Attached are page(s) from the 2011 Hilti North American Product Tech Guide. For complete details on this product, including data development, product specifications, general suitability, installation, corrosion, and spacing and edge distance guidelines, please refer to the Technical Guide, or contact Hilti.

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3.3.5 KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor

Listings/Approvals

ICC-ES (International Code Council)
ESR-3027
(Cracked & Uncracked Concrete)
AC 106 ESR Pending
(Grout filled concrete masonry)
City of Los Angeles
Research Report No. 25897

Independent Code Evaluation

IBC® / IRC® 2009 (AC 193 / ACI 355.2)
IBC® / IRC® 2006 (AC 193 / ACI 355.2)
IBC® / IRC® 2003 (AC 193 / ACI 355.2)

3.3.5.1 Product Description

Hilti KWIK HUS-EZ (KH-EZ) anchors are comprised of a body with hex washer head. The anchor is manufactured from carbon steel and is heat treated. It has a minimum 0.0003 inch (8 µm) zinc coating in accordance with DIN EN ISO 4042. The KWIK HUS-EZ (KH-EZ) system is available in a variety of lengths with diameters of 1/4 inch, 3/8 inch, 1/2 inch, 5/8 inch and 3/4 inch (6.4mm, 9.5mm, 12.7mm, 15.9mm and 19.1mm). The hex head is larger than the diameter of the anchor and is formed with serrations on the underside. The anchor body is formed with threads running most of the length of the anchor body. The anchor is installed in a predrilled hole with a powered impact wrench or torque wrench. The anchor threads cut into the concrete on the sides of the hole and interlock with the base material during installation. Applicable base materials include normal-weight concrete, structural lightweight concrete lightweight concrete over metal deck, and grout filled concrete masonry.

Guide Specifications

Screw anchors shall be KWIK HUS-EZ as supplied by Hilti, Inc. Anchors shall be manufactured from heat treated carbon steel material, zinc plated to a minimum thickness of 8µm. Anchor head shall display name of manufacturer, product name, diameter and length. Anchors shall be installed using a drill bit of same nominal diameter as anchor.

Product Features

- Suitable for cracked and uncracked normal weight and lightweight concrete, and grout filled concrete masonry.
- Suitable for seismic and nonseismic loads.
- 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.

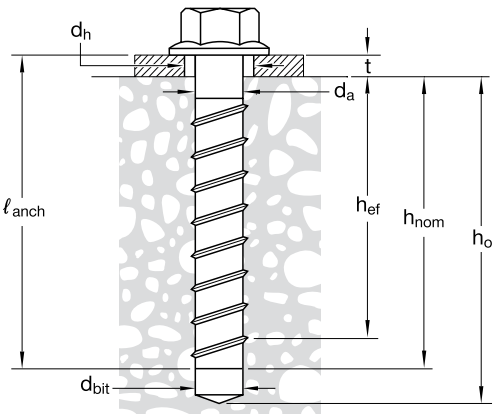
3.3.5.2 Material Specifications

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

3.3.5.3 Technical Data

The data contained in Tables 1-5 of this section have been evaluated in accordance with AC 193. For more detail, see ICC-ES ESR 3027.

Figure 1 — KWIK HUS-EZ anchor installation details



KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor 3.3.5

Table 1 — KWIK HUS-EZ Specification Table[1,2,3]

Characteristic	Symbol	Units	Nominal Anchor Diameter (inches)											
			1/4		3/8			1/2			5/8		3/4	
Nominal Diameter	d_a	in.	1/4		3/8			1/2			5/8		3/4	
Drill Bit Diameter	d_{bit}	in.	1/4		3/8			1/2			5/8		3/4	
Baseplate Clearance Hole Diameter	d_h	in.	3/8		1/2			5/8			3/4		7/8	
Installation Torque[4]	T_{inst}	ft-lbf	18		40			45			85		115	
Impact Wrench Torque Rating[3]	T_{impact}	ft-lbf	114	137	114	450		137	450		450		450	
Nominal Embedment depth	h_{nom}	in.	1-5/8	2-1/2	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 Depth	h_{ef}	in.	1.18	1.92	1.11	1.86	2.50	1.50	2.16	3.22	2.39	3.88	2.92	4.84
Minimum Hole Depth	h_o	in.	2	2-7/8	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[2]	c_{ac}	in.	2.00	2.78	2.10	2.92	3.75	2.75	3.75	5.25	3.63	5.81	4.41	7.28
Minimum Spacing at critical edge Distance	$s_{min,cac}$	in.	1.50		2.25			3					4	
Minimum Edge Distance[2]	c_{min}	in.	1.50					1.75						
Minimum Spacing at Minimum Edge Distance	s_{min}	in.	3										4	
Minimum ConcreteThickness	h_{min}	in.	3.25	4.125	3.25	4	4.875	4.5	4.75	6.75	5	7	6	8.125
Wrench socket size	-	in.	7/16		9/16			3/4			15/16		1-1/8	
Head height	-	in.	0.24		0.35			0.49			0.57		0.70	
Effective tensile stress area	A_{se}	$in.^2$	0.045		0.086			0.161			0.268		0.392	
Minimum specified ultimate strength	f_{uta}	psi	134,000		106,225	120,300		112,540			90,180		81,600	

For SI**:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 Pa, 1 in^2 = 645 mm^2, 1 lb/in = 0.175 N/mm

1 The data presented in this table is to be used in conjunction with the design criteria of ACI 318 Appendix D.

2 For installations through the soffit of steel deck into concrete (see Figure 2) anchors installed in the lower flute may be installed with a maximum 1 inch offset in either direction from the center of the flute.

3 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.

4 $T_{inst,max}$ applies to installations using a calibrated torque wrench.

3.3.5 KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor

Table 2 — KWIK HUS EZ (KH EZ) Tension Strength Design Information[1,2,3,4,5]

Characteristic	Symbol	Units	Nominal Anchor Diameter(inches)											
			1/4		3/8			1/2			5/8		3/4	
Anchor Category 1,2 or 3			1											
Nominal Embedment Depth	h_{nom}	in.	1-5/8	2-1/2	1-5/8	2-1/2	3-1/4	2-1/4	3	4-1/4	3-1/4	5	4	6-1/4
Steel Strength in Tension (ACI 318 D 5.1)[6]														
Tension Resistance of Steel	N_{sa}	lb.	6070		9125	10335		18120			24210		32013	
Reduction Factor for Steel Strength[2]	Φ_{sa}	-	0.65											
Concrete Breakout Strength in Tension (ACI 318 D.5.2)														
Effective Embedment Depth	h_{ef}	in.	1.18	1.92	1.11	1.86	2.50	1.52	2.16	3.22	2.39	3.88	2.92	4.84
Critical Edge Distance	c_{ac}	in.	2.00	2.78	2.10	2.92	3.74	2.75	3.67	5.25	3.63	5.82	4.81	7.28
Effectiveness Factor — Uncracked Concrete	k_{uncr}	-	24					27						
Effectiveness Factor — Cracked Concrete	k_{cr}	-	17											
Modification factor for cracked and uncracked concrete[5]	$\psi_{c,N}$	-	1.0											
Reduction Factor for Concrete Breakout Strength[2]	Φ_{cb}	-	0.65 (Condition B)											
Pullout Strength in Tension (Non Seismic Applications) (ACI318 D.5.3)														
Characteristic pullout strength, uncracked concrete (2,500psi)	$N_{p,uncr}$	lb.	1305[4]	2348[4]	N/A									
Characteristic pullout strength, cracked concrete (2500 psi)	$N_{p,cr}$	lb.	632[4]	1166[4]	728[4]	N/A								
Reduction factor for pullout strength[2]	Φ_{p}	-	0.65 (Condition B)											
Pullout Strength in Tension (Seismic Applications) (ACI 318 D.5.3)														
Characteristic Pullout Strength, Seismic (2,500 psi)	N_{eq}	lb.	632[4]	1166[4]	728[4]	N/A								
Reduction Factor for Pullout Strength[2] (2,500 psi)	Φ_{eq}	-	0.65 (Condition B)											
Axial Stiffness in Service Load Range														
Uncracked Concrete	β_{uncr}	lb/in.	760,000											
Cracked Concrete	β_{cr}		293,000											

For SI**:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 Pa, 1 in^2 = 645 mm^2, 1 lb/in = 0.175 N/mm

1 The data in this table is intended for use with the design provisions of ACI 318 Appendix D; for anchors resisting seismic load combinations the additional requirements of D.3.3 shall apply.

2 Values of Φ in this table apply when the load combinations for ACI 318 Section 9.2, IBC Section 1605.2.1 are used and the requirements of ACI 318 D.4.4 for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of Φ must be used. For situations where reinforcement meets the requirements of Condition A, ACI 318 Section D.4.4 provides the appropriate φ factor.

3 N/A denotes that pullout resistance does not govern and does not need to be considered.

4 The characteristic pullout resistance for concrete compressive strengths greater than 2500 psi may be increased by multiplying the value in the table by $(f'_c/2{,}500)^{1/2}$ for psi or $(f'_c/17.2)^{1/2}$ for MPa.

5 For sand-lightweight concrete, multiply concrete capacity values and pullout values by 0.60.

KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor 3.3.5

Table 3 — KWIK HUS EZ (KH EZ) Shear Strength Design Information[1,2,3,4,5]

Characteristic	Symbol	Units	Nominal Anchor Diameter (inches)											
			1/4		3/8			1/2			5/8		3/4	
Anchor Category	1,2 or 3		1											
Embedment Depth	h_{nom}	in.	1-5/8	2-1/2	1-5/8	2-1/2	3-1/4	2-1/4	3	4-1/4	3-1/4	5	4	6-1/4
Steel Strength in Shear (ACI 318 D 6.1)[4, 5]														
Shear Resistance of Steel — Static	V_{sa}	lb.	1548		4057	5185		9245			11221		16662	
Shear Resistance of Steel — Seismic	V_{eq}	lb.	1393		2524	3111		5547			6733		11556	
Reduction Factor for Steel Strength	Φ_{sa}	-	0.60											
Concrete Breakout Strength in Shear (ACI 318 D.6.2)														
Nominal Diameter	d_a	in.	0.250		0.375			0.500			0.625		0.750	
Load Bearing Length of Anchor	ℓ_e	in.	1.18	1.92	1.11	1.86	2.50	1.52	2.16	3.22	2.39	3.88	2.92	4.84
Reduction Factor for Concrete Breakout Strength	Φ_{cb}	-	0.70											
Concrete Pryout Strength in Shear (ACI 318 D.6.3)														
Coefficient for Pryout Strength	k_{cp}		1.0				2.0	1.0		2.0	1.0	2.0		
Reduction Factor for Pryout Strength	Φ_{cp}	-	0.70											

For SI**:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 Pa, 1 in^2 = 645 mm^2, 1 lb/in = 0.175 N/mm

1 The data in this table is intended for use with the design provisions of ACI 318 Appendix D

2 Values of Φ in this table apply when the load combinations for ACI 318 Section 9.2, IBC Section 1605.2.1 are used and the requirements of ACI 318 D.4.4 for Condition B are met. If the load combinations of ACI 318 Appendix C are used, the appropriate value of Φ must be used. For situations where reinforcement meets the requirements of Condition A, ACI 318 D.4.4 provides the appropriate Φ factor.

3 Reported values for steel strength in shear are based on test results per ACI 355.2, Section 9.4 and must be used for design in lieu of calculated results using equation D-20 of ACI 318.

4 The KWIK HUS-EZ (KH-EZ) is considered a brittle steel element as defined by ACI 318 D.1.

5 For sand-lightweight concrete, multiply concrete breakout and concrete pryout values by 0.60.

3.3.5 KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor

Table 4 – KWIK HUS-EZ (KH-EZ) Tension and Shear Design Data for Installation in the Underside of Concrete-Filled Profile Steel Deck Assemblies[1,2,3,4,5]

Characteristic	Symbol	Units	Lower Flute											Upper Flute				
			Anchor Diameter															
			1/4		3/8			1/2			5/8		3/4	1/4		3/8		1/2
Embedment	h_{nom}	in.	1-5/8	2-1/2	1-5/8	2-1/2	3-1/4	2-1/4	3	4-1/4	3-1/4	5	4	1-5/8	2-1/2	1-5/8	2-1/2	2-1/4
Minimum Hole Depth	h_{hole}	in.	2	2-7/8	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	2	2-7/8	1-7/8	2-7/8	2-5/8
Effective Embedment Depth	h_{ef}	in.	1.18	1.92	1.11	1.86	2.50	1.52	2.16	3.22	2.39	3.88	2.92	1.18	1.92	1.11	1.86	1.52
Pullout Resistance, (uncracked concrete)	$N_{p,deck,uncr}$	lb.	1210	1875	1285	2240	3920	1305	3060	5360	4180	9495	4180	1490	1960	1015	2920	1395
Pullout Resistance (cracked concrete and seismic loads)	$N_{p,deck,cr}$	lb.	860	1330	1120	1965	3430	925	2170	3795	3070	7385	2630	1055	1390	885	2560	985
Steel Strength in Shear	$V_{sa,deck}$	lb.	1205	2210	1670	1511	3605	1605	2922	3590	3470	4190	3762	1205	3265	3935	6090	7850
Steel Strength in Shear, Seismic	$V_{sa,deck,eq}$	lb.	1080	1988	935	905	2163	963	1750	2154	2082	2514	2609	1080	2937	2203	3650	4710

1 Installation must comply with Figure 2.

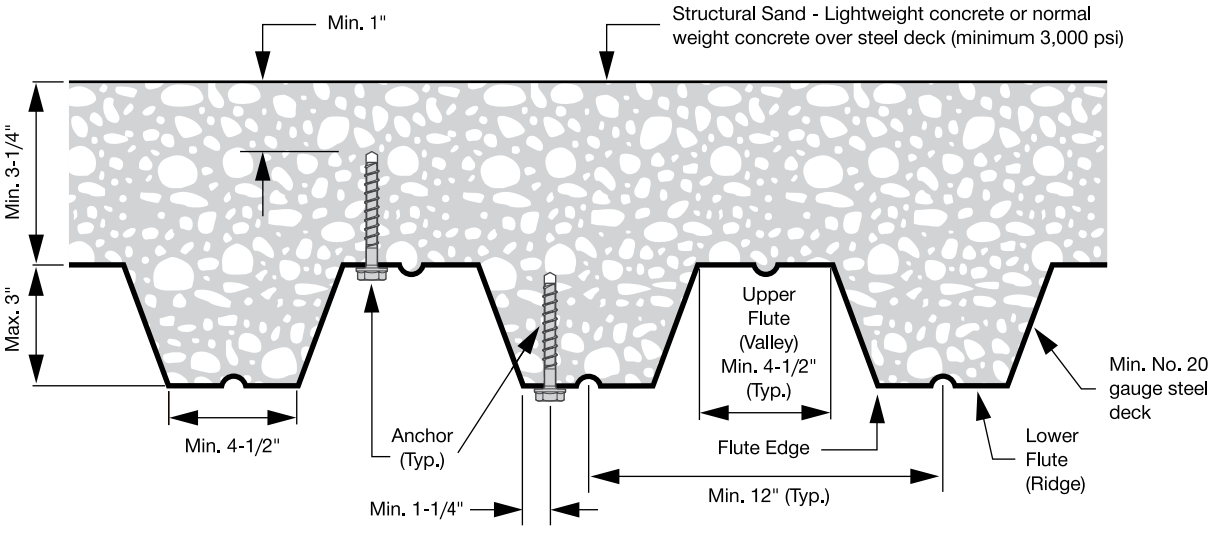
2 The values in this table are derived in accordance with ACI 318 Appendix D, Section D.5.3.2.

3 The values for ϕ_p in tension can be found in Table 2 of this report and the values for ϕ_{sa} in shear can be found in Table 3.

4 For installations through the soffit of steel deck into concrete (see Figure 2) anchors installed in the lower flute shall be installed with a maximum 1 inch offset in either direction from the centerline of the flute.

5 The characteristic pullout resistance for concrete compressive strengths greater than 2,500 psi may be increased by multiplying the value in the table by $(f'_c / 3{,}000)^{1/2}$ for psi or $(f'_c / 20.7)^{1/2}$ for MPa.

Figure 2 – Installation of KWIK HUS-EZ (KH-EZ) in Soffit of Concrete Over Steel Deck Floor and Roof Assemblies



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.

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Table 5 – KWIK HUS-EZ (KH-EZ) Allowable Stress Design Values for Illustrative Purposes[1,2,3,4,5,6,7,8,9,12]

Nominal Anchor Diameter [in.]	Embedment Depth, h_{nom} [in.]	Effective Embedment Depth, h_{ef} [in.]	Allowable Tension Load[10] [lbs]	Allowable Shear Load[11] [lbs]
1/4	1 5/8	1.18	589	645
	2-1/2	1.92	1060	645
3/8	1-5/8	1.11	633	682
	2-1/2	1.86	1374	1480
	3-1/4	2.50	2141	2160
1/2	2-1/4	1.52	1142	1230
	3	2.16	1934	2083
	4-1/4	3.22	3521	3852
5/8	3-1/4	2.39	2252	2425
	5	3.88	4657	4675
3/4	4	2.92	3041	6549
	6-1/4	4.84	6489	6943

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

1 Single anchor with static tension or shear load only.

2 Concrete determined to remain uncracked for the life of the anchorage.

3 Load combinations are taken from ACI 318 Section 9.2 (no seismic loading).

4 40% dead load and 60% live load, controlling load combination 1.2D + 1.6L.

5 Calculation of weighted average for conversion factor α = 1.2(0.4) + 1.6(0.6) = 1.44.

6 f'_c = 2,500 psi (normal weight concrete).

7 $c_{a1} = c_{a2} \geq c_{ac}$, see Table 1.

8 $h \geq h_{min}$, see Table 1.

9 Values are for Condition B where supplementary reinforcement in accordance with ACI 318 D.4.4 is not provided.

10 Allowable Tension Load = factored Load (Lessor of N_p or Concrete Breakout from Table 2) ÷ 1.44

11 Allowable Shear Load = factored Load (Lessor of V_{sa} or Concrete Pryout from Table 3) ÷ 1.44

12 Values are for single anchors installed without influence of base material edge distance or adjacent anchors.

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Table 6 – Allowable Tension Loads for KWIK HUS-EZ Installed in Grout-Filled Masonry Walls (lb)[1,2,7,8]

Anchor Diameter (inches)	Embedment (inches)[3]	Loads @ C_{cr} and S_{cr}	Spacing			Edge Distance		
			Critical - S_{cr} (inches)[4]	Minimum - S_{min} (inches)[4]	Load Reduction Factor at S_{min}[6]	Critical - C_{cr} (inches)[5]	Minimum C_{min} (inches)[5]	Load Reduction Factor[6]
1/4	1 5/8	530	4	2	0.70	4	4	1.00
	2 1/2	910		4	1.00			
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	1210						
1/2	2 1/4	710	4	2	0.60	4	4	1.00
	3	1110	8	4				
	4 1/4	1515						
5/8	3 1/4	1155	10	4	0.60	10	4	1.00
	5	1735						
3/4	4	1680	12	4	0.60	12	4	1.00
	6 1/4	2035						

Table 7 – Allowable Shear Loads for KWIK HUS-EZ Installed in Grout-Filled Masonry Walls (lb)[1,2,7,8]

Anchor Diameter (inches)	Embedment (inches)[3]	Load at C_{cr} and S_{cr}	Spacing			Edge Distance			
			Critical - S_{cr} (inches)[4]	Minimum - S_{min} (inches)[4]	Load Reduction Factor at S_{min}[6]	Critical - C_{cr} (inches)[5]	Minimum - C_{min} (inches)[5]	Load Reduction Factor at C_{min}	
								Load Direction Perpendicular to Edge	Load Direction Parallel to Edge
1/4	1 5/8	675	4	4	1.00	4	4	1.00	1.00
	2 1/2	840						1.00	1.00
3/8	1 5/8	1140	6	4	0.94	6	4	0.61	1.00
	2 1/2	1165						0.70	1.00
	3 1/4	1190						0.70	1.00
1/2	2 1/4	1845	8	4	0.88	8	4	0.50	1.00
	3	2055						0.45	0.94
	4 1/4	2745						0.40	0.89
5/8	3 1/4	3040	10	4	0.36	10	4	0.36	0.82
	5	3485						0.34	0.92
3/4	4	3040	10	4	0.36	12	4	0.36	0.82
	6 1/4	3485						0.34	0.92

1 All values are for anchors installed in fully grouted masonry with minimum masonry prism strength of 1500psi. Concrete masonry units shall be light-weight or normal-weight.

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

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

4 S_{cr} is anchor spacing where full load values in the Table may be used. S_{min} is the minimum anchor spacing for which values are available and installation is recommended. Spacing is measured from the center of one anchor to the center of an adjacent anchor.

5 C_{cr} is the edge distance where full load values in the table may be used. C_{min} is the minimum edge distance for which values are available and installation is recommended. Edge distance is measured from the center of the anchor to the closest edge.

6 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 (C) or spacing (S).

7 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.

8 For combined loading: For 1/4" diameter - $\frac{T_{applied}}{T_{allowable}} + \frac{V_{applied}}{V_{allowable}} \leq 1$ For 3/8" - 3/4" diameter - $\left(\frac{T_{applied}}{T_{allowable}}\right)^{5/3} + \left(\frac{V_{applied}}{V_{allowable}}\right)^{5/3} \leq 1$

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Table 8 – KWIK HUS-EZ Allowable Loads Installed In Top of Grout-Filled Concrete Masonry Construction (lb)

Anchor Diameter (inches)	Minimum Embedment Depth (inches)[2]	Minimum Edge Distance (inches)	Minimum Spacing (inches)	Minimum End Distance (inches)	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	1110
5/8	5	1 3/4	10	5	1310	305	1165

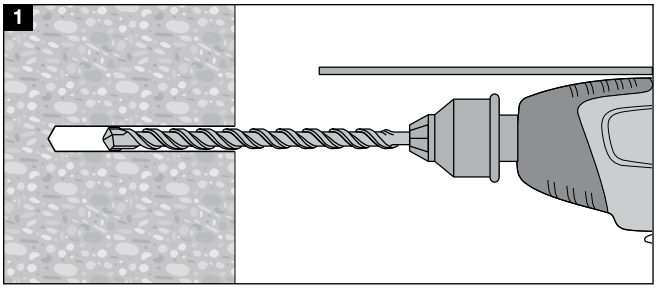
1 All values are for anchors installed in fully grouted masonry with minimum masonry prism strength of 1500psi. Concrete masonry units shall be light-weight or normal-weight.

2 Embedment depth is measured from the top of the masonry construction.

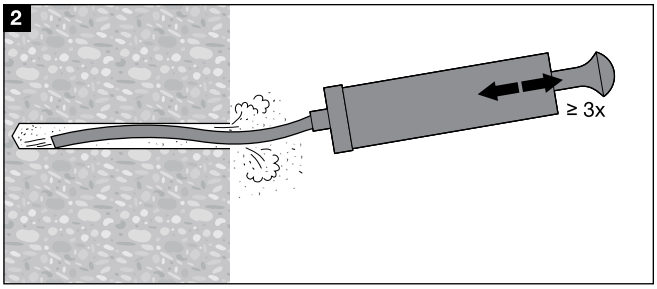
3 For combined loading: For 1/4" diameter - $\frac{T_{applied}}{T_{allowable}} + \frac{V_{applied}}{V_{allowable}} \leq 1$ For 3/8" - 3/4" diameter - $\left(\frac{T_{applied}}{T_{allowable}}\right)^{5/3} + \left(\frac{V_{applied}}{V_{allowable}}\right)^{5/3} \leq 1$

3.3.5.4 Installation Instructions

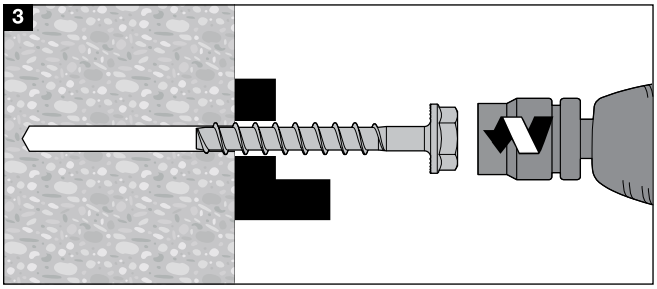
Drill holes in base material using carbide-tipped masonry drill bits complying with ANSI B212.15-1994. The nominal drill bit diameter must be equal to that of the anchor. The minimum drilled hole depth is given in Table 1. Prior to installation, dust and debris must be removed from the drilled hole using a hand pump, compressed air or a vacuum. The anchor must be installed into the predrilled hole using a powered impact wrench or installed with a torque wrench until the proper nominal embedment depth is obtained. The impact wrench torque, T_{impact} and installation torque, T_{inst} for the manual torque wrench must be in accordance with Table 1. The KWIK HUS-EZ (KH-EZ) may be loosened by a maximum of one turn and reinstalled with a socket wrench or powered impact wrench to facilitate fixture attachment or realignment. For member thickness and edge distance restrictions for installations into the soffit of concrete on steel deck assemblies, see Figure 2.



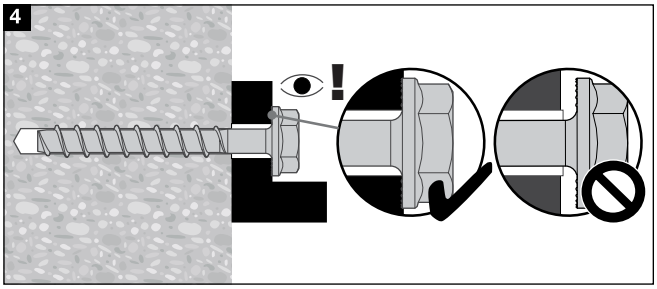
Drill hole in base material using proper diameter drill bit.



Clean drilled hole to remove debris.



Fasten anchor tightly against fastened part.



Install anchor using proper impact tool or torque wrench.

3.3.5.5 KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor

The data below is developed from testing performed in accordance with ACI 355.2. It is intended for applications designed according to CSA A23.3-04 Update No. 3 (August 2009) Design Of Concrete Structures Annex D and is generally suitable for the conditions described in the introduction of Annex D.

Table 9 — KWIK HUS-EZ Design Information (For use with CSA A23.3-04)

Characteristic	Symbol	Units	Nominal Anchor Diameter(inches)												Code Ref.
			1/4		3/8			1/2			5/8		3/4		
Anchor Category 1,2 or 3			1												
Nominal Embedment Depth	h_{nom}	mm	41	64	41	64	83	57	76	108	83	127	102	159	
Concrete material resistance factor for concrete	Φ_c	-	0.65												8.4.2
Steel material resistance factor	Φ_s	-	0.85												8.4.3
Ultimate strength of anchor steel	f_{ut}	MPa	924		732	829		776			622		563		
Effective cross-sectional area of anchor	A_{se}	mm^2	29.0		55.5			103.9			172.9		252.9		
Minimum Edge Distance	c_{min}	mm	38					44							
Minimum Spacing	s_{min}	mm	76										102		
Minimum Concrete Thickness	h_{min}	mm	83	102	83	102	121	114	140	171	127	178	152	203	
Steel Strength in Tension (CSA A23.3 D.6.1)[2]															
Factored Steel Resistance in tension	N_{sr}	kN	14.9		24.2	27.4		48.0			64.0		84.7		D.6.1.2
Reduction Factor for Steel Strength	R	-		0.70											D.5.4b
Concrete Breakout Strength in Tension (CSA A23.3 D.6.2)															
Effective Embedment Depth	h_{ef}	mm	30	49	28	47	64	39	55	82	61	99	74	123	
Critical Edge Distance	c_{ac}	mm	51	71	53	74	95	70	93	133	92	148	112	185	
Effectiveness Factor — Uncracked Concrete	k_{uncr}	-	10												D.6.2.2
Effectiveness Factor — Cracked Concrete	k_{cr}	-	7												
Modification factor for resistance in tension to account for uncracked concrete	$\Psi_{c,N}$	-	1.4												D.6.2.6
Reduction Factor for Concrete Breakout Strength	R	-	1.15 (Condition A), 1.00 (Condition B)												D.5.4c

KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor 3.3.5.5

Table 9 (Continued)

Characteristic	Symbol	Units	Nominal Anchor Diameter(inches)												Code Ref.
			1/4		3/8			1/2			5/8		3/4		
Anchor Category 1,2 or 3			1												
Nominal Embedment Depth	h_{nom}	mm	41	64	41	64	83	57	76	108	83	127	102	159	
Pullout Strength in Tension — Non Seismic Applications (CSA A23.3 D.6.3)[1]															
Factored Pullout Resistance, uncracked concrete (20 MPa)	$N_{pr,uncr}$	kN	4.1	7.3	N/A										D.6.3.2
Factored Pullout Resistance, cracked concrete (20 MPa)	$N_{pr,cr}$	kN	2.0	3.6	2.3	N/A									D.6.3.2
Reduction Factor for pullout strength	R	-	1.15 (Condition A), 1.00 (Condition B)												
Pullout Strength in Tension — Seismic Applications (CSA A23.3 D.6.3)[1]															
Factored Pullout Resistance, Seismic (20 MPa)	$N_{pr,seis}$	kN	2.0	3.6	2.3	N/A									D.6.3.2
Reduction Factor for pullout strength	R	-	1.15 (Condition A), 1.00 (Condition B)												
Axial Stiffness in Service Load Range															
Uncracked Concrete	$ß_{uncr}$	lb/in.	760000												
Cracked Concrete	$ß_{cr}$	lb/in.	293000												
Steel Strength in Shear (CSA A23.3 D.7.1)[2]															
Factored Shear Resistance of Steel – Static	V_{sr}	kN	3.8		11.1	12.7		22.7			27.6		40.9		D.7.1.2c
Factored Shear Resistance of Steel – Seismic	$V_{sr,seis}$	kN	3.4		6.2	7.6		13.6			16.5		28.4		D.7.1.2c
Reduction Factor for Steel Strength	R	-	0.65												D.5.4b
Concrete Breakout Strength in Shear (CSA A23.3 D.7.2)															
Nominal Diameter	d_o	mm	6.4		9.5			12.7			15.9		19.1		
Load Bearing Length of Anchor	ℓ_e	mm	49		28	47	64	39	55	82	61	99	74	123	
Reduction Factor for Concrete Breakout Strength	R				1.15 (Condition A), 1.00 (Condition B)										
Concrete Pryout Strength in Shear (CSA A23.3 D.7.3)															
Coefficient for Pryout Strength	k_{cp}		1.0				2.0	1.0		2.0	1.0		2.0		
Reduction Factor for Pryout Strength	R				1.15 (Condition A), 1.00 (Condition B)										

1 N/A denotes that pullout resistance does not govern and does not need to be considered.

2 The KWIK HUS-EZ (KH-EZ) is considered a brittle steel element as defined by CSA A23.3 D.2.

This table replaces Table 3 and Table 4 of this Supplement (and Table 3 and Table 4 of ESR-3027) for anchorage design in normal weight concrete in accordance with CSA A23.3-04.

3.3.5 KWIK HUS-EZ (KH-EZ) Carbon Steel Screw Anchor

3.3.5.6 Ordering Information

Order Information

Description	Hole Diameter	Total Length without Anchor Head	Minimum Embedment Depth	Qty (pcs) / Box
KH-EZ 1/4"x1-7/8"	1/4"	1-7/8"	1-5/8"	100
KH-EZ 1/4"x2-5/8"	1/4"	2-5/8"	2-1/2"	100
KH-EZ 1/4"x3"	1/4"	3"	2-1/2"	100
KH-EZ 1/4"x3-1/2"	1/4"	3-1/2"	2-1/2"	100
KH-EZ 1/4"x4"	1/4"	4"	2-1/2"	100
KH-EZ 3/8"x1-7/8"	3/8"	1-7/8"	1-5/8"	50
KH-EZ 3/8"x2-1/8"	3/8"	2-1/8"	1-5/8"	50
KH-EZ 3/8"x3"	3/8"	3"	2-1/2"	50
KH-EZ 3/8"x3-1/2"	3/8"	3-1/2"	2-1/2"	50
KH-EZ 3/8"x4"	3/8"	4"	3-1/4"	50
KH-EZ 3/8"x5"	3/8"	5"	3-1/4"	30
KH-EZ 1/2"x2-1/2"	1/2"	2-1/2"	2-1/4"	30
KH-EZ 1/2"x3"	1/2"	3"	2-1/4"	30
KH-EZ 1/2"x3-1/2"	1/2"	3-1/2"	3"	25
KH-EZ 1/2"x4"	1/2"	4"	3"	25
KH-EZ 1/2"x4-1/2"	1/2"	4-1/2"	4 1/4"	25
KH-EZ 1/2"x5"	1/2"	5"	4 1/4"	25
KH-EZ 1/2"x6"	1/2"	6"	4-1/4"	25
KH-EZ 5/8"x3-1/2"	5/8"	3-1/2"	3-1/4"	15
KH-EZ 5/8"x4"	5/8"	4"	3-1/4"	15
KH-EZ 5/8"x5-1/2"	5/8"	5-1/2"	3-1/4"	15
KH-EZ 5/8"x6-1/2"	5/8"	6-1/2"	3-1/4"	15
KH-EZ 5/8"x8"	5/8"	8"	3-1/4"	15
KH-EZ 3/4"x4-1/2"	3/4"	4-1/2"	4"	10
KH-EZ 3/4"x5-1/2"	3/4"	5-1/2"	4"	10
KH-EZ 3/4"x7"	3/4"	7"	4"	10
KH-EZ 3/4"x8"	3/4"	8"	4"	10
KH-EZ 3/4"x9"	3/4"	9"	4"	10