The following excerpt are pages from the North American Product Technical Guide, Volume 2: Anchor Fastening, Edition 21.

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.
US: 877-749-6337 or HNATechnicalServices@hilti.com
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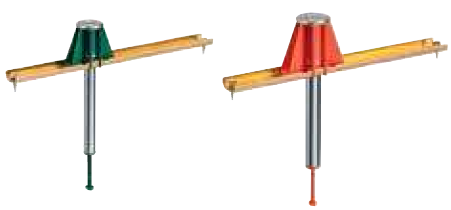
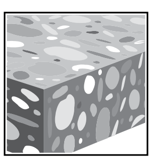
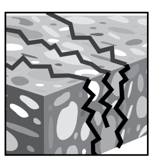
3.3.18 KCC-WF AND KCC-MD CAST-IN ANCHOR

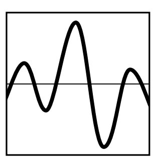
PRODUCT DESCRIPTION

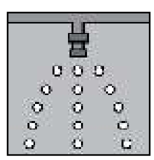
KCC-WF and KCC-MD cast-in anchors

Anchor System		Features and Benefits
	Internally threaded cast-in anchors for wood form construction (KCC-WF)	• Quick push-to-connect technology offers ultimate productivity • Ideal for pre-assembled / pre-fabricated hanger assemblies • KCC-WF — Color-coded foam covering protects inner threads from concrete intrusion • KCC-WF — Nails through the head helps prevent anchor from being knocked over and from head popping off due to rebar hits • KCC-MD SP and LP — Pre-assembled self-tapping screws reduce installation time • KCC-MD SP and LP — Color-coded plastic plugs protect inner threads from concrete, sprayed-on fireproofing, or sprayed-on insulation • KCC-MD LP — Pre-assembled spanner plate offers flexibility with installation at any location on the metal deck including the incline • KCC-MD LP — Anchor installs to the top of the flutes, so anchoring point is at consistent height throughout, which is ideal for pre-fabricated hangers
	Internally threaded short plate cast-in anchors for lightweight concrete over metal deck construction (KCC-MD SP)	
	Internally threaded long plate cast-in anchors for lightweight concrete over metal deck construction (KCC-MD LP)	


Uncracked concrete


Cracked concrete


Seismic Design Categories A-F


Fire sprinkler listings

Approvals/ Listings

ICC-ES (International Code Council) 2018 International Building Code / International Residential Code (IBC/IRC)	ESR-4145 in concrete per ACI 318 Ch. 17 / ICC-ES AC446
City of Los Angeles	2020 LABC Supplement (within ESR-4145)
Florida Building Code	2017 FBC with HVHZ
UL LLC (Underwriters Laboratory LLC)	Pipe Hanger Equipment for Fire Protection Services for 3/8 through 1/2 (See Table 28)
FM (Factory Mutual) Pipe	Hanger Components for Automatic Sprinkler Systems for 3/8 through 1/2 (See Table 28)

LISTED

APPROVED

MATERIAL SPECIFICATIONS

KCC-WF and KCC-MD (short plate and long plate) have an insert body made from carbon steel with an engineered plastic flange. The insert body is zinc plated per ASTM B633 Fe/Zn 5 Type III.

INSTALLATION PARAMETERS

Table 1 — Hilti KCC-WF, KCC-MD SP and KCC-MD LP cast-in anchor installation information

Design Information	Symbol	Units	KCC-WF		KCC-MD SP		KCC-MD LP	
Insert thread	d	UNC	3/8-16	1/2-13	3/8-16	1/2-13	3/8-16	1/2-13
Plastic housing color	-	-	Dark Green	Dark Orange	Dark Green	Dark Orange	Dark Green	Dark Orange
Outside diameter of anchor steel body	d_a	in. (mm)	0.67 (17)	0.87 (22)	0.67 (17)	0.87 (22)	0.67 (17)	0.87 (22)
Bearing area	A_{brg}	in.^{2} (mm^2)	1.0 (643)	1.2 (774)	1.0 (643)	1.2 (774)	1.0 (643)	1.2 (774)
Effective embedment	h_{ef}	in. (mm)	1.63 (41)	2.04 (52)	2.00 (51)	2.50 (64)	2.00 (51)	2.50 (64)
Nominal embedment	h_{nom}	in. (mm)	1.76 (45)	2.17 (55)	2.13 (54)	2.63 (67)	2.21 (56)	2.71 (69)
Metal hole saw diameter	d_{bit}	in.	N/A	N/A	11/16	13/16	5/8	3/4
Steel head thickness	t_{sh}	mm	3.3					
Minimum member thickness — wood form installation	h_{min}	in. (mm)	2.5 (64)	3 (76)	N/A	N/A	N/A	N/A
Minimum concrete cover over metal deck — all installations (see Figures 5A, 5B, 5C and 5D)	$h_{deck,min}$	in. (mm)	N/A	N/A	2.5 (64)	3.25 (83)	2.5 (64)	3.25 (83)
Minimum metal deck gauge	-	-	N/A		20			
Minimum anchor spacing	S_{min}	in. (mm)	2.6 (67)	3.5 (88)	6.0 (152)	7.5 (191)	6.0 (152)	7.5 (191)
Minimum edge distance	C_{min}	in. (mm)	1.5 (38)	1.5 (38)	6.0 (152)	7.5 (191)	6.0 (152)	7.5 (191)
Thread engagement length — see Figure 4	l_{th}	in.	1.6	1.9	N/A	N/A	N/A	N/A
Thread engagement length Plastic on/ Metal tube on — see Figure 4	l_{th}	in.	N/A	N/A	4.3	4.7	6.9	7.3
Thread engagement length Plastic off — see Figure 4	l_{th}	in.	N/A	N/A	2.5	2.9	N/A	N/A

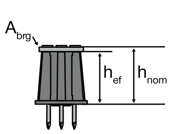


Figure 1 — KCC-WF

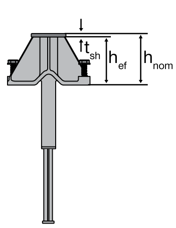


Figure 2 — KCC-MD SP

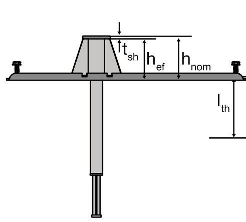
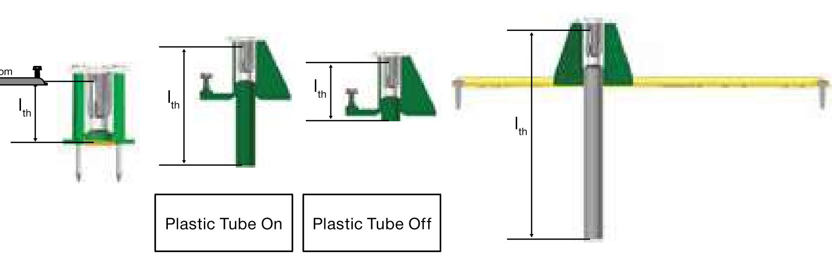


Figure 3 — KCC-MD LP



(a) KCC-WF (b) KCC-MD SP (c) KCC-MD LP (Metal Tube On)

Figure 4 — KCC Thread Engagement Measurement

DESIGN INFORMATION IN CONCRETE PER ACI 318

ACI 318 Chapter 17

The technical data contained in this section are Hilti Simplified Tables. The load values were developed using the Strength Design parameters and variables of ESR-4145 and the equations within ACI 318 Chapter 17. For a detailed explanation of the Hilti Simplified Design Tables, refer to section 3.1.8. Data tables from ESR-4145 are not contained in this section, but can be found at www.icc-es.org or at www.hilti.com.

Table 2 — Design strength for steel failure of KCC-WF inserts[1,2,3,4]

DESIGN INFORMATION	Symbol	Units	Insert type	
			KCC-WF	
Nominal rod diameter	-	in.	3/8	1/2
Design steel strength of insert in tension	$\phi_{Nsa,insert}$	lb (kN)	2,625 (11.7)	3,515 (15.6)
Design seismic steel strength of insert in tension	$\phi_{Nsa,insert,eq}$	lb (kN)	2,625 (11.7)	3,515 (15.6)
Design steel strength of insert in shear	$\phi_{Vsa,insert}$	lb (kN)	3,220 (14.3)	3,340 (14.9)
Design seismic steel strength of insert in shear	$\phi_{Vsa,insert}$	lb (kN)	3,220 (14.3)	3,340 (14.9)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Hilti KCC-WF Inserts are considered brittle steel elements
3 Values are for the insert only. The capacity of the threaded rod must be also be determined from Table 16. The design strength of concrete must be in accordance with ACI 318 Chapter 17 and Tables 3 to 4 as necessary. Compare the values (threaded rod, inserts, and concrete). The lesser of the values is to be used for the design.
4 Only threaded rods ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 are allowed to be used for applocations resisting shear, seismic shear or seismic tension loads.

Table 3 — Hilti KCC-WF cast-in insert design strength with concrete / pullout failure in uncracked concrete [1,2,3,4,5,6]

Nominal anchor internal diameter	Effective embedment depth in. (mm)	Tension - ΦN_n				Shear - ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)
3/8"	1.63 (41)	2,185 (9.7)	2,390 (10.6)	2,760 (12.3)	3,385 (15.1)	2,185 (9.7)	2,390 (10.6)	2,760 (12.3)	3,385 (15.1)
1/2"	2.04 (52)	3,055 (13.6)	3,350 (14.9)	3,865 (17.2)	4,735 (21.1)	3,055 (13.6)	3,350 (14.9)	3,865 (17.2)	4,735 (21.1)

Table 4 — Hilti KCC-WF cast-in insert design strength with concrete / pullout failure in cracked concrete [1,2,3,4,5,6]

Nominal anchor internal diameter	Effective embedment depth in. (mm)	Tension - ΦN_n				Shear - ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)
3/8"	1.63 (41)	1,745 (7.8)	1,910 (8.5)	2,210 (9.8)	2,705 (12.0)	1,745 (7.8)	1,910 (8.5)	2,210 (9.8)	2,705 (12.0)
1/2"	2.04 (52)	2,445 (10.9)	2,680 (11.9)	3,095 (13.8)	3,790 (16.9)	2,445 (10.9)	2,680 (11.9)	3,095 (13.8)	3,790 (16.9)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between concrete compressive strengths is not permitted.
3 Tabular values are for single anchors located at edge distance (c) and spacing (s) greater than $3h_{ef}$. For anchors with edge distance or spacing less than $3h_{ef}$ use ACI 318 to calculate load reduction factor. Compare the calculated value to the steel values (threaded rod and inserts) in Tables 16 and 2. 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 = 0.85. For all-lightweight, λ_a = 0.75.
5 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. No reduction needed for seismic shear.
6 Compare tabular value to the insert steel strength values in Table 2 and threaded rod steel strength values in Table 16 The lesser of the values is to be used for the design.

Table 5 — Load adjustment factors for KCC-WF 3/8” in uncracked concrete [1,2]

KCC-WF 3/8" 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}
Embedment h_{ef}		in (mm)	1.63 (41)	1.63 (41)	1.63 (41)	1.63 (41)	1.63 (41)	1.63 (41)
Min. conc. thickness h_{min} (in.)			2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	1-1/2	(38)	n/a	0.713	n/a	0.282	0.564	n/a
	2	(51)	n/a	0.859	n/a	0.434	0.859	n/a
	2-1/2	(64)	n/a	1.000	n/a	0.607	1.000	0.691
	2-5/8	(67)	0.768		0.625	0.653		0.708
	3	(76)	0.807		0.643	0.798		0.757
	3-1/2	(89)	0.858		0.667	1.000		0.818
	4	(102)	0.909		0.691			0.874
	4-1/2	(114)	0.960		0.715			0.927
	5	(127)	1.000		0.739			0.978
	5-1/2	(140)			0.763			1.000
	6	(152)			0.787			
	7	(178)			0.834			
	8	(203)			0.882			
	10	(254)			0.978			
	12	(305)			1.000			

Table 6 — Load adjustment factors for KCC-WF 3/8” in cracked concrete [1,2]

KCM-WF 1/4”-3/8” 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}
Embedment h_{ef}		in (mm)	1.63 (41)	1.63 (41)	1.63 (41)	1.63 (41)	1.63 (41)	1.63 (41)
Min. conc. thickness h_{min} (in.)			2-1/2	2-1/2	2-1/2	2-1/2	2-1/2	2-1/2
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	1-1/2	(38)	n/a	0.713	n/a	0.252	0.504	n/a
	2	(51)	n/a	0.859	n/a	0.388	0.775	n/a
	2-1/2	(64)	n/a	1.000	n/a	0.542	1.000	0.666
	2-5/8	(67)	0.768		0.616	0.583		0.682
	3	(76)	0.807		0.633	0.712		0.729
	3-1/2	(89)	0.858		0.655	0.897		0.788
	4	(102)	0.909		0.677	1.000		0.842
	4-1/2	(114)	0.960		0.699			0.893
	5	(127)	1.000		0.722			0.941
	5-1/2	(140)			0.744			0.987
	6	(152)			0.766			1.000
	7	(178)			0.810			
	8	(203)			0.854			
	10	(254)			0.943			
	12	(305)			1.000			

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 PROFIS Engineering or perform anchor calculation using design equations from ACI 318 Chapter 17 (or CSA A23.3 (R2014) Annex D).
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

Table 7 — Load adjustment factors for KCC-WF 1/2" in uncracked concrete [1,2]

KCM-WF 1/2" 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}
Embedment h_{ef}		in (mm)	2.04 (52)	2.04 (52)	2.04 (52)	2.04 (52)	2.04 (52)	2.04 (52)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	1-1/2	(38)	n/a	0.631	n/a	0.281	0.561	n/a
	2	(51)	n/a	0.741	n/a	0.432	0.741	n/a
	2-1/2	(64)	n/a	0.859	n/a	0.604	0.859	n/a
	3	(76)	n/a	0.984	n/a	0.794	0.984	0.756
	3-1/2	(89)	0.786	1.000	0.667	1.000	1.000	0.817
	4	(102)	0.827		0.691			0.873
	4-1/2	(114)	0.868		0.714			0.926
	5	(127)	0.908		0.738			0.976
	5-1/2	(140)	0.949		0.762			1.000
	5-3/4	(146)	0.970		0.774			
	6	(152)	0.990		0.786			
	7	(178)	1.000		0.833			
	8	(203)			0.881			
	9	(229)			0.929			
	10	(254)			0.976			
	12	(305)			1.000			

Table 8 — Load adjustment factors for KCC-WF 1/2" in cracked concrete [1,2]

KCM-WF 3/8"-1/2" 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}
Embedment h_{ef}		in (mm)	2.04 (52)	2.04 (52)	2.04 (52)	2.04 (52)	2.04 (52)	2.04 (52)
Spacing (s) / Edge Distance (c_a) / Concrete Thickness (h) - in. (mm)	1-1/2	(38)	n/a	0.631	n/a	0.251	0.501	n/a
	2	(51)	n/a	0.741	n/a	0.386	0.741	n/a
	2-1/2	(64)	n/a	0.859	n/a	0.539	0.859	n/a
	3	(76)	n/a	0.984	n/a	0.709	0.984	0.728
	3-1/2	(89)	0.786	1.000	0.655	0.893	1.000	0.786
	4	(102)	0.827		0.677	1.000		0.841
	4-1/2	(114)	0.868		0.699			0.892
	5	(127)	0.908		0.721			0.940
	5-1/2	(140)	0.949		0.743			0.986
	5-3/4	(146)	0.970		0.754			1.000
	6	(152)	0.990		0.765			
	7	(178)	1.000		0.809			
	8	(203)			0.853			
	9	(229)			0.898			
	10	(254)			0.942			
	12	(305)			1.000			

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 PROFIS Engineering or perform anchor calculation using design equations from ACI 318 Chapter 17 (or CSA A23.3 (R2014) Annex D).
3 Spacing factor reduction in shear, f_{AV}, assumes an influence of a nearby edge. If no edge exists, then $f_{AV} = f_{AN}$.
4 Concrete thickness reduction factor in shear, f_{HV}, assumes an influence of a nearby edge. If no edge exists, then f_{HV} = 1.0.

Table 9 — Design strength for steel failure of KCC-MD Short Plate and Long Plate inserts [1,2,3,4,5]

Design information	Symbol	Units	Insert Type			
			SP 3/8”	SP 1/2”	LP 3/8”	LP 1/2”
Nominal rod diameter		in.	3/8	1/2	3/8	1/2
Design steel strength of insert in tension	$\phi N_{sa,insert}$	lb	2,625	3,515	2,625	3,515
		(kN)	(11.7)	(15.6)	(11.7)	(15.6)
Design seismic steel strength of insert in tension	$\phi N_{sa,insert,eq}$	lb	2,625	3,515	2,625	3,515
		(kN)	(11.7)	(15.6)	(11.7)	(15.6)
Installations in upper flute of metal deck (i.e. W-deck and B-deck) according to Figure 5A						
Design steel strength of insert in shear	$\phi_{Vsa,insert}$	lb	3,045	3,615	3,045	3,615
		(kN)	(13.6)	(16.1)	(13.6)	(16.1)
Design seismic steel strength of insert in shear	$\phi V_{sa,insert,eq}$	lb	3,045	5,735	3,045	5,735
		(kN)	(13.6)	(25.5)	(13.6)	(25.5)
Installations in lower flute of metal deck (i.e. W-deck) according to Figure 5B						
Design steel strength of insert in shear	$\phi V_{sa,insert}$	lb	2,235	2,720	3,220	3,615
		(kN)	(9.9)	(12.1)	(14.3)	(16.1)
Design seismic steel strength of insert in shear	$\phi V_{sa,insert,eq}$	lb	2,235	2,720	3,220	3,615
		(kN)	(9.9)	(12.1)	(14.3)	(16.1)
Installations in lower flute of metal deck (i.e. B-deck) according to Figure 5C						
Design steel strength of insert in shear	$\phi V_{sa,insert}$	lb	2,050	2,380	3,130	3,615
		(kN)	(9.1)	(11)	(13.9)	(16.1)
Design seismic steel strength of insert in shear	$\phi V_{sa,insert,eq}$	lb	2,050	2,380	3,130	3,615
		(kN)	(9.1)	(11)	(13.9)	(16.1)
Installations over flute incline of metal deck (i.e. W-deck) according to Figure 5D						
Design steel strength of insert in shear	$\phi V_{sa,insert}$	lb	N/A		1,120	2,890
		(kN)			(5.0)	(12.9)
Design seismic steel strength of insert in shear	$\phi V_{sa,insert,eq}$	lb			1,120	2,310
		(kN)			(5.0)	(10.3)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Hilti KCC-MD Inserts are considered brittle steel elements
3 Tension values are for the inserts only. The capacity of the threaded rods must be also determined from Table 16. The design strength of concrete must be obtained from tables 10 to 15. Compare the tension values of threaded rod, inserts, and concrete. The lesser of the values is to be used for the design.
4 Shear values are for the inserts only. The capacity of the threaded rods must be also determined from Table 16. The calculation of concrete shear strength is not required. Compare the shear values of threaded rod and inserts. The lesser of the values is to be used for the design strength of the anchor in shear.
5 Only threaded rod ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 is permitted to be used for the applications resisting shear, seismic shear, or seismic tension loads.

Table 10 — Hilti KCC Short Plate and Long Plate tension design strength in the soffit of uncracked sand-lightweight concrete over metal deck (B profile) [1,2,3,4,5,6,7,8]

Anchor	Nominal Embed. Depth in. (mm)	Upper flute per Figure 4A		Lower flute per Figure 4C	
		Tension - ΦN_n		Tension - ΦN_n	
		f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)
SP 3/8"	2.13 (54)	3,610 (16.1)	4,170 (18.5)	635 (2.8)	735 (3.3)
SP 1/2"	2.63 (67)	4,580 (20.4)	5,290 (23.5)	695 (3.1)	805 (3.6)
LP 3/8"	2.21 (56)	3,610 (16.1)	4,170 (18.5)	3,610 (16.1)	4,170 (18.5)
LP 1/2"	2.71 (69)	4,580 (20.4)	5,290 (23.5)	4,580 (20.4)	5,290 (23.5)

Table 11 — Hilti KCC-MD Short Plate and Long Plate tension design strength in the soffit of cracked sand-lightweight concrete over metal deck (B profile) [1,2,3,4,5,6,7,8]

Anchor	Nominal Embed. Depth in. (mm)	Upper flute per Figure 4A		Lower flute per Figure 4C	
		Tension - ΦN_n		Tension - ΦN_n	
		f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)
SP 3/8"	2.13 (54)	2,890 (12.9)	3,335 (14.8)	505 (2.2)	585 (2.6)
SP 1/2"	2.63 (67)	3,660 (16.3)	4,225 (18.8)	555 (2.5)	640 (2.8)
LP 3/8"	2.21 (56)	2,890 (12.9)	3,335 (14.8)	2,890 (12.9)	3,335 (14.8)
LP 1/2"	2.71 (69)	3,660 (16.3)	4,225 (18.8)	3,660 (16.3)	4,225 (18.8)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between 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 hef (effective embedment).
4 Tabular values are for normal weight or sand-light weight concrete.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Compare tabular value to the insert steel strength values in Table 9 and threaded rod steel strength values in Table 16. The lesser of the values is to be used for the design.
7 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. See PTG ED.19, Section 3.1.8.7 for additional information on seismic applications.
8 For Hilti KCC-MD anchors, calculation of static and seismic concrete strength in shear is not required. See Table 9 for shear calculations.

Table 12 — Hilti KCC-MD Short Plate and Long Plate tension design strength in the soffit of uncracked sand-lightweight concrete over metal deck (W profile with 3-7/8” width) [1,2,3,4,5,6,7,8]

Anchor	Nominal Embed. Depth in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - ΦN_n		Tension - ΦN_n		Tension - ΦN_n	
		f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)
SP 3/8”	2.13 (54)	3,610 (16.1)	4,170 (18.5)	1,850 (8.2)	2,135 (9.5)	-	-
SP 1/2”	2.63 (67)	4,580 (20.4)	5,290 (23.5)	2,120 (9.4)	2,450 (10.9)	-	-
LP 3/8”	2.21 (56)	3,610 (16.1)	4,170 (18.5)	4,895 (21.8)	5,650 (25.1)	3,610 (16.1)	4,170 (18.5)
LP 1/2”	2.71 (69)	4,580 (20.4)	5,290 (23.5)	6,565 (29.2)	7,580 (33.7)	4,580 (20.4)	5,290 (23.5)

Table 13 — Hilti KCC-MD Short Plate and Long Plate tension design strength in the soffit of cracked sand-lightweight concrete over metal deck (W profile with 3-7/8” width) [1,2,3,4,5,6,7,8]

Anchor	Nominal Embed. Depth in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - ΦN_n		Tension - ΦN_n		Tension - ΦN_n	
		f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)
SP 3/8”	2.13 (54)	2,890 (12.9)	3,335 (14.8)	1,480 (6.6)	1,710 (7.6)	-	-
SP 1/2”	2.63 (67)	3,660 (16.3)	4,225 (18.8)	1,695 (7.5)	1,955 (8.7)	-	-
LP 3/8”	2.21 (56)	2,890 (12.9)	3,335 (14.8)	3,915 (17.4)	4,520 (20.1)	2,890 (12.9)	3,335 (14.8)
LP 1/2”	2.71 (69)	3,660 (16.3)	4,225 (18.8)	5,250 (23.4)	6,060 (27.0)	3,660 (16.3)	4,225 (18.8)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between 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_{ef} (effective embedment).
4 Tabular values are for normal weight or sand-light weight concrete.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Compare tabular value to the insert steel strength values in Table 9 and threaded rod steel strength values in Table 16. The lesser of the values is to be used for the design.
7 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. See PTG ED.19, Section 3.1.8.7 for additional information on seismic applications.
8 For Hilti KCC-MD anchors, calculation of static and seismic concrete strength in shear is not required. See Table 9 for shear calculations.

Table 14 — Hilti KCC-MD Short Plate and Long Plate tension design strength in the soffit of uncracked sand-lightweight concrete over metal deck (W profile with 4-1/2" width) [1,2,3,4,5,6,7,8]

Anchor	Nominal Embed. Depth in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - ΦN_n		Tension - ΦN_n		Tension - ΦN_n	
		f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)
SP 3/8"	2.13 (54)	3,610 (16.1)	4,170 (18.5)	1,850 (8.2)	2,135 (9.5)	-	-
SP 1/2"	2.63 (67)	4,580 (20.4)	5,290 (23.5)	2,120 (9.4)	2,450 (10.9)	-	-
LP 3/8"	2.21 (56)	3,610 (16.1)	4,170 (18.5)	4,895 (21.8)	5,650 (25.1)	3,610 (16.1)	4,170 (18.5)
LP 1/2"	2.71 (69)	4,580 (20.4)	5,290 (23.5)	6,565 (29.2)	7,580 (33.7)	4,580 (20.4)	5,290 (23.5)

Table 15 — Hilti KCC-MD Short Plate and Long Plate tension design strength in the soffit of cracked sand-lightweight concrete over metal deck (W profile with 4-1/2" width) [1,2,3,4,5,6,7,8]

Anchor	Nominal Embed. Depth in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - ΦN_n		Tension - ΦN_n		Tension - ΦN_n	
		f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)
SP 3/8"	2.13 (54)	2,890 (12.9)	3,335 (14.8)	1,480 (6.6)	1,710 (7.6)	-	-
SP 1/2"	2.63 (67)	3,660 (16.3)	4,225 (18.8)	1,695 (7.5)	1,955 (8.7)	-	-
LP 3/8"	2.21 (56)	2,890 (12.9)	3,335 (14.8)	3,915 (17.4)	4,520 (20.1)	2,890 (12.9)	3,335 (14.8)
LP 1/2"	2.71 (69)	3,660 (16.3)	4,225 (18.8)	5,250 (23.4)	6,060 (27.0)	3,660 (16.3)	4,225 (18.8)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between 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_{ef} (effective embedment).
4 Tabular values are for normal weight or sand-light weight concrete.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Compare tabular value to the insert steel strength values in Table 9 and threaded rod steel strength values in Table 16. The lesser of the values is to be used for the design.
7 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. See PTG ED.19, Section 3.1.8.7 for additional information on seismic applications.
8 For Hilti KCC-MD anchors, calculation of static and seismic concrete strength in shear is not required. See Table 9 for shear calculations.

Table 16 — Design strength for steel failure of common threaded rods [1,5]

Nominal anchor diameter	Grade A36 threaded rod			ASTM A 193 B7 or ASTM F1554 Gr. 105 threaded rod			ASTM A 307, Grade A threaded rod		
	Tensile[2] $\phi N_{sa,rod}$ or $\phi N_{sa,eq,rod}$ lb (kN)	Shear[3] $\phi V_{sa,rod}$ lb (kN)	Seismic Shear[4] $\phi V_{sa,eq,rod}$ lb (kN)	Tensile[2] $\phi N_{sa,rod}$ or $\phi N_{sa,eq,rod}$ lb (kN)	Shear[3] $\phi V_{sa,rod}$ lb (kN)	Seismic Shear[4] $\phi V_{sa,eq,rod}$ lb (kN)	Tensile[2] $\phi N_{sa,rod}$ or $\phi N_{sa,eq,rod}$ lb (kN)	Shear[3] $\phi V_{sa,rod}$ lb (kN)	Seismic Shear[4] $\phi V_{sa,eq,rod}$ lb (kN)
3/8	3,395 (15.1)	1,750 (7.8)	1,225 (5.4)	7,315 (32.5)	3,780 (16.8)	2,646 (11.8)	3,490 (15.5)	1,815 (8.1)	1,271 (5.7)
1/2	6,175 (27.5)	3,210 (14.3)	2,245 (10.0)	13,315 (59.2)	6,915 (30.8)	4,841 (21.5)	6,375 (28.4)	3,315 (14.7)	2,321 (10.3)

1 See PTG Ed. 19, Section 3.1.8.7 for additional information on seismic applications.
2 Tensile values determined by static tension tests with $\phi N_{sa} = \phi A_{se,N} f_{uta}$ as noted in ACI 318 Chapter 17.
3 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.
4 Seismic shear values determined by seismic shear tests with $\phi\, Vsa \le \phi\, 0.60\, A_{se,V} f_{uta}$ as noted in ACI 318, Chapter 17.
5 Values are for the threaded rod only. The capacity of the insert must be also be determined from Tables 2 and 9. The design strength of concrete must be in accordance with ACI 318 Chapter 17 and Tables 10 to 15 as necessary. Compare the values (threaded rod, inserts, and concrete). The lesser of the values is to be used for the design.

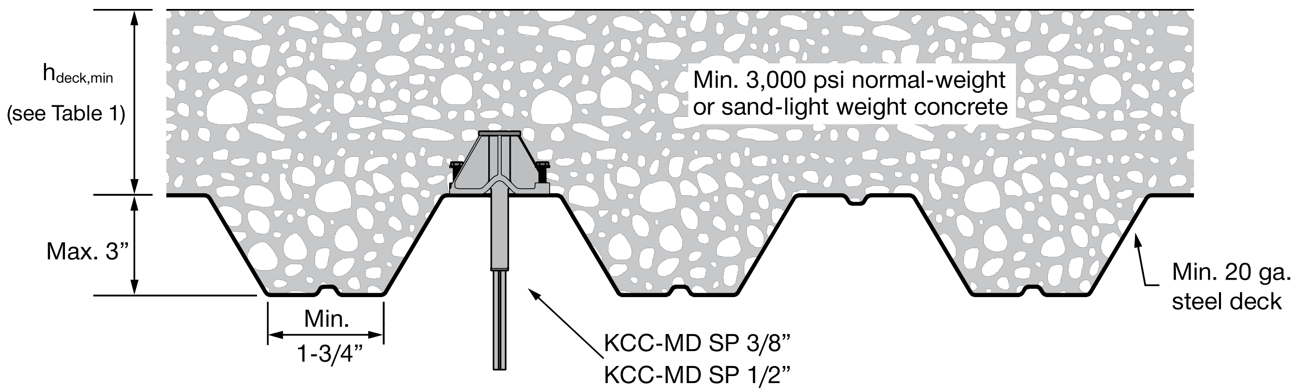
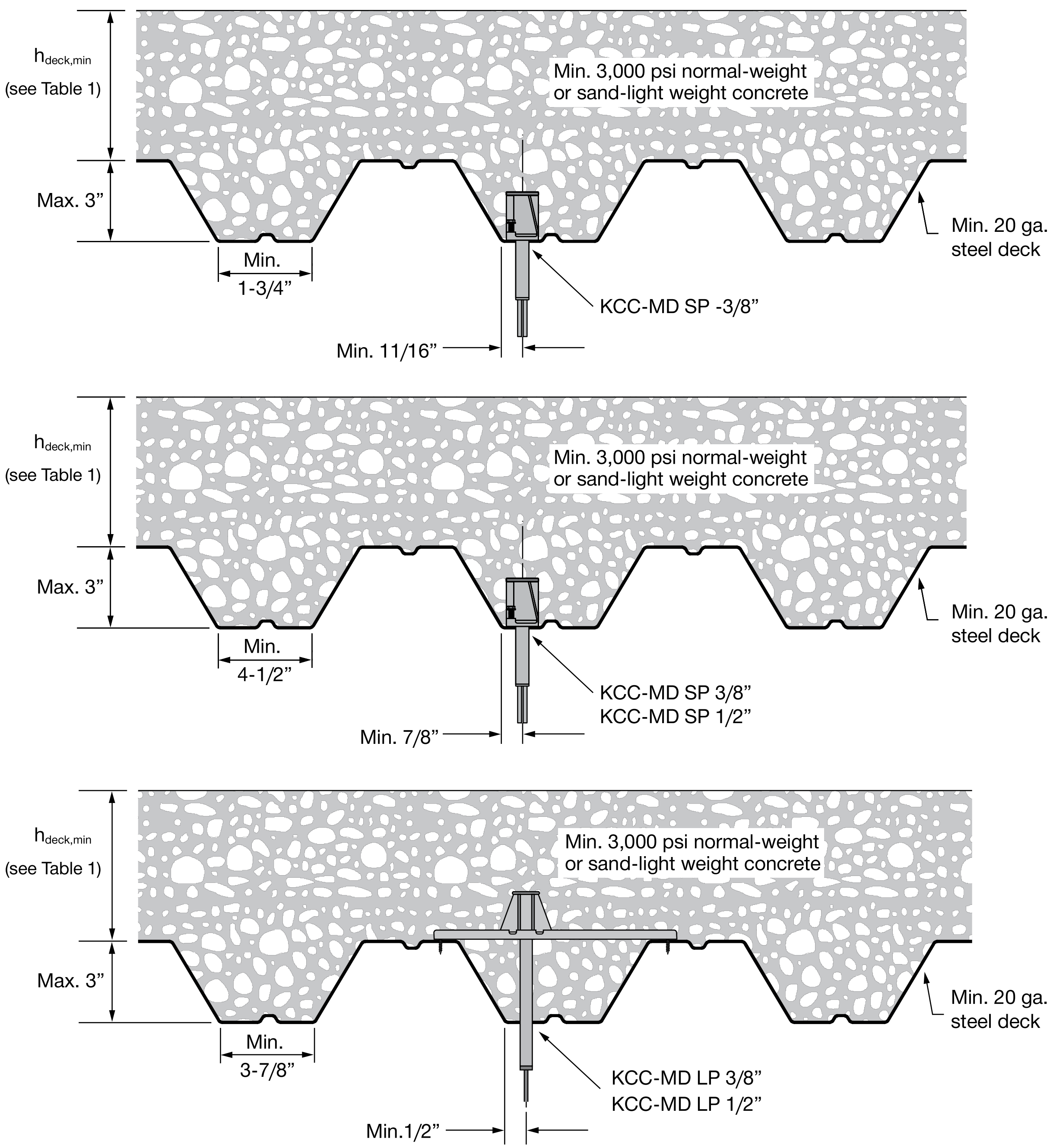


Figure 5A — Installation of KCC-MD inserts in the soffit of concrete filled metal deck floor and roof assemblies-over upper flute (B-deck and W-deck)



3.3.18

Figure 5B —Installation of KCC-MD inserts in the soffit of concrete filled metal deck floor and roof assemblies-over lower flute (W-deck)

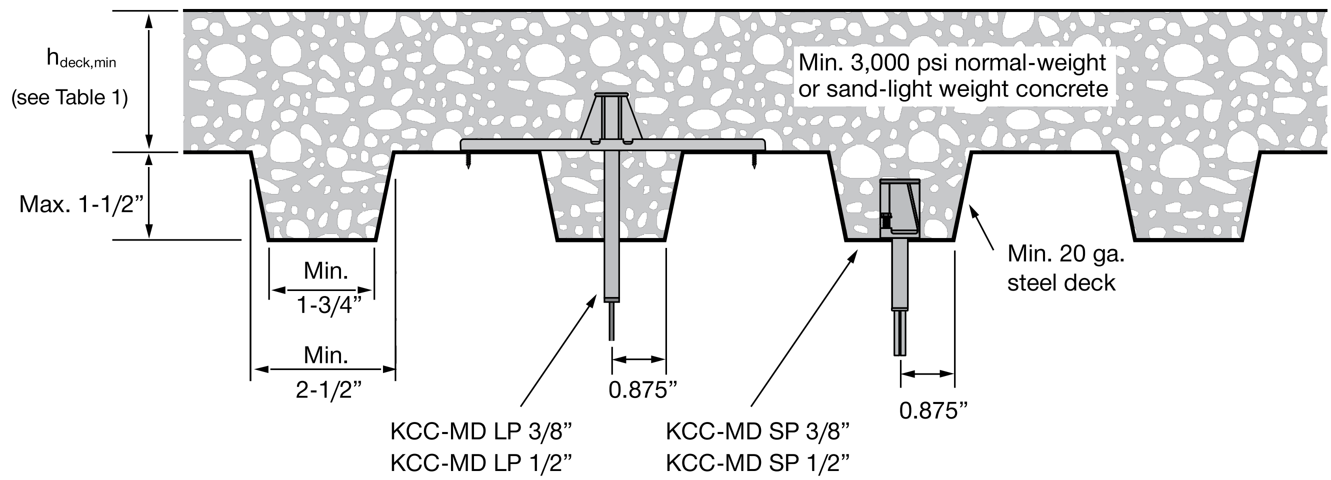


Figure 5C — Installation of KCC-MD inserts in the soffit of concrete filled metal deck floor and roof assemblies-over lower flute (B-deck)

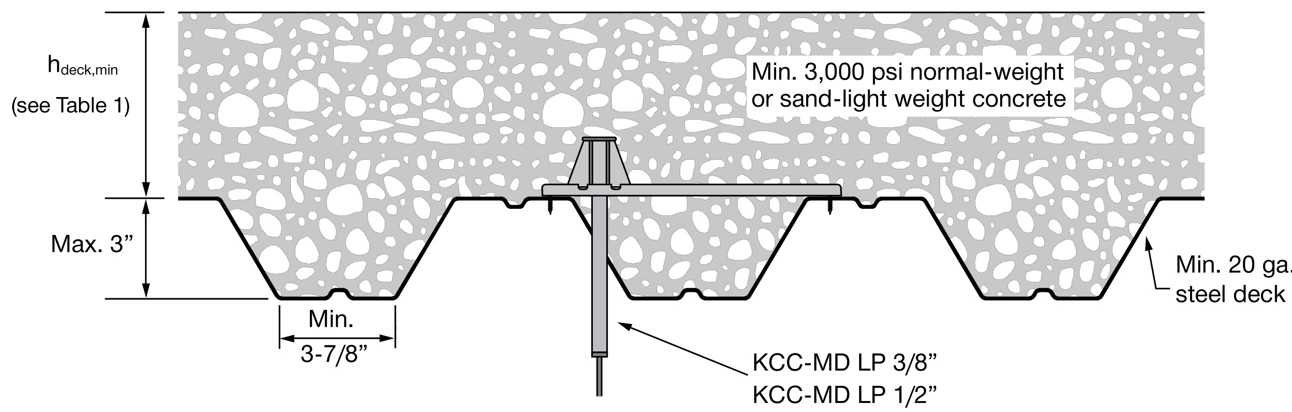


Figure 5D — Installation of KCC-MD inserts in the soffit of concrete filled metal deck floor and roof assemblies-over flute incline (W-deck)

DESIGN DATA IN CONCRETE PER CSA A23.3

CSA A23.3 Annex D Design

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 ICC Evaluation Services ESR-4145. 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 of 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 PTG ED. 19, Section 3.1.8. Technical assistance is available by contacting Hilti Canada at (800) 363-4458 or at www.hilti.ca.

Table 17 — Hilti KCC-WF insert design information in accordance with CSA A23.3 (R2014) Annex D [1,4]

Design parameter	Symbol	Units	Nominal anchor diameter		Ref A23.3-14
			3/8"	1/2"	
Outside diameter of anchor steel body	d_a	in. (mm)	0.67 (17)	0.87 (22)	
Effective embedment	h_{ef}	in. (mm)	1.63 (41)	2.04 (52)	
Minimum member thickness	h_{min}	in. (mm)	2.5 (51)	3 (76)	
Minimum edge distance	c_{min}	in. (mm)	1-1/2 (38)		
Minimum anchor spacing	s_{min}	*in.* (mm)	2.6 (67)	3.5 (88)	
Steel embed. material resistance factor for reinforcement	Φ_s	-	0.85		8.4.3
Resistance modification factor for tension, steel failure modes [2]	R	-	0.70		D.5.3
Resistance modification factor for shear, steel failure modes [2]	R	-	0.65		D.5.3
Factored steel resistance in tension	N_{sar}	lb (kN)	2,404 (10.7)	3,219 (14.3)	D.6.1.2
Factored steel resistance in tension, seismic	$N_{sar,eq}$	lb (kN)	2,404 (10.7)	3,219 (14.3)	D.6.1.2
Factored steel resistance in shear	V_{sar}	lb (kN)	2,735 (12.2)	3,075 (13.7)	D.7.1.2
Factored steel resistance in shear, seismic	$V_{sar,eq}$	lb (kN)	2,735 (12.2)	3,075 (13.7)	D.7.1.2
Coeff. for factored conc. breakout resistance, uncracked concrete	$k_{c,uncr}$	-	10		D.6.2.2
Coeff. for factored conc. breakout resistance, cracked concrete	$k_{c,cr}$	-	10		D.6.2.2
Modification factor for anchor resistance, tension, uncracked conc.	$\Psi_{c,N}$	-	1.25		D.6.2.6
Modification factor for anchor resistance, tension, cracked conc.	$\Psi_{c,N}$		1.0		D.6.2.6
Anchor category	-	-	cast-in		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 [3]	R	-	1.00		D.5.3 (c)

1 Design information in this table is taken from ICC-ES ESR-4145, and converted for use with CSA A23.3 (R2014) Annex D.
2 The carbon steel KCC-WF is considered a brittle steel element as defined by CSA A23.3 (R2014) Annex D section D.2.
3 For use with the load combinations of CSA A23.3 (R2014) chapter 8. Condition B applies where supplementary reinforcement in conformance with CSA A23.3 (R2014) 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.
4 Values are for the insert only. The capacity of the threaded rod must be also be determined from Table 27. The design strength of concrete must be in accordance with CSA A23.3 (R2014) and Tables 18 to 19 as necessary. Compare the values (threaded rod, inserts, and concrete). The lesser of the values is to be used for the design.

Table 18 — Hilti KCC-WF cast-in insert design strength with concrete / pullout failure in uncracked concrete [1,2,3,4,5,6]

Nominal anchor internal diameter	Effective embedment depth in. (mm)	Tension - ΦN_n				Shear - ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)
3/8"	1.63	2,185	2,390	2,760	3,385	2,185	2,390	2,760	3,385
	(41)	(9.7)	(10.6)	(12.3)	(15.1)	(9.7)	(10.6)	(12.3)	(15.1)
1/2"	2.04	3,055	3,350	3,865	4,735	3,055	3,350	3,865	4,735
	(52)	(13.6)	(14.9)	(17.2)	(21.1)	(13.6)	(14.9)	(17.2)	(21.1)

Table 19 — Hilti KCC-WF cast-in insert design strength with concrete / pullout failure in cracked concrete [1,2,3,4,5,6]

Nominal anchor internal diameter	Effective embedment depth in. (mm)	Tension - ΦN_n				Shear - ΦV_n			
		f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)	f'_c = 2,500 psi (17.2 MPa) lb (kN)	f'_c = 3,000 psi (20.7 MPa) lb (kN)	f'_c = 4,000 psi (27.6 MPa) lb (kN)	f'_c = 6,000 psi (41.1 MPa) lb (kN)
3/8"	1.63	1,745	1,910	2,210	2,705	1,745	1,910	2,210	2,705
	(41)	(7.8)	(8.5)	(9.8)	(12.0)	(7.8)	(8.5)	(9.8)	(12.0)
1/2"	2.04	2,445	2,680	3,095	3,790	2,445	2,680	3,095	3,790
	(52)	(10.9)	(11.9)	(13.8)	(16.9)	(10.9)	(11.9)	(13.8)	(16.9)

1 See PTG Ed. 19, Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between concrete compressive strengths is not permitted.
3 Tabular values are for single anchors located at edge distance (c) and spacing (s) greater than $3h_{ef}$. For anchors with edge distance or spacing less than $3h_{ef}$ use ACI 318 to calculate load reduction factor. Compare the calculated value to the steel values (threaded rod and inserts) in Tables 17 and 27. 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 = 0.85. For all-lightweight, λ_a = 0.75.
5 Tabular values are for static loads only. Seismic design is not permitted for uncracked concrete. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. No reduction needed for seismic shear.
6 Compare tabular value to the insert steel strength values in Table 17 and threaded rod steel strength values in Table 27 The lesser of the values is to be used for the design.

Table 20 — Design strength for steel failure of KCC-MD Short Plate and Long Plate inserts [1,2,3,4,5]

Design information	Symbol	Units	Insert Type			
			SP 3/8”	SP 1/2”	LP 3/8”	LP 1/2”
Nominal rod diameter (in.)	-	in.	3/8	1/2	3/8	1/2
Anchor O.D.	d_a	in. (mm)	0.67 (17)	0.87 (22)	0.67 (17)	0.87 (22)
Effective embedment	h_{ef}	in. (mm)	2.00 (51)	2.50 (64)	2.00 (51)	2.50 (64)
Min. specified ult. Strength, f_{ut} lb (kN)	f_{ut}	lb (kN)	4,040 (18.0)	5,410 (24.1)	4,040 (18.0)	5,410 (24.1)
Anchor category	-	-	Cast-In			
Concrete material resistance factor	ϕ_c	-	0.65			
Resistance modification factor for tension and shear, concrete failure modes, Condition B	R	-	1.00			
Steel embed. material resistance factor for reinforcement	ϕ_s	-	0.85			
Resistance modification factor for tension, steel failure modes	R	-	0.70			
Resistance modification factor for shear, steel failure modes	R	-	0.65			
Factored steel strength of insert in tension,	$\phi_{Nsa,insert}$	lb (kN)	2,405 (10.7)	3,220 (14.3)	2,405 (10.7)	3,220 (14.3)
Factored seismic steel strength of insert in tension	$\phi_{Nsa,insert,eq}$	lb (kN)	2,405 (11)	3,220 (14)	2,405 (11)	3,220 (14.3)
Installations in upper flute of metal deck (i.e. W-deck and B-deck) according to Figures 5A						
Factored steel strength of insert in shear	$\phi_{Vsa,insert}$	lb (kN)	2,590 (12)	3,075 (14)	2,590 (12)	3,075 (14)
Factored seismic steel strength of insert in shear	$\phi_{Vsa,insert,eq}$	lb (kN)	2,590 (12)	4,875 (22)	2,590 (12)	4,875 (22)
Installations in lower flute of metal deck (i.e. W-deck) according to Figures 5B						
Factored steel strength of insert in shear	$\phi_{Vsa,insert}$	lb (kN)	1,900 (8)	2,310 (10)	2,735 (12)	3,075 (14)
Factored seismic steel strength of insert in shear	$\phi_{Vsa,insert,eq}$	lb (kN)	1,900 (8)	2,310 (10)	2,735 (12)	3,075 (14)
Installations in lower flute of metal deck (i.e. B-deck) according to Figures 5C						
Factored steel strength of insert in shear	$\phi_{Vsa,insert}$	lb (kN)	1,745 (8)	2,190 (10)	2,660 (12)	3,075 (14)
Factored seismic steel strength of insert in shear	$\phi_{Vsa,insert,eq}$	lb (kN)	1,745 (8)	2,190 (10)	2,660 (12)	3,075 (14)
Installations in lower flute of metal deck (i.e. W-deck) according to Figures 5D						
Factored steel strength of insert in shear	$\phi_{Vsa,insert}$	lb (kN)	N/A		950 (4)	2,455 (11)
Factored seismic steel strength of insert in shear	$\phi_{Vsa,insert,eq}$	lb (kN)			950 (4)	1,965 (9)

1 Design information in this table is taken from ICC-ES ESR-4145, Table 4, and converted for use with CSA A23.3 (R2014) Annex D.
2 The carbon steel KCC-MD is considered a brittle steel element as defined by CSA A23.3 (R2014) Annex D section D.2.
3 Tension values are for the inserts only. The capacity of the threaded rods must be also determined from Table 27. The design strength of concrete must be obtained from tables 21-27. Compare the tension values of threaded rod, inserts, and concrete. The lesser of the values is to be used for the design.
4 Shear values are for the inserts only. The capacity of the threaded rods must be also determined from Table 27. The calculation of concrete shear strength is not required. Compare the shear values of threaded rod and inserts. The lesser of the values is to be used for the design strength of the anchor in shear.
5 Only threaded rod ASTM A193 Grade B7, ASTM A325, or ASTM F1554 Grade 105 is permitted to be used for the applications resisting shear, seismic shear, or seismic tension loads.

Table 21 — Hilti KCC-MD Short Plate and Long Plate factored tension resistance in the soffit of uncracked sand-lightweight concrete over metal deck (B profile) [1,2,3,4,5,6,7,8]

Anchor	Nominal embed. in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5C	
		Tension - N_r		Tension - N_r	
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)
SP 3/8"	2.13 (54)	3,300 (14.7)	4,040 (18.0)	580 (2.6)	710 (3.2)
SP 1/2"	2.63 (67)	4,180 (18.6)	5,120 (22.8)	635 (2.8)	775 (3.4)
LP 3/8"	2.21 (56)	3,300 (14.7)	4,040 (18.0)	3,300 (14.7)	4,040 (18.0)
LP 1/2"	2.71 (69)	4,180 (18.6)	5,120 (22.8)	4,180 (18.6)	5,120 (22.8)

Table 22 — Hilti KCC-MD Short Plate and Long Plate factored tension resistance in the soffit of cracked sand-lightweight concrete over metal deck (B profile) [1,2,3,4,5,6,7,8]

Anchor	Nominal embed. in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5C	
		Tension - N_r		Tension - N_r	
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)
SP 3/8"	2.13 (54)	2,640 (11.7)	3,230 (14.4)	465 (2.1)	565 (2.5)
SP 1/2"	2.63 (67)	3,345 (14.9)	4,095 (18.2)	505 (2.2)	620 (2.8)
LP 3/8"	2.21 (56)	2,640 (11.7)	3,230 (14.4)	2,640 (11.7)	3,230 (14.4)
LP 1/2"	2.71 (69)	3,345 (14.9)	4,095 (18.2)	3,345 (14.9)	4,095 (18.2)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between 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_{ef} (effective embedment).
4 Tabular values are for normal weight or sand-light weight concrete.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Compare tabular value to the insert steel strength values in Table 17 and threaded rod steel strength values in Table 27. The lesser of the values is to be used for the design.
7 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. See PTG ED.19, Section 3.1.8.7 for additional information on seismic applications.
8 For Hilti KCC-MD anchors, calculation of static and seismic concrete strength in shear is not required. See Table 20 for shear calculations.

Table 23 — Hilti KCC-MD Short Plate and Long Plate factored tension resistance in the soffit of uncracked sand-lightweight concrete over metal deck (W profile with 3-7/8" width) [1,2,3,4,5,6,7,8]

Anchor	Nominal embed. in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - N_r		Tension - N_r		Tension - N_r	
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)
SP 3/8"	2.13 (54)	3,300 (14.7)	4,040 (18.0)	1,685 (7.5)	2,065 (9.2)	-	-
SP 1/2"	2.63 (67)	4,180 (18.6)	5,120 (22.8)	1,935 (8.6)	2,370 (10.5)	-	-
LP 3/8"	2.21 (56)	3,300 (14.7)	4,040 (18.0)	4,470 (19.9)	5,475 (24.4)	3,300 (14.7)	4,040 (18.0)
LP 1/2"	2.71 (69)	4,180 (18.6)	5,120 (22.8)	5,990 (26.6)	7,340 (32.6)	4,180 (18.6)	5,120 (22.8)

Table 24 — Hilti KCC-MD Short Plate and Long Plate factored tension resistance in the soffit of cracked sand-lightweight concrete over metal deck (W profile with 3-7/8" width) [1,2,3,4,5,6,7,8]

Nominal anchor diameter in.	Nominal embed. in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - N_r		Tension - N_r		Tension - N_r	
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)
SP 3/8"	2.13 (54)	2,640 (11.7)	3,230 (14.4)	1,350 (6.0)	1,655 (7.4)	-	-
SP 1/2"	2.63 (67)	3,345 (14.9)	4,095 (18.2)	1,550 (6.9)	1,895 (8.4)	-	-
LP 3/8"	2.21 (56)	2,640 (11.7)	3,230 (14.4)	3,575 (15.9)	4,380 (19.5)	2,640 (11.7)	3,230 (14.4)
LP 1/2"	2.71 (69)	3,345 (14.9)	4,095 (18.2)	4,795 (21.3)	5,870 (26.1)	3,345 (14.9)	4,095 (18.2)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between 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_{ef} (effective embedment).
4 Tabular values are for normal weight or sand-light weight concrete.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Compare tabular value to the insert steel strength values in Compare tabular value to the insert steel strength values in Table 17 and threaded rod steel strength values in Table 27. The lesser of the values is to be used for the design.
7 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. See PTG ED.19, Section 3.1.8.7 for additional information on seismic applications.
8 For Hilti KCC-MD anchors, calculation of static and seismic concrete strength in shear is not required. See Table 20 for shear calculations.

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Table 25 — Hilti KCC-MD Short Plate and Long Plate factored tension resistance in the soffit of uncracked sand-lightweight concrete over metal deck (W profile with 4-1/2" width) [1,2,3,4,5,6,7,8]

Anchor	Nominal embed. in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - N_r		Tension - N_r		Tension - N_r	
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)
SP 3/8"	2.13 (54)	3,300 (14.7)	4,040 (18.0)	1,685 (7.5)	2,065 (9.2)	-	-
SP 1/2"	2.63 (67)	4,180 (18.6)	5,120 (22.8)	1,935 (8.6)	2,370 (10.5)	-	-
LP 3/8"	2.21 (56)	3,300 (14.7)	4,040 (18.0)	4,470 (19.9)	5,475 (24.4)	3,300 (14.7)	4,040 (18.0)
LP 1/2"	2.71 (69)	4,180 (18.6)	5,120 (22.8)	5,990 (26.6)	7,340 (32.6)	4,180 (18.6)	5,120 (22.8)

Table 26 — Hilti KCM-MD Short Plate and Long Plate factored tension resistance in the soffit of cracked sand-lightweight concrete over metal deck (W profile with 4-1/2" width) [1,2,3,4,5,6,7,8]

Anchor	Nominal embed. in. (mm)	Upper flute per Figure 5A		Lower flute per Figure 5B		Inclined per Figure 5D	
		Tension - N_r		Tension - N_r		Tension - N_r	
		f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)	f'_c = 20 MPa (2,900 psi) lb (kN)	f'_c = 30 MPa (4,350 psi) lb (kN)
SP 3/8"	2.13 (54)	2,640 (11.7)	3,230 (14.4)	1,350 (6.0)	1,655 (7.4)	-	-
SP 1/2"	2.63 (67)	3,345 (14.9)	4,095 (18.2)	1,550 (6.9)	1,895 (8.4)	-	-
LP 3/8"	2.21 (56)	2,640 (11.7)	3,230 (14.4)	3,575 (15.9)	4,380 (19.5)	2,640 (11.7)	3,230 (14.4)
LP 1/2"	2.71 (69)	3,345 (14.9)	4,095 (18.2)	4,795 (21.3)	5,870 (26.1)	3,345 (14.9)	4,095 (18.2)

1 See Section 3.1.8.6 to convert design strength value to ASD value.
2 Linear interpolation between 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_{ef} (effective embedment).
4 Tabular values are for normal weight or sand-light weight concrete.
5 No additional reduction factors for spacing or edge distance need to be applied.
6 Compare tabular value to the insert steel strength values in Table 17 and threaded rod steel strength values in Table 27. The lesser of the values is to be used for the design.
7 Tabular values are for static loads only. For seismic tension loads, multiply cracked concrete tabular values in tension by $\alpha_{N,seis}$ = 0.75. See PTG ED.19, Section 3.1.8.7 for additional information on seismic applications.
8 For Hilti KCC-MD anchors, calculation of static and seismic concrete strength in shear is not required. See Table 20 for shear calculations.

Table 27 — Design strength for steel failure of common threaded rods used with KCC-WF and KCC-MD cast-in anchor [1,2,3]

Nominal anchor diameter	Grade A36 threaded rod			ASTM A 193 B7 or ASTM F1554 Gr. 105 threaded rod			ASTM A 307, Grade A threaded rod		
	Tensile[4] $\phi N_{sar,rod}$ or $\phi N_{sar,eq,rod}$ lb (kN)	Shear[5] $\phi V_{sar,rod}$ lb (kN)	Seismic Shear[6] $\phi V_{sar,eq,rod}$ lb (kN)	Tensile[4] $\phi N_{sar,rod}$ or $\phi N_{sar,eq,rod}$ lb (kN)	Shear[5] $\phi V_{sar,rod}$ lb (kN)	Seismic Shear[6] $\phi V_{sar,eq,rod}$ lb (kN)	Tensile[4] $\phi N_{sar,rod}$ or $\phi N_{sar,eq,rod}$ lb (kN)	Shear[5] $\phi V_{sar,rod}$ lb (kN)	Seismic Shear[6] $\phi V_{sar,eq,rod}$ lb (kN)
1/4	1,260 (5.6)	705 (3.1)	495 (2.2)	2,720 (12.1)	1,520 (6.8)	1,064 (4.7)	1,290 (5.7)	725 (3.2)	508 (2.3)
3/8	3,075 (13.7)	1,720 (7.7)	1,205 (5.4)	6,630 (29.5)	3,705 (16.5)	2,594 (11.5)	3,160 (14.1)	1,780 (7.9)	1,246 (5.5)

1 See section 3.1.8.6 to convert design strength value to ASD value.
2 Hilti KCC-WF and KCC-MD anchors are to be considered brittle steel elements
3 See Section 3.1.8.7 for additional information on seismic applications.
4 Tensile $N_{sar} = \phi_s A_{se,N} R f_{ut}$ as noted in CSA A23.3 Annex D.
5 Shear values determined by static shear tests with $V_{sar} < \phi_s 0.60 A_{se,V} f_{ut}$ R. as noted in CSA A23.3 Annex D.
6 Seismic shear values determined by seismic shear tests with $V_{sar,eq} < \phi_s 0.60 A_{se,V} f_{ut}$ R. as noted in CSA A23.3 Annex D.

Table 28 — UL cUL LLC and FM approvals for KCC-WF, KCC-MD Short Plate and KCC-MD Long Plate Anchors [1,2]

Design information		WF and SP-MD 3/8"			WF and SP-MD 1/2"			LP 3/8"			LP 1/2"		
Nominal rod diameter (in.)	Metal deck soffit or Wood Form	UL max pipe size (in.)	Test load (lb)	FM max pipe size (in.)	UL max pipe size (in.)	Test load (lb)	FM max pipe size (in.)	UL max pipe size (in.)	Test load (lb)	FM max pipe size (in.)	UL max pipe size (in.)	Test load (lb)	FM max pipe size (in.)
3/8	Wood Form	4	1,500	4	-	-	-	4	1,500	4	-	-	-
	Upper flute	4	1,500	4	-	-	-	4	1,500	4	-	-	-
	Lower flute	4	1,500	4	-	-	-	4	1,500	4	-	-	-
1/2	Wood Form	-	-	-	8	4,050	8	-	-	-	8	4,050	8
	Upper flute	-	-	-	8	4,050	8	-	-	-	8	4,050	8
	Lower flute	-	-	-	8	4,050	8	-	-	-	8	4,050	8

1 UL LLC Listing based on successful completion of testing in accordance with UL 203.
2 FM Approval based on successful completion of testing in accordance with FM 1952.

INSTALLATION INSTRUCTIONS

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

KCC-WF and KCC-MD Short Plate and Long Plate cast-in anchors for use in metal deck[1]

Description	Anchor color [2]	Qty / box	Hole saw diameter
KCC-WF 3/8"	Dark Green	150	N/A
KCC-WF 1/2"	Dark Orange	100	N/A
KCC-MD SP 3/8"	Dark Green	75	11/16"
KCC-MD SP 1/2"	Dark Orange	45	13/16"
KCC-MD LP 3/8"	Dark Green	20	5/8"
KCC-MD LP 1/2"	Dark Orange	15	3/4"

1 All dimensions in inches
2 Identifies anchor size