25
KH-EZ CRC 1/2"x6"	1/2"	3	6	25
KH-EZ CRC 5/8"x5 1/2"	5/8"	3-1/4	5-1/2	15
KH-EZ CRC 5/8"x6 1/2"	5/8"	3-1/4	6-1/2	15
KH-EZ CRC 5/8"x8"	5/8"	3-1/4	8	15
KH-EZ CRC 3/4"x5 1/2"	3/4"	4	5-1/2	10
KH-EZ CRC 3/4"x7"	3/4"	4	7	10
KH-EZ CRC 3/4"x9"	3/4"	4	9	10

The data contained herein was current as of the date of publication. Updates and changes may be made based on later testing. If verification is needed that the data is still current, please contact the Hilti Technical Support Specialists at 1-877-749-6337. All published load values herein represent the results of testing by Hilti or test organizations. Because of variations in materials, on-site testing may be necessary to determine performance at any specific site.

Hilti, Inc.
1-800-879-8000 I en español 1-800-879-5000
www.hilti.com

Hilti (Canada) Corporation
1-800-363-4458
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