The following excerpt are pages from the North American Product Technical Guide, Volume 2: Anchor Fastening, Edition 22.

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

To consult directly with a team member regarding our anchor fastening products, contact Hilti's team of technical support specialists between the hours of 7:00am – 6:00pm CST.
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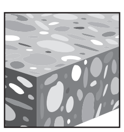
3.3.10 KWIK HUS CARBON STEEL SCREW ANCHOR

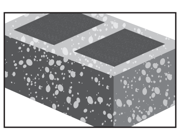
PRODUCT DESCRIPTION

KWIK HUS (KH) Carbon Steel Screw Anchor

Anchor System	Features and Benefits
Carbon Steel KH 	• Quick and easy to install. • Length and diameter identification clearly stamped on head facilitates quality control and inspection after installation. • Through fixture installation improves productivity and accurate installation. • Thread design enables quality setting and exceptional load values in wide variety of base material strengths. • Anchor is fully removable • Anchor size is same as drill bit size and uses standard diameter drill bits. • Suitable for reduced edge distances and spacing. • Suitable for uncracked normal-weight concrete, lightweight concrete



Uncracked concrete



Grout-filled concrete masonry

MATERIAL SPECIFICATIONS

Hilti KWIK HUS anchors are manufactured from carbon steel. The anchors are dull zinc plated to a minimum thickness of 8 μm.

INSTALLATION PARAMETERS

Figure 1 — Hilti KWIK HUS anchor installation details

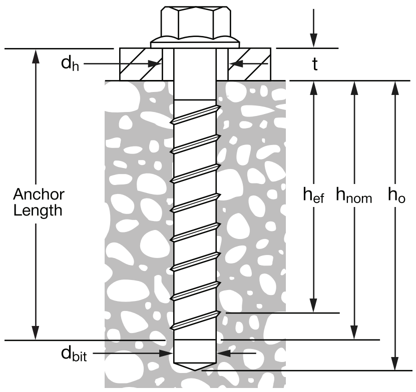


Table 1 — Hilti KWIK HUS specifications

Setting information	Symbol	Units	Nominal anchor diameter									
			3/8			1/2			5/8		3/4	
Nominal bit diameter	d_{bit}	in.	3/8			1/2			5/8		3/4	
Fixture hole diameter	d_h	in.	1/2			5/8			3/4		7/8	
Installation torque[1]	T_{inst}	ft-lb	40			45			85		95	
Maximum impact wrench torque rating[2]	$T_{impact,max}$	ft-lb	114	450		137	450		450		450	
Nominal embedment	h_{nom}	in.	1-5/8	2-1/2	3-1/4	2-1/4	3	4-1/4	3-1/4	5	4	6-1/4
Effective embedment	h_{ef}	in.	1.11	1.86	2.20	1.52	2.16	3.22	2.39	3.88	2.92	4.84
Minimum hole depth	h_o	in.	1-7/8	2-3/4	3-1/2	2-5/8	3-3/8	4-5/8	3-5/8	5-3/8	4-3/8	6-5/8
Critical edge distance	c_{ac}	in.	2.50	3.12	3.74	2.75	3.70	5.25	3.63	5.81	4.41	7.28
Minimum spacing at critical edge distance	$s_{min,cac}$	in.	2.25			3					4	
Minimum edge distance	c_{min}	in.	1.50			1.75						
Minimum spacing at minimum edge distance	s_{min}	in.	3								4	
Minimum concrete thickness	h_{min}	in.	3-1/4	4	4-7/8	3-3/4	4-3/4	6-3/4	5	7	6	8-1/8
Wrench size	-	in.	9/16			3/4			15/16		1-1/8	
Effective tensile stress area	A_{se}	in^2	0.086			0.161			0.268		0.392	
Minimum specified ultimate strength	f_{uta}	psi	107,120			97,140			90,180		81,600	

1 T_{inst} applies to installations using a calibrated torque wrench.

2 Because of variability in measurement procedures, the published torque of an impact tool may not correlate properly with the above setting torques. Over-torquing can damage the anchor and/or reduce its holding capacity.

DESIGN INFORMATION IN CONCRETE PER ACI 318

ACI 318 Chapter 17 design

The technical data contained in this section are Hilti Simplified Design Tables. The load values were developed using the Strength Design equations of ACI 318 Chapter 17. KWIK HUS anchor were tested and the test results were evaluated in accordance with ACI 355.2 and AC193. An ICC-ES evaluation report was not published with this information. For a detailed explanation of the Hilti Simplified Design Tables, refer to section 3.1.8.

Table 2 — Hilti KWIK HUS design strength with concrete / pullout failure in uncracked concrete[1,2,3,4,5]

Nominal anchor diameter	Nominal embed. in. (mm)	Tension - ϕN_n				Shear - ϕV_n			
		f'_c = 2,500 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 6,000 psi lb (kN)	f'_c = 2,500 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 6,000 psi lb (kN)
3/8	1-5/8 (41)	910 (4.0)	1,000 (4.4)	1,155 (5.1)	1,415 (6.3)	980 (4.4)	1,075 (4.8)	1,245 (5.5)	1,520 (6.8)
	2-1/2 (64)	1,980 (8.8)	2,165 (9.6)	2,505 (11.1)	3,065 (13.6)	2,130 (9.5)	2,335 (10.4)	2,695 (12.0)	3,300 (14.7)
	3-1/4 (83)	2,545 (11.3)	2,790 (12.4)	3,220 (14.3)	3,945 (17.5)	2,740 (12.2)	3,005 (13.4)	3,465 (15.4)	4,245 (18.9)
1/2	2-1/4 (57)	1,460 (6.5)	1,600 (7.1)	1,850 (8.2)	2,265 (10.1)	1,575 (7.0)	1,725 (7.7)	1,990 (8.9)	2,440 (10.9)
	3 (76)	2,475 (11.0)	2,710 (12.1)	3,130 (13.9)	3,835 (17.1)	2,665 (11.9)	2,920 (13.0)	3,375 (15.0)	4,130 (18.4)
	4-1/4 (108)	4,505 (20.0)	4,935 (22.0)	5,700 (25.4)	6,980 (31.0)	9,705 (43.2)	10,635 (47.3)	12,280 (54.6)	15,040 (66.9)
5/8	3-1/4 (83)	3,240 (14.4)	3,550 (15.8)	4,100 (18.2)	5,025 (22.4)	3,490 (15.5)	3,825 (17.0)	4,415 (19.6)	5,410 (24.1)
	5 (127)	6,705 (29.8)	7,345 (32.7)	8,485 (37.7)	10,390 (46.2)	14,445 (64.3)	15,825 (70.4)	18,270 (81.3)	22,380 (99.6)
3/4	4 (102)	4,380 (19.5)	4,795 (21.3)	5,540 (24.6)	6,785 (30.2)	9,430 (41.9)	10,330 (45.9)	11,930 (53.1)	14,610 (65.0)
	6-1/4 (159)	9,345 (41.6)	10,235 (45.5)	11,820 (52.6)	14,475 (64.4)	20,125 (89.5)	22,045 (98.1)	25,455 (113.2)	31,175 (138.7)

1 See section 3.1.8 to convert design strength value to ASD value.

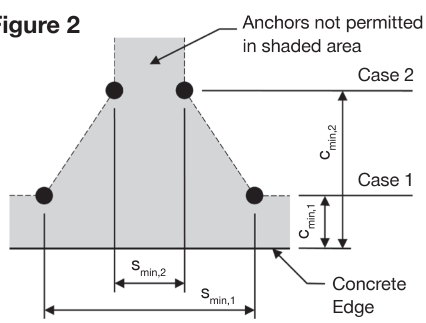
2 Linear interpolation between embedment depths and concrete compressive strengths is not permitted.

3 Apply spacing, edge distance, and concrete thickness factors in tables 4 to 7 as necessary. Compare to steel values in table 3. The lesser of the values is to be used for the design.

4 Tabular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: for sand-lightweight, λ_a = 0.68; for all-lightweight, λ_a = 0.60

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

Figure 2



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

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

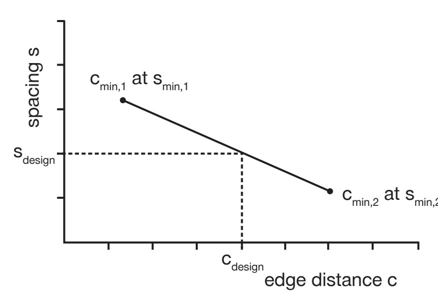


Table 3 — Steel design strength for Hilti KWIK HUS anchors[1,2]

Nominal anchor diameter	Hilti KWIK HUS anchors Tensile[1,3] ϕN_{sa} lb (kN)	Hilti KWIK HUS anchors Shear[2,4] ϕV_{sa} lb (kN)
3/8	5,990 (26.6)	3,095 (13.8)
1/2	10,165 (45.2)	4,910 (21.8)
5/8	15,735 (70.0)	6,735 (30.0)
3/4	20,810 (92.6)	9,995 (44.5)

1 See section 3.1.8 to convert design strength value to ASD value.

2 Hilti KWIK HUS anchors are to be considered brittle steel elements.

3 Tensile = $\phi N_{sa} = \phi_s A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17

4 Shear values determined by static shear tests with $\phi V_{sa} \le \phi\ 0.60\ A_{se,V}\ f_{uta}$ as noted in ACI 318 Chapter 17.

Table 4 — Load adjustment factors for 3/8-in. diameter Hilti KWIK HUS in uncracked concrete[1,2]

3/8-in. KH 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 II to and away from edge f_{RV}			Conc. thickness factor in shear[4] f_{HV}		
Embedment h_{nom} in. (mm)	1-5/8 (41)	2-1/2 (64)	3-1/4 (83)	1-5/8 (41)	2-1/2 (64)	3-1/4 (83)	1-5/8 (41)	2-1/2 (64)	3-1/4 (83)	1-5/8 (41)	2-1/2 (64)	3-1/4 (83)	1-5/8 (41)	2-1/2 (64)	3-1/4 (83)	1-5/8 (41)	2-1/2 (64)	3-1/4 (83)
Spacing (s) / edge distance (c_a) / concrete thickness (h) - in. (mm): 1-1/2 (38)	n/a	n/a	n/a	0.61	0.59	0.54	n/a	n/a	n/a	0.49	0.25	0.20	0.61	0.50	0.40	n/a	n/a	n/a
2 (51)	n/a	n/a	n/a	0.80	0.70	0.62	n/a	n/a	n/a	0.75	0.38	0.31	0.80	0.70	0.62	n/a	n/a	n/a
2-1/4 (57)	0.84	0.70	0.67	0.90	0.76	0.67	0.65	0.60	0.59	0.90	0.46	0.37	0.90	0.76	0.67	n/a	n/a	n/a
2-1/2 (64)	0.88	0.72	0.69	1.00	0.82	0.72	0.67	0.61	0.60	1.00	0.54	0.43	1.00	0.82	0.72	n/a	n/a	n/a
3 (76)	0.95	0.77	0.73		0.96	0.82	0.71	0.63	0.61		0.71	0.57		0.96	0.82	n/a	n/a	n/a
3-1/4 (83)	0.99	0.79	0.75		1.00	0.87	0.72	0.64	0.62		0.80	0.64		1.00	0.87	0.95	n/a	n/a
3-1/2 (89)	1.00	0.81	0.77			0.94	0.74	0.65	0.63		0.89	0.71			0.94	0.98	n/a	n/a
4 (102)		0.86	0.80			1.00	0.78	0.68	0.65		1.00	0.87			1.00	1.00	0.84	n/a
4-1/2 (114)		0.90	0.84				0.81	0.70	0.67			1.00					0.89	n/a
4-7/8 (124)		0.94	0.87				0.84	0.71	0.69								0.93	0.86
5 (127)		0.95	0.88				0.84	0.72	0.69								0.94	0.87
6 (152)		1.00	0.95				0.91	0.76	0.73								1.00	0.96
7 (178)			1.00				0.98	0.81	0.77									1.00
8 (203)							1.00	0.85	0.80									
9 (229)								0.90	0.84									
10 (254)								0.94	0.88									
11 (279)								0.98	0.92									
12 (305)								1.00	0.96									
14 (356)									1.00									
16 (406)																		
18 (457)																		
20 (508)																		
24 (610)																		

1 Linear interpolation not permitted.

2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Engineering software or perform anchor calculation using design equations from ACI 318 Chapter 17.

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

4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

If a reduction factor value is in a shaded cell, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with table 1 and figure 2 of this section to calculate permissable edge distance, spacing and concrete thickness combinations.

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Table 5 — Load adjustment factors for 1/2-in. diameter Hilti KWIK HUS in uncracked concrete[1,2]

1/2-in. KH 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: II to and away from edge f_{RV}			Conc. thickness factor in shear[4] f_{HV}		
Embedment h_{nom}	in. (mm)	2-1/4 (57)	3 (76)	4-1/4 (108)	2-1/4 (57)	3 (76)	4-1/4 (108)	2-1/4 (57)	3 (76)	4-1/4 (108)	2-1/4 (57)	3 (76)	4-1/4 (108)	2-1/4 (57)	3 (76)	4-1/4 (108)	2-1/4 (57)	3 (76)	4-1/4 (108)
Spacing (s) / edge distance (c_a) / concrete thickness (h) - in. (mm)	1-3/4 (44)	n/a	n/a	n/a	0.68	0.58	0.51	n/a	n/a	n/a	0.45	0.28	0.08	0.68	0.56	0.17	n/a	n/a	n/a
	2 (51)	n/a	n/a	n/a	0.75	0.63	0.54	n/a	n/a	n/a	0.54	0.34	0.10	0.75	0.63	0.21	n/a	n/a	n/a
	2-1/2 (64)	n/a	n/a	n/a	0.91	0.72	0.60	n/a	n/a	n/a	0.76	0.48	0.14	0.91	0.72	0.29	n/a	n/a	n/a
	3 (76)	0.83	0.73	0.66	1.00	0.82	0.66	0.67	0.62	0.55	1.00	0.63	0.19	1.00	0.82	0.38	n/a	n/a	n/a
	3-1/2 (89)	0.88	0.77	0.68		0.95	0.73	0.69	0.64	0.56		0.80	0.24		0.95	0.47	n/a	n/a	n/a
	3-3/4 (95)	0.91	0.79	0.69		1.00	0.76	0.71	0.65	0.57		0.89	0.26		1.00	0.53	0.91	n/a	n/a
	4 (102)	0.94	0.81	0.71			0.80	0.72	0.66	0.57		0.98	0.29			0.58	0.94	n/a	n/a
	4-1/2 (114)	0.99	0.85	0.73			0.87	0.75	0.68	0.58		1.00	0.35			0.69	1.00	n/a	n/a
	4-3/4 (121)	1.00	0.87	0.75			0.91	0.76	0.69	0.59			0.38			0.75		0.88	n/a
	5 (127)		0.89	0.76			0.95	0.78	0.70	0.59			0.41			0.81		0.91	n/a
	6 (152)		0.96	0.81			1.00	0.83	0.75	0.61			0.53			1.00		0.99	n/a
	6-3/4 (171)		1.00	0.85				0.87	0.78	0.62			0.64					1.00	0.70
	7 (178)			0.86				0.89	0.79	0.63			0.67						0.72
	8 (203)			0.91				0.94	0.83	0.65			0.82						0.76
	9 (229)			0.97				1.00	0.87	0.66			0.98						0.81
	10 (254)			1.00					0.91	0.68			1.00						0.85
	11 (279)								0.95	0.70									0.90
	12 (305)								0.99	0.72									0.94
	14 (356)								1.00	0.76									1.00
	16 (406)									0.79									
	18 (457)									0.83									
	20 (508)									0.87									
	> 24 (610)									0.94									

Table 6 — Load Adjustment Factors for 5/8-in. Diameter Hilti KWIK HUS in uncracked concrete[1,2]

5/8-in. KH 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: II to and away from edge f_{RV}		Conc. thickness factor in shear[4] f_{HV}	
Embedment h_{nom}	in. (mm)	3-1/4 (83)	5 (127)	3-1/4 (83)	5 (127)	3-1/4 (83)	5 (127)	3-1/4 (83)	5 (127)	3-1/4 (83)	5 (127)	3-1/4 (83)	5 (127)
Spacing (s) / edge distance (c_a) / concrete thickness (h) - in. (mm)	1-3/4 (44)	n/a	n/a	0.62	0.51	n/a	n/a	0.24	0.06	0.47	0.13	n/a	n/a
	2 (51)	n/a	n/a	0.67	0.54	n/a	n/a	0.29	0.08	0.57	0.15	n/a	n/a
	2-1/2 (64)	n/a	n/a	0.76	0.59	n/a	n/a	0.40	0.11	0.76	0.21	n/a	n/a
	3 (76)	0.71	0.63	0.86	0.65	0.61	0.55	0.53	0.14	0.86	0.28	n/a	n/a
	3-1/2 (89)	0.74	0.65	0.97	0.70	0.63	0.55	0.66	0.18	0.97	0.35	n/a	n/a
	4 (102)	0.78	0.67	1.00	0.76	0.65	0.56	0.81	0.22	1.00	0.43	n/a	n/a
	4-1/2 (114)	0.81	0.69		0.83	0.66	0.57	0.97	0.26		0.52	n/a	n/a
	5 (127)	0.85	0.71		0.89	0.68	0.58	1.00	0.30		0.60	0.85	n/a
	5-1/2 (140)	0.88	0.74		0.96	0.70	0.58		0.35		0.70	0.89	n/a
	6 (152)	0.92	0.76		1.00	0.72	0.59		0.40		0.80	0.93	n/a
	7 (178)	0.99	0.80			0.75	0.61		0.50		1.00	1.00	0.65
	8 (203)	1.00	0.84			0.79	0.62		0.61				0.69
	9 (229)		0.89			0.83	0.64		0.73				0.74
	10 (254)		0.93			0.86	0.65		0.86				0.78
	11 (279)		0.97			0.90	0.67		0.99				0.81
	12 (305)		1.00			0.94	0.68		1.00				0.85
	14 (356)					1.00	0.71						0.92
	16 (406)						0.74						0.98
	18 (457)						0.77						1.00
	20 (508)						0.80						
	24 (610)						0.86						
	> 30 (762)						0.95						

1 Linear interpolation not permitted.

2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Engineering software or perform anchor calculation using design equations from ACI 318 Chapter 17.

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

4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

(Shaded cell) If a reduction factor value is in a shaded cell, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with table 1 and figure 2 of this section to calculate permissable edge distance, spacing and concrete thickness combinations.

Table 7 — Load adjustment factors for 3/4-in. diameter Hilti KWIK HUS in uncracked concrete[1,2]

3/4-in. KH 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: II to and away from edge f_{RV}		Conc. thickness factor in shear[4] f_{HV}	
Embedment h_{nom} in. (mm)		4 (102)	6-1/4 (159)	4 (102)	6-1/4 (159)	4 (102)	6-1/4 (159)	4 (102)	6-1/4 (159)	4 (102)	6-1/4 (159)	4 (102)	6-1/4 (159)
Spacing (s) / edge distance (c_a) / concrete thickness (h) - in. (mm)													
1-3/4	(44)	n/a	n/a	0.57	0.48	n/a	n/a	0.10	0.05	0.19	0.10	n/a	n/a
2	(51)	n/a	n/a	0.61	0.50	n/a	n/a	0.12	0.06	0.23	0.12	n/a	n/a
2-1/2	(64)	n/a	n/a	0.68	0.54	n/a	n/a	0.16	0.08	0.33	0.17	n/a	n/a
3	(76)	n/a	n/a	0.76	0.58	n/a	n/a	0.21	0.11	0.43	0.22	n/a	n/a
3-1/2	(89)	n/a	n/a	0.84	0.62	n/a	n/a	0.27	0.14	0.54	0.28	n/a	n/a
4	(102)	0.73	0.64	0.93	0.67	0.58	0.55	0.33	0.17	0.66	0.34	n/a	n/a
4-1/2	(114)	0.76	0.65	1.00	0.72	0.59	0.56	0.39	0.20	0.79	0.41	n/a	n/a
5	(127)	0.79	0.67		0.76	0.60	0.56	0.46	0.24	0.92	0.48	n/a	n/a
5-1/2	(140)	0.81	0.69		0.81	0.61	0.57	0.53	0.28	1.00	0.55	n/a	n/a
6	(152)	0.84	0.71		0.86	0.62	0.58	0.61	0.31		0.63	0.69	n/a
7	(178)	0.90	0.74		0.97	0.64	0.59	0.77	0.40		0.79	0.75	n/a
8	(203)	0.96	0.78		1.00	0.66	0.60	0.94	0.48		0.97	0.80	n/a
8-1/8	(206)	0.96	0.78			0.66	0.60	0.96	0.50		0.99	0.80	0.65
9	(229)	1.00	0.81			0.68	0.62	1.00	0.58		1.00	0.85	0.68
10	(254)		0.84			0.70	0.63		0.68			0.89	0.72
11	(279)		0.88			0.72	0.64		0.78			0.94	0.75
12	(305)		0.91			0.74	0.65		0.89			0.98	0.79
14	(356)		0.98			0.78	0.68		1.00			1.00	0.85
16	(406)		1.00			0.82	0.71						0.91
18	(457)					0.86	0.73						0.96
20	(508)					0.90	0.76						1.00
24	(610)					0.98	0.81						
30	(762)					1.00	0.89						
> 36	(914)						0.96						

1 Linear interpolation not permitted.

2 When combining multiple load adjustment factors (e.g. for a 4 anchor pattern in a corner with thin concrete member) the design can become very conservative. To optimize the design, use Hilti PROFIS Engineering software or perform anchor calculation using design equations from ACI 318 Chapter 17.

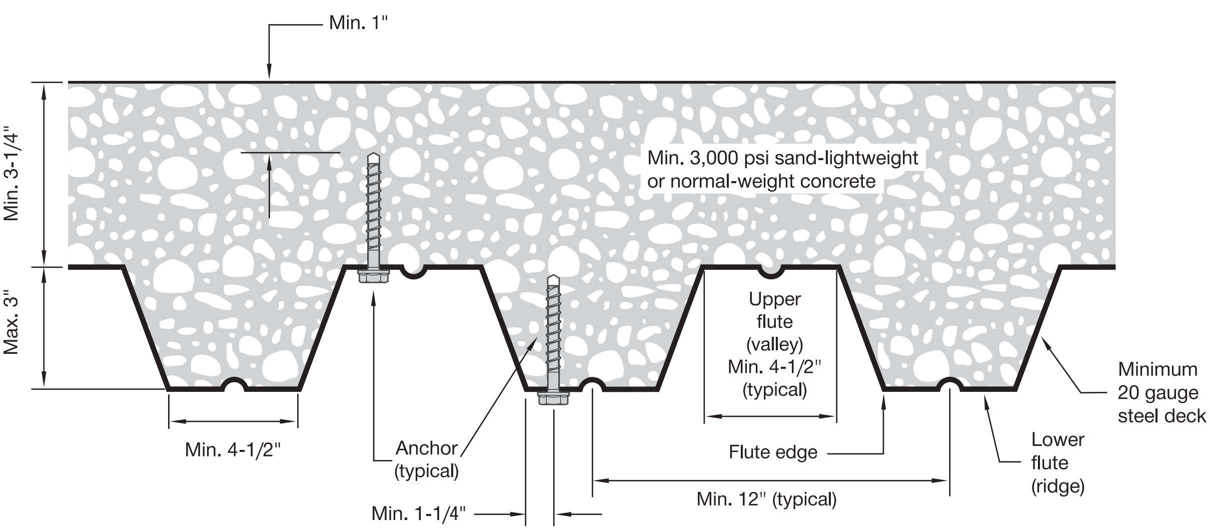
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.

4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then $f_{HV} = 1.0$.

If a reduction factor value is in a shaded cell, this indicates that this specific edge distance may not be permitted with a certain spacing (or vice versa). Check with table 1 and figure 2 of this section to calculate permissable edge distance, spacing and concrete thickness combinations.

3.3.10

Figure 3 — Installation of Hilti KWIK HUS in soffit of concrete over steel deck floor and roof assemblies[1]



1 Anchors may be placed in the upper or lower flute of the steel deck profile provided the minimum concrete cover above the drilled hole is satisfied. Anchors in the lower flute may be installed with a maximum 1-inch offset in either direction from the center of the flute. The offset distance may be increased proportionally for profiles with lower flute widths greater than those shown provided the minimum lower flute edge distance is also satisfied.

Table 8 — Hilti KWIK HUS in the soffit of uncracked lightweight concrete over metal deck[1,2,3,4,5,6,7]

Nominal anchor diameter	Nominal embed. in. (mm)	Installation in lower flute				Installation in upper flute			
		Tension - ϕN_n		Shear - ϕV_n		Tension - ϕN_n		Shear - ϕV_n	
		f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)	f'_c = 3,000 psi lb (kN)	f'_c = 4,000 psi lb (kN)
3/8	1-5/8 (41)	835 (3.7)	965 (4.3)	1,000 (4.4)	1,000 (4.4)	660 (2.9)	760 (3.4)	2,360 (10.5)	2,360 (10.5)
	2-1/2 (64)	1,455 (6.5)	1,680 (7.5)	905 (4.0)	905 (4.0)	1,900 (8.5)	2,195 (9.8)	3,655 (16.3)	3,655 (16.3)
	3-1/4 (83)	2,550 (11.3)	2,945 (13.1)	2,165 (9.6)	2,165 (9.6)	n/a	n/a	n/a	n/a
1/2	2-1/4 (57)	850 (3.8)	980 (4.4)	965 (4.3)	965 (4.3)	905 (4.0)	1,045 (4.6)	4,710 (21.0)	4,710 (21.0)
	3 (76)	1,990 (8.9)	2,300 (10.2)	1,750 (7.8)	1,750 (7.8)	n/a	n/a	n/a	n/a
	4-1/4 (108)	3,485 (15.5)	4,025 (17.9)	2,155 (9.6)	2,155 (9.6)	n/a	n/a	n/a	n/a
5/8	3-1/4 (83)	2,715 (12.1)	3,135 (13.9)	2,080 (9.3)	2,080 (9.3)	n/a	n/a	n/a	n/a
	5 (127)	6,170 (27.4)	7,125 (31.7)	2,515 (11.2)	2,515 (11.2)	n/a	n/a	n/a	n/a
3/4	4 (102)	2,715 (12.1)	3,135 (13.9)	2,255 (10.0)	2,255 (10.0)	n/a	n/a	n/a	n/a

1 See 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 Tabular value is for one anchor per flute. Minimum spacing along the length of the flute is 3 x h_{nom} (nominal embedment).
4 Tabular values are lightweight concrete and no additional reduction factor is needed.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Comparison to steel values in table 3 is not required. Values in tables 8 control.
7 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

DESIGN INFORMATION IN CONCRETE PER CSA A23.3

Limit State Design of anchors is described in the provisions of CSA A23.3 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 table 2 of this section. 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 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 Annex D, refer to Section 3.1.8. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.com.

Table 9 — Steel resistance for Hilti KWIK HUS screw anchor[1,2]

Anchor diameter in.	Nominal embedment in. (mm)	Tensile N_{sar} [3] lb (kN)	Shear V_{sar} [4] lb (kN)
3/8	1-5/8 (41)	5,480 (24.4)	2,850 (12.7)
	2-1/2 (64)		
	3-1/4 (83)		
1/2	2-1/4 (57)	9,280 (41.3)	4,525 (20.1)
	3 (76)		
	4-1/4 (108)		
5/8	3-1/4 (83)	14,405 (64.1)	6,200 (27.6)
	5 (127)		
3/4	4 (102)	19,050 (84.7)	9,205 (40.9)
	6-1/4 (159)		

1 See Section 3.1.8 to convert factored resistance value to ASD value.
2 Hilti KWIK HUS 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 $V_{sar} < A_{se,V}\ \phi_s\ 0.6\ f_{uta}\ R$ as noted in CSA A23.3 Annex D.

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Table 10 — Hilti KWIK HUS screw anchor design information in accordance with CSA A23.3 Annex D[1]

Design parameter	Symbol	Units	Nominal anchor diameter										Ref
			3/8			1/2			5/8		3/4		A23.3
Anchor O.D.	d_a	in. (mm)	0.375 (9.5)			0.5 (12.7)			0.625 (15.9)		0.75 (19.1)		
Effective minimum embedment[2]	h_{ef}	in. (mm)	1.11 (28)	1.86 (47)	2.20 (56)	1.52 (39)	2.16 (55)	3.22 (82)	2.39 (61)	3.88 (99)	2.92 (74)	4.84 (123)	
Minimum concrete thickness	h_{min}	in. (mm)	3-1/4 (83)	4 (102)	4-7/8 (124)	3-3/4 (95)	4-3/4 (121)	6-3/4 (171)	5 (127)	7 (178)	6 (152)	8-1/8 (206)	
Critical edge distance	c_{ac}	in. (mm)	2.10 (53)	2.92 (74)	3.30 (84)	2.75 (70)	3.88 (99)	5.25 (133)	3.63 (92)	5.82 (148)	4.41 (112)	7.28 (185)	
Minimum anchor spacing at critical edge distance	$s_{min,cac}$	in. (mm)	2.25 (57)			3 (76)					4 (102)		
Minimum edge distance	c_{min}	in. (mm)	1.50 (38)			1.75 (44)							
Anchor spacing at minimum edge distance	s_{min}	in. (mm)	3 (76)								4 (102)		
Minimum hole depth in concrete	h_o	in. (mm)	1-7/8 (48)	2-3/4 (70)	3 1/2 (86)	2-5/8 (67)	3-3/8 (86)	4-5/8 (117)	3-5/8 (92)	5-3/8 (137)	4-3/8 (111)	6-5/8 (168)	
Minimum specified ultimate strength	f_{uta}	in. (mm)	107,120 (739)			97,140 (670)			90,180 (622)		81,600 (563)		
Effective tensile stress area	$A_{se,N}$	in. (mm)	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)	5,840 (26.0)		9,200 (40.9)				14,405 (64.1)		19,050 (84.7)		D.6.1.2
Factored steel resistance in shear	V_{sar}	lb (kN)	2,850 (12.7)		4,525 (20.1)				6,200 (27.6)		9,205 (40.9)		D.7.1.2
Coefficient for factored concrete breakout resistance, uncracked concrete	$k_{c,uncr}$	-	10						11.2				D.6.2.2
Modification factor for anchor resistance, tension, uncracked concrete[5]	$\psi_{c,N}$	-	10										D.6.2.6
Anchor category	-	-	1										D.5.3 (c)
Concrete material resistance factor	ϕ_c	-	0.65										8.4.2
Resistance modification factor for tension and shear, concrete failure modes, Condition B[6]	R	-	1.00										D.5.3 (c)
Factored pullout resistance in 20 MPa uncracked concrete[7]	$N_{pr,uncr}$	lb (kN)	NA										D.6.3.2

1 Design information in this table is taken from tables 2 of this section and converted with use of CSA A23.3 Annex D.
2 See figure 1 of this section.
3 For concrete over metal deck applications where the concrete thickness over the top flute is less than h_{min} in this table, see figure 3 and table 3 of this section.
4 The KWIK HUS is considered a brittle steel element as defined by CSA A23.3 Annex D section D.2.
5 For all design cases, $\psi_{c,N}$ = 1.0.
6 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.
7 For all design cases, $\psi_{c,P}$ = 1.0. NA (not applicable) denotes that this value does not control for design.

Table 11 — Hilti KWIK HUS screw anchor factored resistance with concrete / pullout failure in uncracked concrete[1,2,3,4,5]

Nominal anchor diameter in.	Effective embed. in. (mm)	Nominal embed. in. (mm)	Tension - N_r f'_c = 20 MPa (2,900psi) lb (kN)	Tension - N_r f'_c = 25 MPa (3,625 psi) lb (kN)	Tension - N_r f'_c = 30 MPa (4,350 psi) lb (kN)	Tension - N_r f'_c = 40 MPa (5,800 psi) lb (kN)	Shear - V_r f'_c = 20 MPa (2,900 psi) lb (kN)	Shear - V_r f'_c = 25 MPa (3,625 psi) lb (kN)	Shear - V_r f'_c = 30 MPa (4,350 psi) lb (kN)	Shear - V_r f'_c = 40 MPa (5,800 psi) lb (kN)
3/8	1-1/8 (28)	1-5/8 (41)	970 (4.3)	1,085 (4.8)	1,185 (5.3)	1,370 (6.1)	970 (4.3)	1,085 (4.8)	1,185 (5.3)	1,370 (6.1)
	1-7/8 (47)	2-1/2 (64)	2,105 (9.4)	2,355 (10.5)	2,580 (11.5)	2,980 (13.2)	2,105 (9.4)	2,355 (10.5)	2,580 (11.5)	2,980 (13.2)
	2-3/16 (56)	3-1/4 (83)	2,740 (12.2)	3,060 (13.6)	3,355 (14.9)	3,875 (17.2)	2,740 (12.2)	3,060 (13.6)	3,355 (14.9)	3,875 (17.2)
1/2	1-1/2 (39)	2-1/4 (57)	1,590 (7.1)	1,780 (7.9)	1,950 (8.7)	2,250 (10.0)	1,590 (7.1)	1,780 (7.9)	1,950 (8.7)	2,250 (10.0)
	2 (55)	3 (76)	2,665 (11.9)	2,980 (13.3)	3,265 (14.5)	3,770 (16.8)	2,665 (11.9)	2,980 (13.3)	3,265 (14.5)	3,770 (16.8)
	3-1/4 (82)	4-1/4 (108)	4,850 (21.6)	5,425 (24.1)	5,945 (26.4)	6,860 (30.5)	9,705 (43.2)	10,850 (48.3)	11,885 (52.9)	13,725 (61.1)
5/8	2-3/8 (61)	3-1/4 (83)	3,485 (15.5)	3,900 (17.3)	4,270 (19.0)	4,930 (21.9)	3,485 (15.5)	3,900 (17.3)	4,270 (19.0)	4,930 (21.9)
	4 (99)	5 (127)	7,210 (32.1)	8,060 (35.9)	8,830 (39.3)	10,195 (45.4)	14,420 (64.1)	16,120 (71.7)	17,660 (78.6)	20,390 (90.7)
3/4	2-15/16 (74)	4 (102)	4,660 (20.7)	5,210 (23.2)	5,705 (25.4)	6,590 (29.3)	9,320 (41.4)	10,420 (46.3)	11,415 (50.8)	13,180 (58.6)
	4-13/16 (123)	6-1/4 (159)	9,985 (44.4)	11,165 (49.7)	12,230 (54.4)	14,120 (62.8)	19,970 (88.8)	22,325 (99.3)	24,455 (108.8)	28,240 (125.6)

1 See section 3.1.8 to convert factored resistance 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 4 to 7 as necessary. Compare to the steel values in table 9. The lesser of the values is to be used for the design.
4 Tablular values are for normal-weight concrete only. For lightweight concrete multiply design strength by λ_a as follows: for sand-lightweight, λ_a = 0.68; for all-lightweight, λ_a = 0.60
5 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

Table 12 — Hilti KWIK HUS in the soffit of uncracked lightweight concrete over metal deck[1,2,3,4,5,6,7]

3.3.10

Nominal anchor diameter in.	Nominal embedment depth in. (mm)	Lower flute Tension - ϕN_r f'_c = 20 MPa (2,900 psi) lb (kN)	Lower flute Tension - ϕN_r f'_c = 30 MPa ((4,350 psi) lb (kN)	Lower flute Shear - ϕV_r f'_c = 20 MPa (2,900 psi) lb (kN)	Lower flute Shear - ϕV_r f'_c = 30 MPa (4,350 psi) lb (kN)	Upper flute Tension - ϕN_r f'_c = 20 MPa (2,900 psi) lb (kN)	Upper flute Tension - ϕN_r f'_c = 30 MPa (4,350 psi) lb (kN)	Upper flute Shear - ϕV_r f'_c = 20 MPa (2,900 psi) lb (kN)	Upper flute Shear - ϕV_r f'_c = 30 MPa (4,350 psi) lb (kN)
3/8	1-5/8 (41)	820 (3.6)	1,005 (4.5)	925 (4.1)	925 (4.1)	650 (2.9)	795 (3.5)	2,175 (9.7)	2,175 (9.7)
	2-1/2 (64)	1,430 (6.4)	1,755 (7.8)	835 (3.7)	835 (3.7)	1,865 (8.3)	2,285 (10.2)	3,365 (15.0)	3,365 (15.0)
	3-1/4 (83)	2,505 (11.1)	3,070 (13.7)	1,990 (8.9)	1,990 (8.9)	n/a	n/a	n/a	n/a
1/2	2-1/4 (57)	835 (3.7)	1,020 (4.5)	885 (3.9)	885 (3.9)	890 (4.0)	1,090 (4.8)	4,335 (19.3)	4,335 (19.3)
	3 (76)	1,955 (8.7)	2,395 (10.7)	1,615 (7.2)	1,615 (7.2)	n/a	n/a	n/a	n/a
	4-1/4 (108)	3,425 (15.2)	4,195 (18.7)	1,985 (8.8)	1,985 (8.8)	n/a	n/a	n/a	n/a
5/8	3-1/4 (83)	2,670 (11.9)	3,270 (14.5)	1,915 (8.5)	1,915 (8.5)	n/a	n/a	n/a	n/a
	5 (127)	6,070 (27.0)	7,430 (33.1)	2,315 (10.3)	2,315 (10.3)	n/a	n/a	n/a	n/a
3/4	4 (102)	2,670 (11.9)	3,270 (14.5)	2,080 (9.3)	2,080 (9.3)	n/a	n/a	n/a	n/a

1 See 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 Tabular value is for one anchor per flute. Minimum spacing along the length of the flute is 3 x h_{nom} (nominal embedment).
4 Tabular values are lightweight concrete and no additional reduction factor is needed.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Comparison of the tabular values to the steel strength is not necessary. Tabular values control.
7 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete.

DESIGN INFORMATION IN MASONRY

Table 13 — Allowable tension loads for Hilti KWIK HUS installed in grout-filled masonry walls (lb)[1,2,3,4,5]

Nominal anchor diameter	Nominal embedment [3] in.	Loads at c_{cr} and s_{cr}	Spacing			Edge distance		
			Critical - s_{cr} [6] in.	Minimum - s_{min} [6] in.	Load reduction factor at s_{min} [6]	Critical - c_{cr} [7] in.	Minimum c_{min} [8] in.	Load reduction factor [7]
3/8	1-5/8	535	4	2	0.70	4	4	1.00
	2-1/2	895	6	4	0.80			
	3-1/4	1,210						
1/2	2-1/4	710	4	2	0.60	4	4	1.00
	3	1,110	8	4				
	4-1/4	1,515						
5/8	3-1/4	1,155	10	4	0.60	10	4	1.00
	5	1,735						
3/4	4	1,680	12	4	0.60	12	4	1.00
	6-1/4	2,035						

Table 14 — Allowable shear loads for Hilti KWIK HUS installed in grout-filled masonry walls (lb)[1,2,3,4,5]

Nominal anchor diameter	Nominal embedment [3] in.	Loads at c_{cr} and s_{cr}	Spacing			Edge distance			
								Load reduction factor at c_{min}	
			Critical - s_{cr} [6] in.	Minimum - s_{min} [6] in.	Load reduction factor at s_{min} [7]	Critical - c_{cr} [8] in.	Minimum c_{min} [8] in.	Load direction perpendicular to edge	Load direction parallel to edge
3/8	1-5/8	1,140	6	4	0.94	6	4	0.61	1.00
	2-1/2	1,165						0.70	1.00
	3-1/4	1,190						0.70	1.00
1/2	2-1/4	1,845	8	4	0.88	8	4	0.50	1.00
	3	2,055						0.45	0.94
	4-1/4	2,745						0.40	0.89
5/8	3-1/4	3,040	10	4	0.36	10	4	0.36	0.82
	5	3,485						0.34	0.92
3/4	4	3,040	10	4	0.36	12	4	0.36	0.82
	6-1/4	3,485						0.34	0.92

1 All values are for anchors installed in fully-grouted masonry with minimum masonry prism strength of 1,500 psi. Concrete masonry units may be lightweight or normal-weight.

2 Anchors may not be installed within 1 inch in any direction of a vertical joint.

3 Embedment depth is measured from the outside face of the concrete masonry embedment.

4 Linear interpolation of load values between minimum spacing (s_{min}) and critical spacing (s_{cr}) and between minimum edge distance (c_{min}) and critical edge distance (c_{cr}) is permitted.

5 For combined loading: $\left(\frac{T_{applied}}{T_{allowable}}\right)^{5/3} + \left(\frac{V_{applied}}{V_{allowable}}\right)^{5/3} \leq 1$

6 Anchor spacing s_{cr} is where full load values in the table may be used. Anchor-to-anchor spacing of less than s_{min} is not recommended. Spacing is measured from the center of one anchor to the center of an adjacent anchor.

7 Load reduction factors are multiplicative, both spacing and edge distance load reduction factors must be considered. Load values for anchors installed at less than c_{cr} or s_{cr} must be multiplied by the appropriate load reduction factor based on actual edge distance or anchor spacing.

8 Critical edge distance c_{cr} is where full load values in the table may be used. Edge distance spacing of less than c_{min} is not recommended. Edge distance is measured from the center of the anchor to the closest edge.

Table 15 — Hilti KWIK HUS allowable loads installed in top of grout-filled concrete masonry construction (lb)[1,2]

Nominal anchor diameter	Nominal embedment in.	Minimum edge distance in.	Minimum spacing in.	Minimum end distance in.	Tension	Shear	
						Perpendicular to edge of masonry wall	Parallel to edge of masonry wall
1/2	4-1/4	1-3/4	8	4	680	305	1,110
5/8	5	1-3/4	10	5	1,310	305	1,165

1 All values are for anchors installed in fully-grouted masonry with minimum masonry prism strength of 1,500 psi. Concrete masonry units may be lightweight or normal-weight.

2 For combined loading: $\left(\frac{T_{applied}}{T_{allowable}}\right)^{5/3} + \left(\frac{V_{applied}}{V_{allowable}}\right)^{5/3} \leq 1$

INSTALLATION INSTRUCTIONS

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

ORDERING INFORMATION[1]

Description	Hole diameter	Anchor length See figure 1	Minimum embedment depth	Qty / Box
KH 3/8 x 2-1/8	3/8	2-1/8	1-5/8	50
KH 3/8 x 3	3/8	3	2-1/2	50
KH 3/8 x 3-1/2	3/8	3-1/2	2-1/2	50
KH 3/8 x 4	3/8	4	3-1/4	50
KH 3/8 x 5	3/8	5	3-1/4	30
KH 1/2 x 3	1/2	3	2-1/4	30
KH 1/2 x 3-1/2	1/2	3-1/2	3	25
KH 1/2 x 4	1/2	4	3	25
KH 1/2 x 4-1/2	1/2	4-1/2	4- 1/4	25
KH 1/2 x 5	1/2	5	4-1/4	25
KH 1/2 x 6	1/2	6	4-1/4	25
KH 5/8 x 4	5/8	4	3-1/4	15
KH 5/8 x 5-1/2	5/8	5-1/2	3-1/4	15
KH 5/8 x 6-1/2	5/8	6-1/2	3-1/4	15
KH 3/4 x 4-1/2	3/4	4-1/2	4	10
KH 3/4 x 5-1/2	3/4	5-1/2	4	10
KH 3/4 x 7	3/4	7	4	10
KH 3/4 x 9	3/4	9	4	10

1 All dimensions in inches.