ICC-ES Evaluation Report

ESR-5065

Reissued December 2023

Subject to renewal December 2025

This report also contains:

- LABC Supplement

- FBC Supplement

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DIVISION: 03 00 00—CONCRETE Section: 03 16 00—Concrete Anchors DIVISION: 05 00 00—METALS Section: 05 05 19—Post-Installed Concrete Anchors	REPORT HOLDER: HILTI, INC.	EVALUATION SUBJECT: HILTI KWIK-X DUAL ACTION SYSTEM IN CRACKED AND UNCRACKED CONCRETE	

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, and 2015 *International Building Code*® (IBC)
- 2021, 2018, and 2015 *International Residential Code*® (IRC)

For evaluation for compliance with codes adopted by *Los Angeles Department of Building and Safety* (LADBS), see ESR-5065 LABC and LARC Supplement.

Property evaluated:

Structural

2.0 USES

The Hilti Kwik-X Dual Action System (Kwik-X) System is used as anchorage to resist static, wind and earthquake (Seismic Design Categories A through F) tension and shear loads in cracked and uncracked normal-weight or lightweight concrete having a specified compressive strength, f'_c, of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

The anchor system complies with anchors as described in Section 1901.3 of the 2021, 2018 and 2015 IBC. The anchor systems may also be used where an engineered design is submitted in accordance with Section R301.1.3 of the IRC.

3.0 DESCRIPTION

3.1 General:

The Hilti Kwik-X Dual Action System is comprised of the following components:

- Hilti Kwik-X Dual Action capsules (KHC)
- Hilti KWIK HUS-EZ (KH-EZ) carbon steel screw anchor or Hilti KWIK HUS-EZ CRC (KH-EZ CRC) mechanically deposited zinc coated screw anchor.
- Setting tools to mix the capsules with the screw anchor during installation.

The Hilti Kwik-X Dual Action System must be used with the Hilti KH-EZ or KH-EZ CRC screw anchor as depicted in Figure 1. The primary components of the Hilti Kwik-X Dual Action System, including the Hilti Kwik-X Dual Action capsules, setting tools andscrew anchor, are shown in Figure 2 of this report.

The manufacturer's printed installation instructions (MPII), as included with each anchor unit package, are consolidated as Figure 4.

3.2 Materials:

3.2.1 Hilti Kwik-X Dual Action Capsules (KHC): Hilti KHCs are a two-component adhesive (resin / hardener) with each component individually contained in a single foil and then the two foils are attached together side-by-side forming a single capsule. The two components are mixed when the single capsule is inserted into a drilled hole in the concrete and a KH-EZ / KH-EZ CRC screw anchor is spun into the capsule with a setting tool as described in Section 3.2.3, mixing the adhesive. KHCs are individually sized and labeled by diameter. Each capsule is stamped with the adhesive expiration date, capsule size, and lot number. The shelf life, as indicated by the expiration date, applies to an unused capsule stored in a dry, dark environment and in accordance with Figure 4.

3.2.2 Hole Cleaning Equipment:

3.2.2.1 Standard Equipment: Standard hole cleaning equipment is described in Figure 4 of this report.

3.2.2.2 Hilti Safe-Set™ System: For the elements described in Section 3.2.4, the Hilti TE-CD or TE-YD hollow carbide drill bit with a carbide drilling head conforming to ANSI B212.15 must be used. When used in conjunction with a Hilti vacuum with a minimum value for the maximum volumetric flow rate of 129 CFM (61 ℓ/s), the Hilti TE-CD or TE-YD drill bit will remove the drilling dust, automatically cleaning the hole. Available sizes for Hilti TE-CD or TE-YD drill bits are shown in Figure 4.

3.2.3 Setting Tools: Hilti Kwik-X anchors must be set with a KH-EZ or KH-EZ CRC screw anchor that is set with an impact wrench as described in Figure 4 of this report.

3.2.4 Hilti KH-EZ screw anchors:

3.2.4.1 KH-EZ: The KH-EZ anchors are comprised of a body with a hex washer head. The anchor is manufactured from carbon steel and is heat-treated. It has a minimum 0.0003-inch-thick (8 µm) zinc coating in accordance with DIN EN ISO 4042. The anchoring system is available in a variety of lengths with nominal diameters of $^3/_8$-inch, $^1/_2$-inch, $^5/_8$-inch and $^3/_4$-inch. The KH-EZ is illustrated in Figure 2. 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. The anchor threads cut into the concrete on the sides of the hole and interlock with the base material during installation.

The Hilti KH-EZ anchors in this report are evaluated in accordance with ICC-ES AC193 in ICC-ES ESR-3027.

3.2.4.2 KH-EZ CRC: The KH-EZ CRC 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 of 0.0021-inch-thick (53 µm) mechanically deposited zinc coating in accordance with ASTM B695, Class 55. The anchoring system is available in a variety of lengths with nominal diameters of $^3/_8$-inch, $^1/_2$-inch, $^5/_8$-inch and $^3/_4$-inch. The KH-EZ CRC is illustrated in Figure 2.

The Hilti KH-EZ CRC anchors in this report are evaluated in accordance with ICC-ES AC193 in ICC-ES ESR-3027.

3.3 Concrete:

Normal-weight concrete must comply with Sections 1903 and 1905 of the IBC, as applicable. The specified compressive strength of the concrete must be from 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design of Post-Installed Anchors:

4.1.1 General: The design strength of anchors under the 2021 IBC, as well as the 2021 IRC, must be determined in accordance with ACI 318-19 and this report. The design strength of anchors under the 2018 and 2015 IBC and 2018 and 2015 IRC must be determined in accordance with ACI 318-14 and this report.

Design parameters are based on ACI 318-19 for use with the 2021 IBC, and ACI 318-14 for use with the 2018 and 2015 IBC, unless noted otherwise in Sections 4.1.1 through 4.1.11 of this report.

The strength design of anchors must comply with ACI 318-19 17.5.1.2 or ACI 318-14 17.3.1, as applicable, except as required in ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable.

Design parameters are provided in Table 1 through Table 3. Strength reduction factors, ϕ, as given in ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable must be used for load combinations calculated in accordance with Section 1605.1 of the 2021 IBC or Section 1605.2 of the 2018 and 2015 IBC or ACI 318-19 and ACI 318-14 5.3, as applicable.

4.1.2 Static Steel Strength in Tension: The nominal static steel strength of a single anchor in tension, N_{sa}, in accordance with ACI 318-19 17.6.1.2 or ACI 318-14 17.4.1.2, as applicable, and the associated strength reduction factors, ϕ, in accordance with ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable, are provided in Table 1.

4.1.3 Static Concrete Breakout Strength in Tension: The nominal concrete breakout strength of a single anchor or group of anchors in tension, N_{cb} or N_{cbg}, must be calculated in accordance with ACI 318-19 17.6.2 or ACI 318-14 17.4.2, as applicable, with the following addition:

The basic concrete breakout strength of a single anchor in tension, N_b, must be calculated in accordance with ACI 318-19 17.6.2.2 or ACI 318-14 17.4.2.2, as applicable using the values of $k_{c,cr}$, and $k_{c,uncr}$, as described in this report. Where analysis indicates no cracking in accordance with ACI 318-19 17.6.2.5 or ACI 318-14 17.4.2.6, as applicable, N_b must be calculated using $k_{c,uncr}$ and $\Psi_{c,N}$ = 1.0. See Table 2. For anchors in lightweight concrete, see ACI 318-19 17.2.4 or ACI 318-14 17.2.6, as applicable. The value of f'_c used for calculation must be limited to 8,000 psi (55 MPa) in accordance with ACI 318-19 17.3.1 or ACI 318-14 17.2.7, as applicable. Additional information for the determination of nominal bond strength in tension is given in Section 4.1.4 of this report.

4.1.4 Static Bond Strength in Tension: The nominal static bond strength of a single adhesive anchor or group of adhesive anchors in tension, N_a or N_{ag}, must be calculated in accordance with ACI 318-19 17.6.5 or ACI 318-14 17.4.5, as applicable. Bond strength values are a function of the concrete compressive strength, whether the concrete is cracked or uncracked, the concrete temperature range, and the installation conditions (dry or water-saturated concrete). The resulting characteristic bond strength shall be multiplied by the associated strength reduction factor ϕ_{nn} as follows:

DRILLING METHOD	CONCRETE TYPE	PERMISSIBLE INSTALLATION CONDITIONS	BOND STRENGTH	ASSOCIATED STRENGTH REDUCTION FACTOR
Hammer-drill or Hilti TE-CD or TE-YD Hollow Drill Bit or Diamond Core Drilled	Cracked and Uncracked	Dry	$\tau_{k,uncr}$ or $\tau_{k,cr}$	ϕ_d
		Water-saturated	$\tau_{k,uncr}$ or $\tau_{k,cr}$	ϕ_{ws}

Strength reduction factors for determination of the bond strength are outlined in Table 3 of this report. Adjustments to the bond strength may also be made for increased concrete compressive strength as noted in the footnotes to the bond strength table.

4.1.5 Static Steel Strength in Shear: The nominal static strength of a single anchor in shear as governed by the steel, V_{sa}, in accordance with ACI 318-19 17.7.1.2 or ACI 318-14 17.5.1.2, as applicable, and strength reduction factors, ϕ, in accordance with ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable, are given in Table 1.

4.1.6 Static Concrete Breakout Strength in Shear: The nominal static concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg}, must be calculated in accordance with ACI 318-19 17.7.2 or ACI 318-14 17.5.2, as applicable. The basic concrete breakout strength of a single anchor in shear,

V_b, must be calculated in accordance with ACI 318-19 17.7.2.2 or ACI 318-14 17.5.2.2, as applicable. The value of f'_c must be limited to a maximum of 8,000 psi (55 MPa) in accordance with ACI 318-19 17.3.1 or ACI 318-14 17.2.7, as applicable.

4.1.7 Static Concrete Pryout Strength in Shear: The nominal static pryout strength of a single anchor or group of anchors in shear, V_{cp} or V_{cpg}, must be calculated in accordance with ACI 318-19 17.7.3 or ACI 318-14 17.5.3, as applicable.

4.1.8 Interaction of Tensile and Shear Forces: For designs that include combined tension and shear, the interaction of tension and shear loads must be calculated in accordance with ACI 318-19 17.8 or ACI 318-14 17.6, as applicable.

4.1.9 Minimum Member Thickness, h_{min}, Anchor Spacing, s_{min} and Edge Distance, c_{min}: In lieu of ACI 318-19 17.9.2 or ACI 318-14 17.7.1 and 17.7.3, as applicable, values of s_{min} and c_{min} described in this report must be observed for anchor design and installation. Likewise, in lieu of ACI 318-19 17.9.4 or ACI 318-14 17.7.5, as applicable, the minimum member thicknesses, h_{min}, described in this report must be observed for anchor design and installation.

4.1.10 Critical Edge Distance c_{ac}: The critical edge distance, c_{ac} must be calculated according to Eq. 17.6.5.5.1c for ACI 318-19 or Eq. 17.4.5.5c for ACI 318-14, in lieu of ACI 318-19 17.9.5 or ACI 318-14 17.7.6, as applicable.

$$c_{ac}=h_{ef}\cdot\left(\frac{\tau_{k,uncr}}{1160}\right)^{0.4}\cdot\left[3.1\text{-}0.7\frac{h}{h_{ef}}\right]$$

(Eq. 17.6.5.5.1c for ACI 318-19 or Eq. 17.4.5.5c for ACI 318-14)

where $\left[\frac{h}{h_{ef}}\right]$ need not be taken as larger than 2.4: and

$\tau_{k,uncr}$ is the characteristic bond strength in uncracked concrete stated in this report, h is the member thickness, and h_{ef} is the embedment depth.

$\tau_{k,uncr}$ need not be taken as greater than:

$$\tau_{k,uncr}=\frac{k_{uncr}\sqrt{h_{ef}f'_c}}{\pi\cdot d_a} \qquad \text{Eq. (4-1)}$$

4.1.11 Design Strength in Seismic Design Categories C, D, E and F: In structures assigned to Seismic Design Category C, D, E or F under the IBC or IRC, anchors design must be performed according to ACI 318-19 17.10 or ACI 318-14 17.2.3, as applicable. Modifications to ACI 318-19 17.10 or ACI 318-14 17.2.3 shall be applied under Section 1905.1.8 of the 2021, 2018 and 2015 IBC.

The nominal steel shear strength, V_{sa}, must be adjusted by $\alpha_{V,seis}$ as given in Table 1. For tension, the nominal bond strength τ_{cr} must be adjusted by $\alpha_{N,seis}$. See Table 3 of this report.

4.2 Installation:

Installation parameters are illustrated in Figure 1. Installation must be in accordance with ACI 318-19 26.7.2 or ACI 318-14 17.8.1, as applicable. Anchor locations must comply with this report and the plans and specifications approved by the code official. Installation of the Hilti Kwik-X Dual Action System must conform to the manufacturer's printed installation instructions (MPII) included in each unit package consolidated as Figure 4 of this report. The MPII contains additional requirements for combinations of drill hole depth, diameter, drill bit type, hole preparation, setting tools and minimum drill machine sizes used for setting anchors.

4.3 Special Inspection:

Periodic special inspection must be performed where required in accordance with Section 1705.1.1 and Table 1705.3 of the 2021, 2018, and 2015, as applicable, and this report. The special inspector must be on the jobsite initially during anchor installation to verify anchor type and dimensions, concrete type, concrete compressive strength, adhesive identification and expiration date, hole dimensions, hole cleaning procedures, spacing, edge distances, concrete thickness, anchor embedment, impact wrench type,and adherence to the manufacturer's printed installation instructions.

The special inspector must verify the initial installations of each type and size of adhesive anchor by construction personnel on site. Subsequent installations of the same anchor type and size by the same construction personnel are permitted to be performed in the absence of the special inspector. Any change in

the anchor product being installed or the personnel performing the installation requires an initial inspection. For ongoing installations over an extended period, the special inspector must make regular inspections to confirm correct handling and installation of the product.

Continuous special inspection of adhesive anchors installed in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed in accordance with ACI 318-19 26.13.3.2(e) and 26.7.1(j) or ACI 318-14 17.8.2.4, 26.7.1(h), and 26.13.3.2(c), as applicable.

Under the IBC, additional requirements as set forth in Sections 1705, 1706, and 1707 must be observed, where applicable.

5.0 CONDITIONS OF USE:

The Hilti Kwik-X Dual Action System described in this report complies with, or is a suitable alternative to what is specified in, the codes listed in Section 1.0 of this report, subject to the following conditions:

5.1 Hilti Kwik-X anchors must be installed in accordance with the manufacturer's printed installation instructions (MPII) as included in the adhesive packaging and consolidated as Figure 4 of this report.

5.2 The anchors must be installed in cracked and uncracked normal-weight concrete having a specified compressive strength f'_c = 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa).

5.3 The values of f'_c used for calculation purposes must not exceed 8,000 psi (55.1 MPa).

5.4 The concrete shall have attained its minimum design strength prior to installation of the Hilti Kwik-X anchors.

5.5 Anchors must be installed in concrete base materials in holes drilled using carbide-tipped drill bits manufactured with the range of maximum and minimum drill-tip dimensions specified in ANSI B212.15-1994, or diamond core drill bits, as detailed in Figure 4.

5.6 Installation setting tools used for setting anchors must be in accordance with the (MPII) as included in the capsule packaging and consolidated as Figure 4 of this report.

5.7 Loads applied to the anchors must be adjusted in accordance with Section 1605.1 of the 2021 IBC or Section 1605.2 of the 2018 and 2015 IBC for strength design, and in accordance with Section 1605.1 of the 2021 IBC or Section 1605.3 of the 2018 and 2015 IBC for allowable stress design.

5.8 Hilti Kwik-X anchors are recognized for use to resist short- and long-term loads, including wind and earthquake, subject to the conditions of this report.

5.9 In structures assigned to Seismic Design Category C, D, E or F under the IBC or IRC, anchor strength must be adjusted in accordance with Section 4.1.11 of this report.

5.10 Hilti Kwik-X anchors are permitted to be installed in concrete that is cracked or that may be expected to crack during the service life of the anchor, subject to the conditions of this report.

5.11 Anchor strength design values must be established in accordance with Section 4.1 of this report.

5.12 Minimum anchor spacing and edge distance as well as minimum member thickness must comply with the values noted in this report.

5.13 Prior to anchor installation, calculations and details demonstrating compliance with this report must be submitted to the code official. The calculations and details must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.

5.14 Anchors are not permitted to support fire-resistive construction. Where not otherwise prohibited by the code, Hilti Kwik-X anchors are permitted for installation in fire-resistive construction provided that at least one of the following conditions is fulfilled:

- Anchors are used to resist wind or seismic forces only.
- Anchors that support gravity load–bearing structural elements are within a fire-resistive envelope or a fire-resistive membrane, are protected by approved fire-resistive materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
- Anchors are used to support nonstructural elements.

5.15 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of adhesive anchors subjected to fatigue or shock loading is unavailable at this time, the use of these anchors under such conditions is beyond the scope of this report.

5.16 Use of zinc-plated carbon steel screw anchors is limited to dry, interior locations.

5.17 Use of mechanically galvanized carbon steel screw anchors is permitted for exterior exposure or damp environments.

5.18 Periodic special inspection must be provided in accordance with Section 4.3 of this report. Continuous special inspection for anchors installed in horizontal or upwardly inclined orientations to resist sustained tension loads must be provided in accordance with Section 4.3 of this report.

5.19 Installation of $^{3}/_{8}$- through $^{3}/_{4}$-inch diameter anchors in horizontal or upwardly inclined orientations to resist sustained tension loads shall be performed by personnel certified by an applicable certification program in accordance with ACI 318-19 26.7.2(e) or ACI 318-14 17.8.2.2 or 17.8.2.3, as applicable.

5.20 Hilti Kwik-X anchors may be used to resist tension and shear forces in floor, wall, and overhead installations only if installation is into concrete with a temperature between -10°F and 104°F (-28°C and 40°C).

5.21 Anchors shall not be used for applications where the concrete temperature can rise from 40°F or less to 80°F or higher within a 12-hour period. Such applications may include but are not limited to anchorage of building façade systems and other applications subject to direct sun exposure.

5.22 Hilti Kwik-X anchors are manufactured under a quality-control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Post-installed Adhesive Anchors in Concrete (AC308), dated October 2022, which incorporates requirements in ACI 355.4 (-19 and -11), including but not limited to tests under freeze/thaw conditions (Table 3.2, test series 6).

Hilti KH-EZ anchors used in this report are covered in ICC Evaluation Services ESR-3027.

7.0 IDENTIFICATION

7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-5065) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.

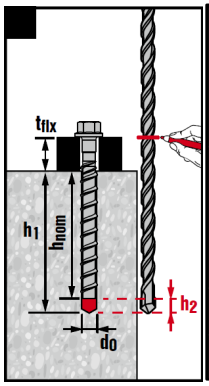
7.2 Hilti KHCs are identified by packaging labeled with the manufacturer's name (Hilti Corp.) and address, product name, lot number, expiration date, and evaluation report number (ESR-5065).

7.3 Hilti KH-EZ and KH-EZ CRC anchors are identified by packaging with the company name (Hilti, Inc.), anchor name, anchor size, and evaluation report number (ESR-3027 and ESR-5065). The anchors with hex washer head have KH-EZ, HILTI, and anchor size and anchor length embossed on the anchor head. Identifications are visible after installation, for verification.

7.4 The report holder's contact information is the following:

HILTI, INC.
7250 DALLAS PARKWAY, SUITE 1000
PLANO, TEXAS 75024
(800) 879-8000
www.hilti.com

KHC + KH-EZ / KH-EZ CRC

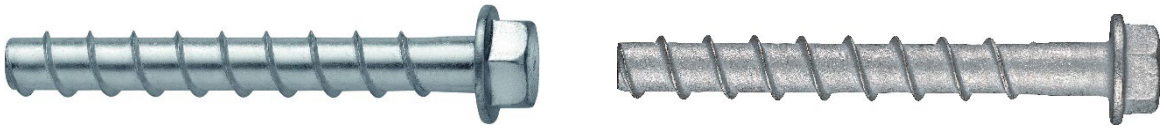


d_o	3/8"	1/2"	5/8"	3/4"	
h_1	$h_{nom} + h_2$	$h_{nom} + h_2$	$h_{nom} + h_2$	$h_{nom} + h_2$	
h_{nom}	2 1/2" – 3"	> 3" – 5"	3" – 4 1/4"	> 4 1/4" – 6"	3 1/4" – 4 1/2"	4 1/2" – 7 1/2"	4" – 4 1/2"	4 1/2" – 8 1/4"
h_2	3/8"		3/8"		3/8"		3/8"	
	3/4"	1 1/4"	3/4"	1"	1"		1"	
	3/8"		3/8"		3/8"		3/8"	
	–		3/8"		3/8"		3/8"	
	3/8"		3/8"		3/8"		3/8"	

KH-EZ / KH-EZ CRC h_{nom}	KHC	d_o	d_h	SW	SIW4-22 NUTRON	SIW6-22 NUTRON	SIW8-22 NUTRON	SIW-22 A	SIW22T-A	SIW9-A22
3/8"	2 1/2" – 3"	3/8" SMALL	3/8"	1/2"	9/16"	⊘	⊘		⊘	⊘
	> 3" – 5"	3/8" LARGE					⊘		⊘	⊘
1/2"	3" – 4 1/4"	1/2" SMALL	1/2"	5/8"	3/4"		⊘		⊘	⊘
	> 4 1/4" – 6"	1/2" LARGE					⊘	⊘	✔	⊘
5/8"	3 1/4" – 4 1/2"	5/8" SMALL	5/8"	3/4"	15/16"			⊘	✔	✔
	> 4 1/2" – 7 1/2"	5/8" LARGE				⊘		⊘	✔	✔
3/4"	4" – 4 1/2"	3/4" SMALL	3/4"	7/8"	1 1/8"	⊘		⊘	✔	✔
	> 4 1/2" – 8 1/4"	3/4" LARGE				⊘		⊘	✔	✔

[°C]	[°F]	[°C]	[°F]	$t_{cure,full}$
-28 … -10	-18 … 14	5 … 40	41 … 104	24 h
-10 … 5	14 … 41	5 … 40	41 … 104	30 min
5 … 40	41 … 104	5 … 40	41 … 104	0.5 min

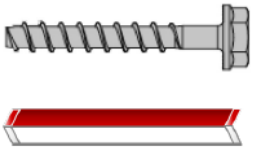
FIGURE 1 - INSTALLATION PARAMETERS FOR KWIK-X DUAL ACTION ANCHOR SYSTEM



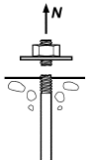
HILTI KH-EZ AND KH-EZ CRC SCREW ANCHORS

HILTI KHC CAPSULE

FIGURE 2 - HILTI KWIK-X ANCHORING SYSTEM



Kwik-X Dual Action Anchor



Steel Strength

TABLE 1 - STEEL DESIGN INFORMATION FOR KWIK-X DUAL ACTION ANCHORS

DESIGN INFORMATION	Symbol	Units	Nominal rod diameter (in.) [1]			
			3/8	1/2	5/8	3/4
Screw anchor diameter	d	in.	0.375	0.500	0.625	0.750
		(mm)	(9.5)	(12.7)	(15.9)	(19.1)
Effective cross-sectional area	A_{se}	in.^{2}	0.086	0.161	0.268	0.392
		(mm^2)	(55.5)	(103.9)	(172.9)	(252.9)
Nominal strength as governed by steel strength	N_{sa}	lb	10,335	18,120	24,210	32,015
		(kN)	(46)	(81)	(108)	(142)
	V_{sa}	lb	5,185	9,245	11,220	16,660
		(kN)	(23.1)	(41.1)	(49.9)	(74.1)
Reduction for seismic shear	$\alpha_{V,seis}$	-	0.60			0.70
Strength reduction factor for tension [2]	ϕ	-	0.65			
Strength reduction factor for shear [2]	ϕ	-	0.60			

For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.448 N.
For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf.

[1] Values provided for screw anchors are based on testing per AC193 and ACI 355.2 and are also reflected in ESR-3027.

[2] For use with the load combinations of IBC Section 1605.2, ACI 318-19 5.3 or ACI 318-14 5.3, as applicable, as set forth in ACI 318-19 17.5.3, or ACI 318-14 17.3.3, as applicable. Values correspond to a brittle steel element.

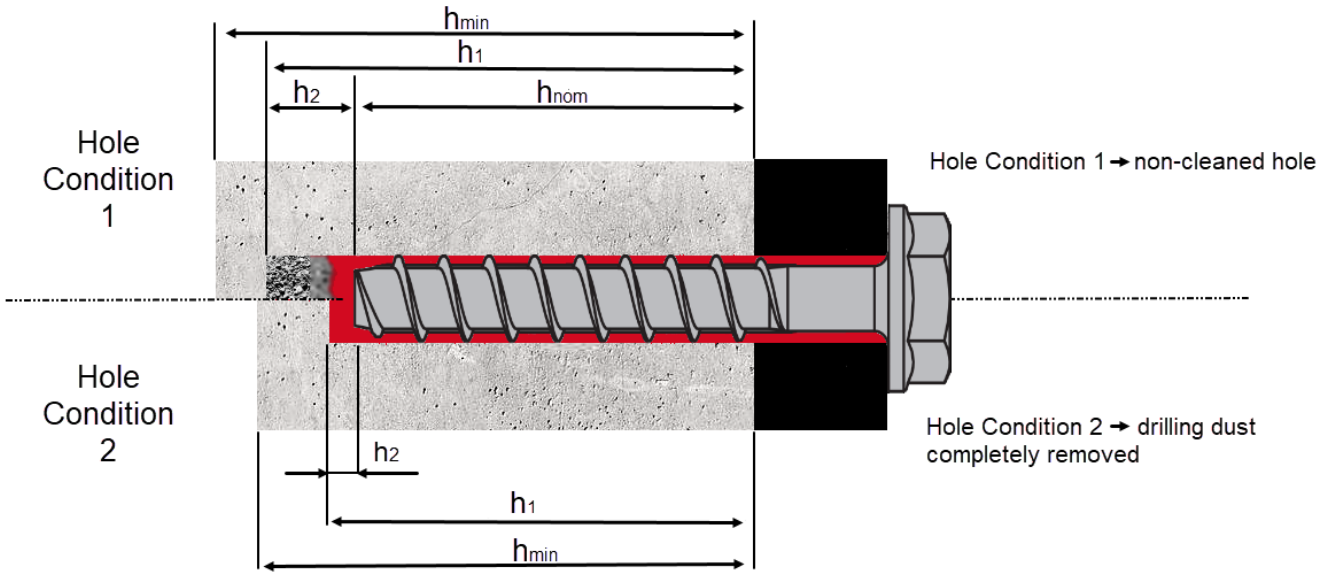
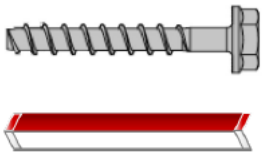
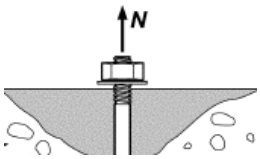


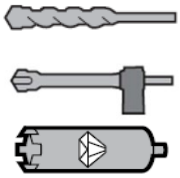
FIGURE 3 – DRILLED HOLE CONDITIONS FOR HILTI KWIK-X DUAL ACTION ANCHORS



Kwik-X Dual Action Anchor



Concrete Breakout Strength



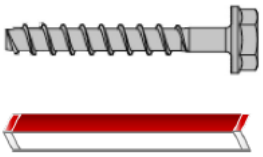
Carbide Bit, Hilti Hollow Carbide Bit, or Diamond Core Drill Bit

TABLE 2 - CONCRETE BREAKOUT DESIGN INFORMATION FOR KWIK-X DUAL ACTION ANCHORS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE BIT), OR DIAMOND CORE DRILL BIT [3]

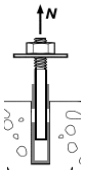
DESIGN INFORMATION		Symbol	Units	Nominal rod diameter (in.)							
				3/8		1/2		5/8		3/4	
Effectiveness factor for cracked concrete		$k_{c,cr}$	in-lb (SI)	17 (7.1)							
Effectiveness factor for uncracked concrete		$k_{c,uncr}$	in-lb (SI)	24 (10.0)							
Effective embedment		$h_{ef,min}$	in. (mm)	2 1/2 (64)		3 (76)		3 1/4 (83)		4 (102)	
		$h_{ef,max}$	in. (mm)	4 1/2 (114)		5 1/2 (140)		6 (152)		7 1/4 (184)	
Nominal embedment[4]		h_{nom}	in. (mm)	2 1/2 – 3 (64 – 76)	3 – 4 1/2 (76 – 114)	3 – 4 1/4 (76 – 108)	4 1/4 – 5 1/2 (108 - 140)	3 1/4 – 4 1/2 (83 – 114)	4 1/2 - 6 (114 – 152)	4 – 4 1/2 (102 – 114)	4 1/2 – 7 1/4 (114 – 184)
KHC Capsule size		-		3/8" Small	3/8" Large	1/2" Small	1/2" Large	5/8" Small	5/8" Large	3/4" Small	3/4" Large
Drilled hole depth[1]	Hole condition 1	h_1	in. (mm)	h_{nom} + 3/4 (h_{nom} + 19)	h_{nom} + 1 1/4 (h_{nom} + 32)	h_{nom} + 3/4 (h_{nom} + 19)	h_{nom} + 1 (h_{nom} + 25)	h_{nom} + 1 (h_{nom} + 25)		h_{nom} + 1 (h_{nom} + 25)	
	Hole condition 2	h_1	in. (mm)	h_{nom} + 3/8 (h_{nom} + 10)		h_{nom} + 3/8 (h_{nom} + 10)		h_{nom} + 3/8 (h_{nom} + 10)		h_{nom} + 3/8 (h_{nom} + 10)	
Minimum anchor spacing		s_{min}	in. (mm)	3 (76)		3 (76)		4 (102)		4 (102)	
Minimum edge distance		c_{min}	in. (mm)	1 1/2 (38)		1 3/4 (45)		1 3/4 (45)		1 3/4 (45)	
Minimum concrete thickness		h_{min}	in. (mm)	h_1 + 1 1/4 (h_1 + 32)		h_1 + 1 1/4 (h_1 + 32)		h_1 + 1 1/4 (h_1 + 32)		h_1 + 1 1/2 (h_1 + 38)	
Critical edge distance for splitting (uncracked concrete)		c_{ac}	in. (mm)	See Section 4.1.10 of this report.							
Strength reduction factor for tension, concrete failure modes[2]		ϕ	-	0.65							
Strength reduction factor for shear, concrete failure modes[2]		ϕ	-	0.70							

For **SI**: 1 inch = 25.4 mm, 1 lbf = 4.448 N.
For **pound-inch** units: 1 mm = 0.03937 inches, 1 N = 0.2248 lbf.

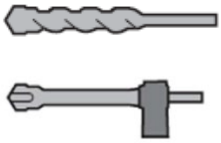
[1] See Figure 3 for description of drilled hole conditions.
[2] The strength reduction factor applies when the load combinations from the IBC of ACI 318 are used and the requirements of ACI 318-19 17.5.3 or ACI 318-14 17.3.3, as applicable, are met.
[3] Additional setting information is described in Figure 4, Manufacturers Printed Installation Instructions (MPII).
[4] Nominal embedment = effective embedment.



Kwik-X Dual Action Anchor



Bond Strength



Carbide Bit or
Hilti Hollow Carbide Bit

OR

Diamond Core Drill Bit

TABLE 3 - BOND STRENGTH DESIGN INFORMATION FOR KWIK-X DUAL ACTION ANCHORS IN HOLES DRILLED WITH A HAMMER DRILL AND CARBIDE BIT (OR HILTI HOLLOW CARBIDE DRILL BIT), OR DIAMOND CORE DRILL BIT[1]

DESIGN INFORMATION	Symbol	Units	Nominal rod diameter (in.)							
			3/8		1/2		5/8		3/4	
Effective Embedment	$h_{ef,min}$	in.	2 1/2		3		3 1/4		4	
		(mm)	(64)		(76)		(83)		(102)	
	$h_{ef,max}$	in.	4 1/2		5 1/2		6		7 1/4	
		(mm)	(114)		(140)		(152)		(184)	
Nominal Embedment	h_{nom}	in.	2 1/2 – 3	3 – 4 1/2	3 – 4 1/4	4 1/4 – 5 1/2	3 1/4 – 4 1/2	4 1/2 - 6	4 – 4 1/2	4 1/2 – 7 1/4
		(mm)	(64 – 76)	(6 – 114)	(76 – 108)	(108 - 140)	(83 – 114)	(114 – 152)	(102 – 114)	(114 – 184)
KHC capsule	–	-	3/8" Small	3/8" Large	1/2" Small	1/2" Large	5/8" Small	5/8" Large	3/4" Small	3/4" Large
Characteristic bond strength cracked concrete[2]	$\tau_{k,cr}$	psi	1,045	2,000	1,900		1,800		1,700	
		(MPa)	(7.2)	(13.8)	(13.1)		(12.4)		(11.7)	
Characteristic bond strength uncracked concrete[2]	$\tau_{k,uncr}$	psi	2,235		2,125		2,020		1,915	
		(MPa)	(15.4)		(14.7)		(13.9)		(13.2)	
Reduction for seismic tension	$\alpha_{N,seis}$	-	1.00							
Dry and Water-saturated concrete: Anchor category	-	-	1							
Dry and Water-saturated concrete: Strength reduction factor	ϕ_d, ϕ_{ws}	-	0.65							

For **SI**: 1 inch = 25.4 mm, 1 psi = 0.006897 MPa.
For **pound-inch** units: 1 mm = 0.03937 inches, 1 MPa = 145 psi.

[1] Bond strength values correspond to concrete compressive strength f'_c = 2,500 psi (17.2 MPa). For concrete compressive strength, f'_c, between 2,500 psi (17.2 MPa) and 8,000 psi (55.2 MPa), the tabulated characteristic bond strength may be increased by a factor of $(f'_c / 2{,}500)^n$ [For SI: $(f'_c / 17.2)^n$], where n is as follows:
n = 0.18 for uncracked concrete, all drilling methods
n = 0.14 for cracked concrete, all drilling methods
See Section 4.1.4 of this report for bond strength determination.

[2] Temperature range: Maximum short term temperature = 176°F (80°C), Maximum long term temperature = 110°F (43°C).
Short-term elevated concrete temperatures are those that occur over brief intervals, e.g., as a result of diurnal cycling. Long-term concrete temperatures are roughly constant over significant periods of time.

HILTI

safe set

qr.hilti.com/r16935754

Hilti KWIK-X

English
Français
Español
Português

ICC ES ICC ESR-5065

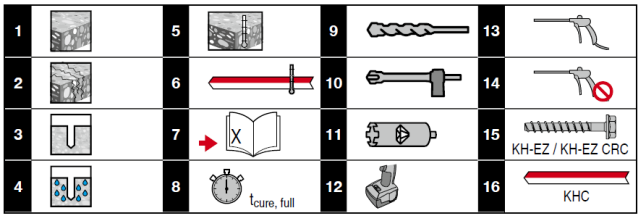
KHC

Warning

Contains: 2-Propenoic acid, 2-methyl-, monoester with 1,2-propanediol (A), 1,4-Butanediol dimethacrylate (A), 4-tert-butylpyrocatechol (A), dibenzoyl peroxide (B), Heating may cause a fire. (B), May cause an allergic skin reaction. (A, B), Causes serious eye irritation. (B), Very toxic to aquatic life with long lasting effects. (B)

(B) (A, B) (B)

KWIK-X



en 1 Uncracked concrete; 2 Cracked concrete; 3 Dry concrete; 4 Water saturated concrete; 5 Concrete temperature; 6 Capsule temperature; 7 Go to page X in the document; 8 Curing time for 100% loading; 9 Hammer drilling; 10 Hollow drill bit; 11 Diamond coring; 12 Impact tool gear setting; 13 Borehole cleaning required (follow detailed instructions); 14 No borehole cleaning required; 15 Screw anchor; 16 Adhesive Capsule

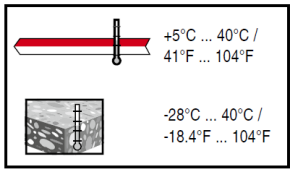
fr 1 Béton non lézardé; 2 Béton lézardé; 3 Matériau de base sec; 4 Matériau de base saturé d'eau; 5 Température du béton; 6 Température de la capsule; 7 Aller à la page X dans le document; 8 Temps de durcissement pour charge 100 %; 9 Perçage avec percussion; 10 Foret creux; 11 Forage au diamant; 12 Réglage de l'engrenage de l'outil à impact; 13 Nettoyage nécessaire du trou foré (suivre les instructions détaillées); 14 Aucun nettoyage nécessaire du trou foré; 15 Vis d'ancrage; 16 Capsule adhésive

es 1 Hormigón no fisurado; 2 Hormigón fisurado; 3 Superficie de trabajo seca; 4 Superficie de trabajo saturada de agua; 5 Temperatura del hormigón; 6 Temperatura de la cápsula; 7 Diríjase a la página X del document; 8 Tiempo de fraguado para una carga del 100 %; 9 Taladro con percusión; 10 Taladro con broca hueca y aspiración; 11 Taladro con diamante; 12 Ajuste del mecanismo de la herramienta de impacto; 13 Limpieza del taladro requerida (siga las instrucciones detalladas); 14 No es necesaria la limpieza del taladro; 15 Anclaje tornillo; 16 Cápsula del mortero

pt 1 Betão não fissurado; 2 Betão fissurado; 3 Material base seco; 4 Material base saturado de água; 5 Temperatura do betão; 6 Temperatura da cápsula; 7 Vá até à página X no documento; 8 Tempo de cura para 100 % de carga; 9 Perfurar de martelo; 10 Broca de coroa oca; 11 Perfurar com equipamento diamantado; 12 Ajuste da velocidade da ferramenta de impacto; 13 Necessário limpar o furo (siga as instruções detalhadas); 14 Não é necessário limpar o furo; 15 Parafuso para betão; 16 Cápsula de resina

3

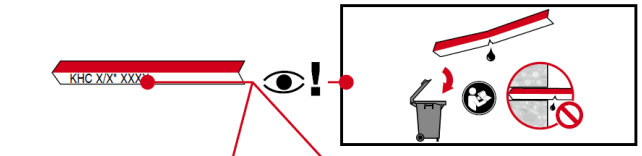
KWIK-X



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

4

KWIK-X



KH-EZ	3/8"	2 ½" – 3"	KHC 3/8" SMALL
		> 3" – 5"	KHC 3/8" LARGE
	½"	3" – 4 ¼"	KHC ½" SMALL
		> 4 ¼" – 6"	KHC ½" LARGE
KH-EZ CRC	5/8"	3 ¼" – 4 ½"	KHC 5/8" SMALL
		> 4 ½" – 7 ½"	KHC 5/8" LARGE
	¾"	4" – 4 ½"	KHC ¾" SMALL
		> 4 ½" – 8 ¼"	KHC ¾" LARGE

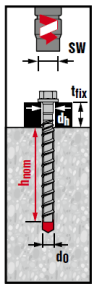
→ 6 / 8 / 10 / 12

5

KWIK-X 3/8"

1

ICC ES ICC ESR-5065 ✔



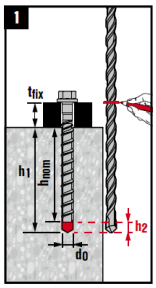
KH-EZ / KH-EZ CRC	h_{nom}	KHC	d_0	d_h	SW	SIW4-22 NUKON	SIW6-22 NUKON	SIW8-22 NUKON	SIW-22 A	SIW22T-A	SIW9-A22
3/8"	2 ½" – 3"	3/8" SMALL	3/8"	½"	9/16"	✔	⊘	⊘	✔	⊘	⊘
	> 3" – 5"	3/8" LARGE				✔	⊘	⊘	✔	⊘	⊘

6

KWIK-X 3/8"

1

ICC ES ICC ESR-5065 ✔



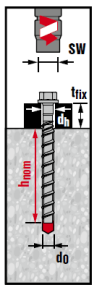
d_0	3/8"		
h_1	$h_{nom} + h_2$		
h_{nom}	2 ½" – 3"	> 3" – 5"	
h_2	3/8"		→ 14 2a
	¾"	1 ¼"	→ 14 2b
	3/8"		→ 14 2b
	–	–	
	3/8"		→ 15 2d

7

KWIK-X ½"

1

ICC ES ICC ESR-5065 ✔



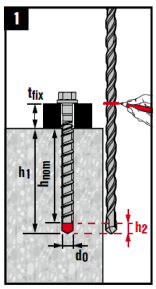
KH-EZ / KH-EZ CRC	h_{nom}	KHC	d_0	d_h	SW	SIW4-22 NUKON	SIW6-22 NUKON	SIW8-22 NUKON	SIW-22 A	SIW22T-A	SIW9-A22
½"	3" – 4 ¼"	½" SMALL	½"	5/8"	¾"	✔	⊘	⊘	✔	⊘	⊘
	> 4 ¼" – 6"	½" LARGE				✔	⊘	⊘	⊘	✔	⊘

8

KWIK-X ½"

1

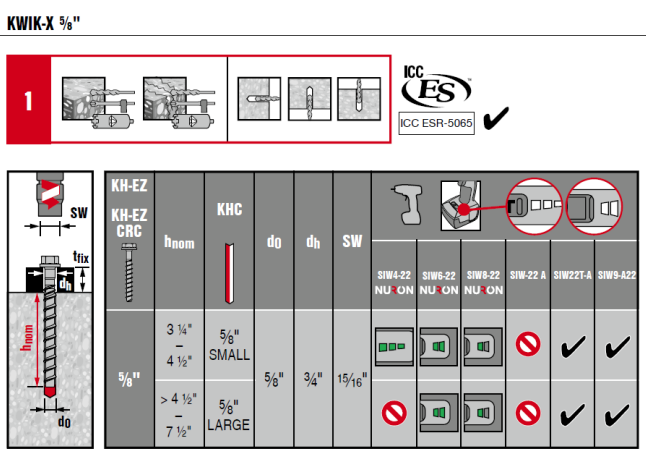
ICC ES ICC ESR-5065 ✔

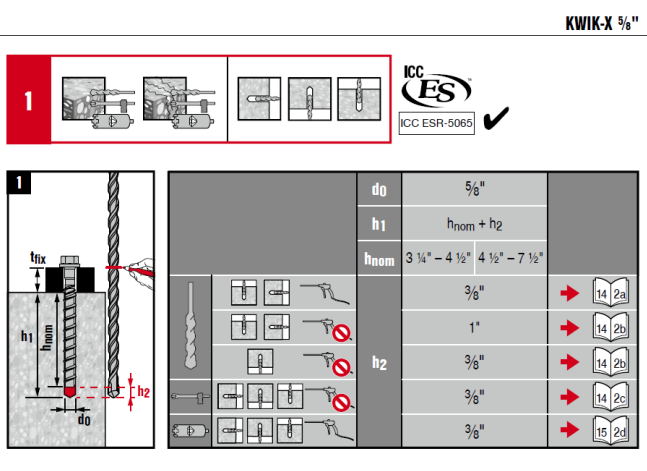


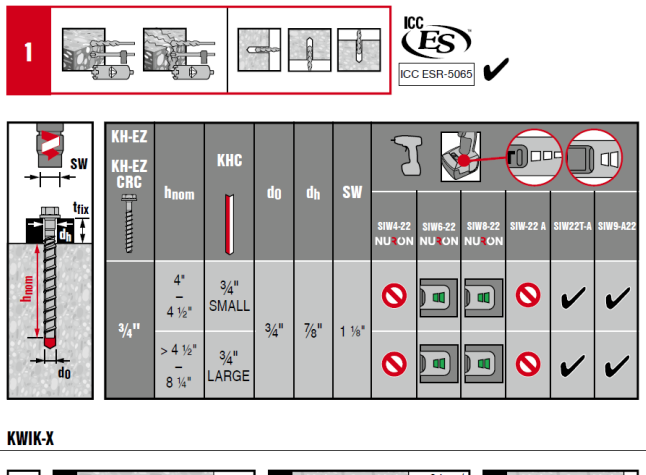
d_0	½"		
h_1	$h_{nom} + h_2$		
h_{nom}	3" – 4 ¼"	> 4 ¼" – 6"	
h_2	3/8"		→ 14 2a
	¾"	1"	→ 14 2b
	3/8"		→ 14 2b
	3/8"		→ 14 2c
	3/8"		→ 15 2d

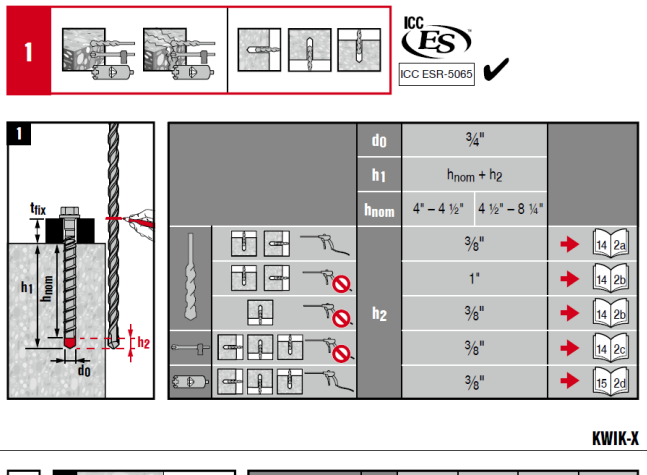
9

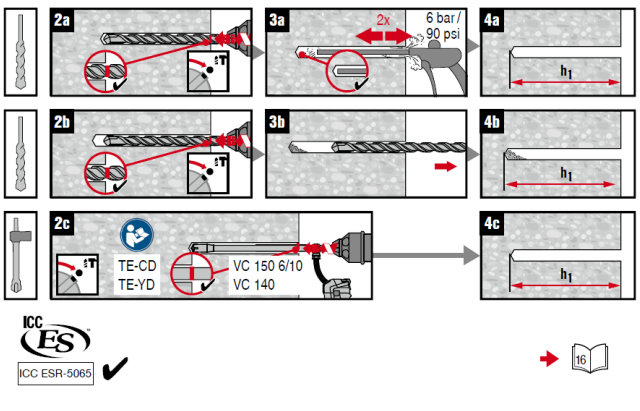
FIGURE 4 - MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII)

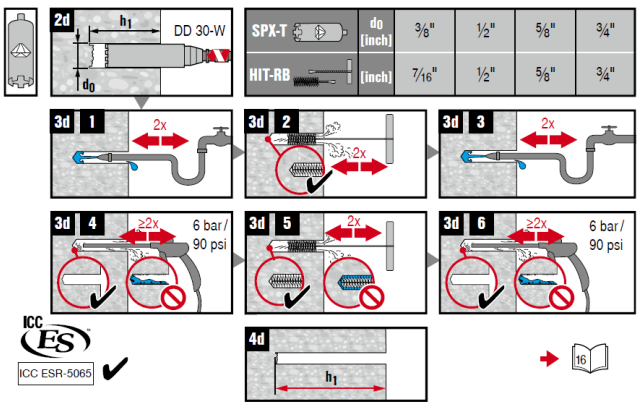


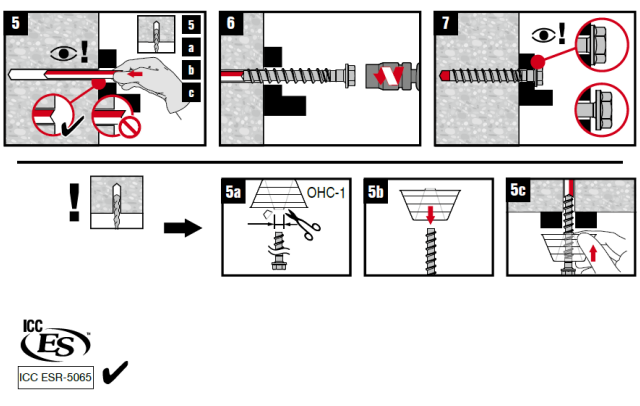












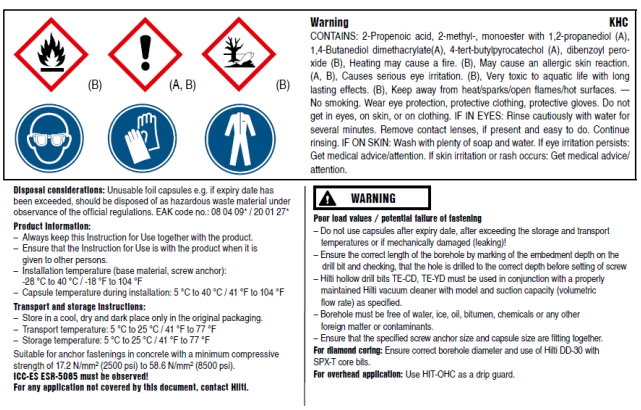


FIGURE 4 - MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS (MPII) - CONTINUED

DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI KWIK-X DUAL ACTIONSYSTEM IN CRACKED AND UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Hilti Kwik-X Dual Action System (Kwik-X) System in Cracked and Uncracked Concrete, described in ICC-ES evaluation report ESR-5065, has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2023 *City of Los Angeles Building Code* (LABC)
- 2023 *City of Los Angeles Residential Code* (LARC)

2.0 CONCLUSIONS

The Hilti Kwik-X Dual Action System (Kwik-X) System in Cracked and Uncracked Concrete, described in Sections 2.0 through 7.0 of the evaluation report ESR-5065, complies with the LABC Chapter 19, and the LARC, and is subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Hilti Kwik-X Dual Action System (Kwik-X) System in Cracked and Uncracked Concrete described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-5065.
- The design, installation, conditions of use and identification of the anchors are in accordance with the 2021 *International Building Code®* (IBC) provisions noted in the evaluation report ESR-5065.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapters 16 and 17, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.
- The design strength values listed in the evaluation report and tables are for the connection of the anchors to the concrete. The connection between the anchors and the connected members shall be checked for capacity (which may govern).
- For use in wall anchorage assemblies to flexible diaphragms, anchors shall be designed per the requirements of City of Los Angeles Information Bulletin P/BC 2020-071

This supplement expires concurrently with the evaluation report, reissued December 2023.

DIVISION: 03 00 00—CONCRETE
Section: 03 16 00—Concrete Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 19—Post-Installed Concrete Anchors

REPORT HOLDER:

HILTI, INC.

EVALUATION SUBJECT:

HILTI KWIK-X DUAL ACTIONSYSTEM IN CRACKED AND UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND EVALUATION SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Hilti Kwik-X Dual Action System (Kwik-X) System in Cracked and Uncracked Concrete, recognized in ICC-ES evaluation report ESR-5065, has also been evaluated for compliance with the codes noted below.

Compliance with the following codes:

- 2023 *Florida Building Code—Building*
- 2023 *Florida Building Code—Residential*

2.0 PURPOSE OF THIS SUPPLEMENT

The Hilti Kwik-X Dual Action System (Kwik-X) System in Cracked and Uncracked Concrete, described in Sections 2.0 through 7.0 of the evaluation report ESR-5065, complies with the *Florida Building Code—Building* and the *Florida Building Code—Residential.* The design requirements are determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable. The installation requirements noted in ICC-ES evaluation report ESR-5065 for the 2021 *International Building Code®* meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential,* as applicable.

Use of the Hilti Kwik-X Dual Action System (Kwik-X) System in Cracked and Uncracked Concrete has also been found to be in compliance with the High-Velocity Hurricane Zone provision of the *Florida Building Code—Building* and the *Florida Building Code—Residential* with the following condition.

a) For anchorage of wood members, the connections subject to uplift, the connection must be designed for no less than 700 pounds (3114 N).

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report, reissued December 2023.