

ICC-ES Evaluation Report

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This report also contains:

- [FL Supplement w/ HVHZ](#)

- [City of LA Supplement](#)

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<p>DIVISION: 03 00 00— CONCRETE</p> <p>Section: 03 16 00— Concrete Anchors</p> <p>DIVISION: 05 00 00— METALS</p> <p>Section: 05 05 19—Post- Installed Concrete Anchors</p>	<p>REPORT HOLDER: HILTI, INC.</p>	<p>EVALUATION SUBJECT: HILTI KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, AND KH-EZ CRC CARBON STEEL SCREW ANCHORS AND KH-EZ SS316 AND KH-EZ C SS316 STAINLESS STEEL SCREW ANCHORS FOR USE IN CRACKED AND UNCRAKED CONCRETE</p>	
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1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2024, 2021, 2018, and 2015 [International Building Code® \(IBC\)](#)
- 2024, 2021, 2018, and 2015 [International Residential Code® \(IRC\)](#)

Main references of this report are for the 2024 IBC and IRC. See [Table 10](#) and [Table 11](#) for applicable sections of the code for previous IBC and IRC editions.

Property evaluated:

Structural

2.0 USES

The Hilti KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I and KH-EZ CRC screw anchors are used as anchorage in cracked and uncracked normal-weight and lightweight concrete having a specified strength, f'_c , of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa); and cracked and uncracked normal-weight or sand-lightweight concrete over steel deck having a minimum specified compressive strength, f'_c , of 3,000 psi (20.7 MPa) to resist static, wind and seismic (Seismic Design Categories A through F) tension and shear loads.

The Hilti KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I and KH-EZ CRC screw anchors are an alternative to anchors described in Section 1901.3 of the 2024 IBC. The anchors 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 KH-EZ:

The 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-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 1/4-inch, 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 or torque wrench. The anchor threads cut into the concrete on the sides of the hole and interlock with the base material during installation.

3.2 KH-EZ I:

The KH-EZ I anchors are comprised of a body with a long internal thread (1/4-inch, 3/8-inch, or 1/2-inch internal thread) 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 KH-EZ I is illustrated in [Figure 3](#).

The over-sized 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 directly to the supporting member surface. The anchor threads cut into the concrete on the sides of the hole and interlock with the base material during installation.

Shear design values in this report for the KH-EZ I are for threaded inserts with F_u equal to or greater than 125 ksi. For use with inserts with F_u less than 125 ksi, the shear values are multiplied by the ratio of F_u of insert and 125 ksi.

3.3 KH-EZ P, KH-EZ PM and KH-EZ PL:

The KH-EZ P, KH-EZ PM and KH-EZ PL anchors are comprised of a body with round pan style head with an indented area in the top of the head with a six point star configuration. The KH-EZ P, KH-EZ PM and KH-EZ PL have different size pan style heads: small (P), medium (PM) and Large (PL). 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 KH-EZ P, KH-EZ PM and KH-EZ PL are available in 1/4-inch diameter. The KH-EZ P, KH-EZ PM and KH-EZ PL are illustrated in [Figure 4](#).

3.4 KH-EZ E:

The KH-EZ E anchors are comprised of a body with a long externally threaded (3/8-inch external thread) 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 KH-EZ E is available in 1/4-inch diameter. The KH-EZ E is illustrated in [Figure 5](#).

3.5 KH-EZ C:

The KH-EZ C anchors are comprised of the same thread profile as the hex head but with a countersunk 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 KH-EZ C is available in 1/4-inch and 3/8-inch diameter. The KH-EZ C is illustrated in [Figure 7](#).

3.6 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 6](#).

3.7 KH-EZ SS316:

The KH-EZ SS316 anchors are comprised of a body with hex washer head. The anchor is manufactured from AISI Type 316 stainless steel material. The anchoring system is available in a variety of lengths with nominal diameters of 1/4-inch, 3/8-inch and 1/2-inch. The KH-EZ SS316 is illustrated in [Figure 8](#).

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.

3.8 KH-EZ C SS316:

The KH-EZ C SS316 anchors are comprised of the same thread profile as the stainless steel hex head but with a countersunk head. The anchor is manufactured from AISI Type 316 stainless steel material. The KH-EZ C SS316 is available in 1/4-inch and 3/8-inch diameter. The KH-EZ C SS316 is illustrated in [Figure 9](#).

3.9 Concrete:

Normal-weight and lightweight concrete must conform to Sections 1903 and 1905 of the 2024 IBC.

3.10 Steel Deck Panels:

Steel deck panels must comply with the configurations in [Figure 12](#) and have a minimum base steel thickness of 0.035 inch (0.889 mm). Steel must comply with ASTM A653/A653M SS Grade 50 and have a minimum yield strength of 50,000 psi (345 MPa).

4.0 DESIGN AND INSTALLATION

4.1 Strength Design:

4.1.1 General: Design strength of anchors complying with the 2024 IBC as well as Section R301.1.3 of the 2024 IRC must be determined in accordance with ACI 318-19 Chapter 17 and this report.

Design parameters provided in [Table 1](#) through [Table 9](#) of this report are based on the 2024 IBC (ACI 318-19) unless noted otherwise in Sections 4.1.1 through 4.1.12.

The strength design of anchors must comply with ACI 318-19 Section 17.5.1.2 except as required in ACI 318-19 Section 17.10. Strength reduction factors, ϕ , as given in ACI 318-19 Section 17.5.3, and noted in [Tables 3, 4](#) and [7](#) of this report, must be used for load combinations calculated in accordance with Section 1605.1 of the 2024 IBC and Section 5.3 of ACI 318-19.

The value of f'_c used in the calculations must be limited to a maximum of 8,000 psi (55.2 MPa), in accordance with ACI 318-19 Section 17.3.1

4.1.2 Requirements for Static Steel Strength in Tension, N_{sa} : The nominal static steel strength, N_{sa} , of a single anchor in tension calculated in accordance with ACI 318-19 Section 17.6.1.2, is given in [Tables 3, 4](#) and [7](#) of this report. Strength reduction factors, ϕ , corresponding to brittle steel elements must be used.

4.1.3 Requirements for Static Concrete Breakout Strength in Tension, N_{cb} or N_{cbg} : The nominal concrete breakout strength of a single anchor or a group of anchors in tension, N_{cb} and N_{cbg} , respectively, must be calculated in accordance with ACI 318-19 Section 17.6.2 with modifications as described in this section. The basic concrete breakout strength of a single anchor in tension, N_b , must be calculated in accordance with ACI 318-19 Section 17.6.2.2 using the values of h_{ef} and k_{cr} as given in [Tables 3, 4](#) and [7](#) of this report. The nominal concrete breakout strength in tension in regions where analysis indicates no cracking in accordance with ACI 318-19 Section 17.6.2.5 must be calculated with the value of k_{uncr} as given in [Tables 3, 4](#) and [7](#) with $\psi_{c,N} = 1.0$.

For anchors installed in the lower or upper flange of the soffit of sand-lightweight or normal-weight concrete-filled steel deck floor and roof assemblies, as shown in [Figure 12](#), calculation of the concrete breakout strength in accordance with ACI 318-19 Section 17.6.2 is not required.

4.1.4 Requirements for Static Pullout Strength in Tension, N_p : The nominal pullout strength of a single anchor in accordance with ACI 318-19 Sections 17.6.3.1 and 17.6.3.2.1 in cracked and uncracked concrete, $N_{p,cr}$, and $N_{p,uncr}$, respectively, is given in [Tables 3, 4](#) and [7](#). In lieu of ACI 318-19 Section 17.6.3.3, $\psi_{c,P} = 1.0$ for all design cases. In accordance with ACI 318-19 Section 17.6.3, the nominal pullout strength in cracked concrete may be adjusted according to Eq.-1:

$$N_{p,f'_c} = N_{p,cr} \left(\frac{f'_c}{2,500} \right)^n \quad (\text{lb, psi}) \quad (\text{Eq.-1})$$

$$N_{p,f'_c} = N_{p,cr} \left(\frac{f'_c}{17.2} \right)^n \quad (\text{N, MPa})$$

where f'_c is the specified concrete compressive strength and n is the factor defining the influence of concrete compressive strength on the pullout strength. For the $1/4$ -inch-diameter anchor at $1\frac{5}{8}$ inches nominal embedment in cracked concrete, n is 0.3. For all other cases, n is 0.5.

In regions where analysis indicates no cracking in accordance with ACI 318-19 Section 17.6.3.3, the nominal pullout strength in tension may be adjusted according to Eq-2:

$$N_{p,f'_c} = N_{p,uncr} \left(\frac{f'_c}{2,500} \right)^n \quad (\text{lb, psi}) \quad (\text{Eq-2})$$

$$N_{p,f'_c} = N_{p,uncr} \left(\frac{f'_c}{17.2} \right)^n \quad (\text{N, MPa})$$

where f'_c is the specified concrete compressive strength and n is the factor defining the influence of concrete compressive strength on the pullout strength. For the $1/4$ -inch-diameter anchor at a nominal embedment of $1\frac{5}{8}$ inches in uncracked concrete, n is 0.3. For all other cases, n is 0.5.

Where values for $N_{p,cr}$ or $N_{p,uncr}$ are not provided in [Tables 3, 4](#) or [Table 7](#) of this report, the pullout strength in tension need not be considered.

The nominal pullout strength in tension of the anchors installed in the soffit of sand-lightweight or normal-weight concrete filled steel deck floor and roof assemblies, as shown in [Figure 12](#), is provided in [Table 5](#) for KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC and [Table 8](#) for KH-EZ I and KH-EZ E. In accordance with ACI 318-19 Section 17.6.3.2.1, the nominal pullout strength in cracked concrete must be calculated according to Eq-1, whereby the value of $N_{p,deck,cr}$ must be substituted for $N_{p,cr}$ and the value of 3,000 psi (20.7 MPa) must be substituted for the value of 2,500 psi (17.2 MPa) in the denominator. In regions where analysis indicates no cracking in accordance with ACI 318-19 Section 17.6.3.3, the nominal strength in uncracked concrete must be calculated according to Eq-2, whereby the value of $N_{p,deck,uncr}$ must be substituted for $N_{p,uncr}$ and the value of 3,000 psi (20.7 MPa) must be substituted for the value of 2,500 psi (17.2 MPa) in the denominator.

4.1.5 Requirements for Static Steel Shear Capacity, V_{sa} : The nominal steel strength in shear, V_{sa} , of a single anchor in accordance with ACI 318-19 Section 17.7.1.2 is given in [Tables 3, 4](#) and [7](#) of this report and must be used in lieu of the values derived by calculation from ACI 318-19 Eq. 17.7.1.2b. The strength reduction factor, ϕ , corresponding to brittle steel elements must be used. The nominal shear strength $V_{sa,deck}$, of anchors installed in the soffit of sand-lightweight or normal-weight concrete filled steel deck floor and roof assemblies, as shown in [Figure 12](#), is given in [Table 5](#) for KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C and KH-EZ CRC and [Table 8](#) for KH-EZ I and KH-EZ E. Shear values for KH-EZ I are for threaded inserts with $F_u \geq 125$ ksi. For use with inserts with F_u less than 125 ksi, the shear values are multiplied by the ratio of F_u of insert and 125 ksi.

4.1.6 Requirements for Static Concrete Breakout Strength in Shear, V_{cb} or V_{cbg} : The nominal concrete breakout strength of a single anchor or group of anchors in shear, V_{cb} or V_{cbg} , respectively, must be calculated in accordance with ACI 318-19 Section 17.7.2 with modifications as described in this section. The basic concrete breakout strength in shear, V_b , must be calculated in accordance with ACI 318-19 Section 17.7.2.2.1 using the values of ℓ_e and d_a given in [Tables 3, 4](#) and [7](#).

For anchors installed in the lower or upper flute of the soffit of sand-lightweight or normal-weight concrete-filled steel deck floor and roof assemblies, as shown in [Figure 12](#), calculation of the concrete breakout strength in accordance with ACI 318-19 Section 17.7.2 is not required.

4.1.7 Requirements for Static Concrete Pryout Strength in Shear, V_{cp} or V_{cpg} : The nominal concrete pryout strength of a single anchor or group of anchors, V_{cp} or V_{cpg} , respectively, must be calculated in accordance with ACI 318-19 Section 17.7.3 using the coefficient for pryout strength, k_{cp} provided in [Tables 3, 4](#) and [7](#) and the value of N_{cb} or N_{cbg} as calculated in Section 4.1.3 of this report.

For anchors installed in the lower or upper flute of the soffit of sand-lightweight or normal-weight concrete-filled steel deck floor and roof assemblies, as shown in [Figure 12](#), calculation of the concrete pryout strength in accordance with ACI 318-19 Section 17.7.3 is not required.

4.1.8 Requirements for Seismic Design:

4.1.8.1 General: For load combinations including seismic, the design must be in accordance with ACI 318-19 Section 17.10. Modifications to ACI 318-19 Section 17.10 shall be applied under Section 1905.7 of the 2024 IBC, as applicable.

The anchors comply with ACI 318-19 Section 2.3 as brittle steel elements and must be designed in accordance with ACI 318-19 Sections 17.10.5 or 17.10.6.

4.1.8.2 Seismic Tension: The nominal steel strength and nominal concrete breakout strength for anchors in tension must be calculated in accordance with ACI 318-19 Sections 17.6.1 and 17.6.2, as described in Sections 4.1.2 and 4.1.3 of this report. In accordance with ACI 318-19 Section 17.6.3.2.1, the appropriate value for pullout strength in tension for seismic loads, $N_{p,eq}$ or $N_{p,deck,cr}$ described in [Tables 3, 4](#) and 5 for KH-EZ, KH-EZ SS316, KH-EZ C, KH-EZ C SS316, KH-EZ P, KH-EZ PM, KH-EZ PL and KH-EZ CRC; and in [Tables 7](#) and [8](#) for KH-EZ I and KH-EZ E, must be used in lieu of N_p . $N_{p,eq}$ or $N_{p,deck,cr}$ may be adjusted by calculations for concrete compressive strength in accordance with Eq-1 of this report in addition for concrete-filled steel deck floor and roof assemblies the value of 3,000 psi (20.7 MPa) must be substituted for the value of 2,500 psi (17.2 MPa) in the denominator. Where values for $N_{p,eq}$ are not provided in [Tables 3, 4](#) or [7](#) of this report, the pullout strength in tension for seismic loads need not be evaluated.

4.1.8.3 Seismic Shear: The nominal concrete breakout strength and pryout strength in shear must be calculated in accordance with ACI 318-19 Sections 17.7.2 and 17.7.3, as described in Sections 4.1.6 and 4.1.7 of this report. In accordance with ACI 318-19 Section 17.7.1.2, the appropriate value for nominal steel strength for seismic loads, $V_{sa,eq}$ or $V_{sa,deck,eq}$ described in [Tables 3, 4](#) and [5](#) for KH-EZ, KH-EZ SS316, KH-EZ C, KH-EZ C SS316, KH-EZ P, KH-EZ PM, KH-EZ PL and KH-EZ CRC, and in [Tables 7](#) and [8](#) for KH-EZ I and KH-EZ E, must be used in lieu of V_{sa} .

4.1.9 Requirements for Interaction of Tensile and Shear Forces: For anchors or groups of anchors that are subject to the effects of combined tensile and shear forces, the design must be determined in accordance with ACI 318-19 Section 17.8.

4.1.10 Requirements for Minimum Member Thickness, Minimum Anchor Spacing and Minimum Edge Distance: In lieu of ACI 318-19 Section 17.9.2, values of s_{min} and c_{min} , respectively, as given in [Tables 1, 2](#) and [6](#) of this report must be used. In lieu of ACI 318-19 Section 17.9.4, minimum member thicknesses, h_{min} as given in [Tables 1, 2](#) and [6](#) must be used. Additional combinations for minimum edge distance, c_{min} , and minimum spacing distance, s_{min} , may be derived by linear interpolation between the given boundary values as defined in [Tables 1, 2](#) and [6](#) of this report.

For anchors installed through the lower flute of the soffit of steel deck assemblies, the anchors must be installed in accordance with [Figure 12](#) and shall have an axial spacing along the flute equal to the greater of $3h_{ef}$ or 1.5 times the flute width. For installations in the upper flute of the soffit of steel deck assemblies the anchors shall have an axial spacing along the flute equal to or greater than $3h_{ef}$.

For 1/4-inch, 3/8-inch and 1/2-inch KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL and KH-EZ C anchors installed on the top of steel deck assemblies, values of $c_{ac,deck,top}$, $s_{min,deck,top}$, and $c_{min,deck,top}$, as given in [Table 9](#) of this report must be used.

4.1.11 Requirements for Critical Edge Distance, c_{ac} : In applications where $c < c_{ac}$ and supplemental reinforcement to control splitting of the concrete is not present, the concrete breakout strength in tension for uncracked concrete, calculated in accordance with ACI 318-19 Section 17.6.2, must be further multiplied by the factor $\psi_{cp,N}$ as given by Eq-3:

$$\psi_{cp,N} = \frac{c}{c_{ac}} \quad (\text{Eq-3})$$

where the factor $\psi_{cp,N}$ need not be taken as less than $\frac{1.5h_{ef}}{c_{ac}}$. For all other cases, $\psi_{cp,N} = 1.0$. In lieu of using ACI 318-19 Section 17.9.5, values of c_{ac} must comply with [Tables 3, 4](#) and [7](#).

4.1.12 Lightweight Concrete: For the use of anchors in lightweight concrete, the modification factor λ_a equal to 0.8λ is applied to all values of $\sqrt{f'_c}$ affecting N_n and V_n .

The value of λ must be determined in accordance with the corresponding version of ACI 318.

For anchors installed in the soffit of sand-lightweight concrete-filled steel deck and floor and roof assemblies, further reduction of the pullout values provided in this report is not required.

4.2 Allowable Stress Design (ASD):

4.2.1 General: Design values for use with allowable stress design load combinations calculated in accordance with Section 1605.1 of the 2024 IBC must be established using the following equations:

$$T_{allowable,ASD} = \frac{\phi N_n}{\alpha} \quad (\text{Eq-4})$$

$$V_{allowable,ASD} = \frac{\phi V_n}{\alpha} \quad (\text{Eq-5})$$

where:

$T_{allowable,ASD}$ = Allowable tension load (lb, N)

$V_{allowable,ASD}$ = Allowable shear load (lb, N)

ϕN_n = Lowest design strength of an anchor or anchor group in tension as determined in accordance with ACI 318-19 Chapter 17 and 2024 IBC Section 1905.7, and Section 4.1 of this report, as applicable.

ϕV_n = Lowest design strength of an anchor or anchor group in shear as determined in accordance with ACI 318-19 Chapter 17 and 2024 IBC Section 1905.7, and Section 4.1 of this report, as applicable.

α = Conversion factor calculated as a weighted average of the load factors for the controlling load combination. In addition, α must include all applicable factors to account for nonductile failure modes and required over-strength.

Limits on edge distance, anchor spacing and member thickness as given in [Tables 1, 2](#) and [6](#) of this report must apply.

4.2.2 Interaction of Tensile and Shear Forces: The interaction must be calculated and consistent with ACI 318-19 Section 17.8 as follows:

For shear loads $V_{applied} \leq 0.2V_{allowable,ASD}$, the full allowable load in tension $T_{allowable,ASD}$ shall be permitted.

For tension loads $T_{applied} \leq 0.2T_{allowable,ASD}$, the full allowable load in shear $V_{allowable,ASD}$ shall be permitted.

For all other cases:

$$\frac{T_{applied}}{T_{allowable,ASD}} + \frac{V_{applied}}{V_{allowable,ASD}} \leq 1.2 \quad (\text{Eq-6})$$

4.3 Installation:

Installation parameters are provided in [Tables 1, 2, 6](#) and [9](#) and [Figures 1, 11A, 11B, 11C, 11D, 11E](#) and [12](#). Anchor locations must comply with this report and plans and specifications approved by the code official. The Hilti KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I and KH-EZ CRC must be installed in accordance with the manufacturer's published instructions and this report. In case of conflict, this report governs. Anchors must be installed in holes drilled into concrete perpendicular to the surface using carbide-tipped masonry drill bits complying with ANSI B212.15-1994 or using the Hilti SafeSet System™. The Hilti SafeSet System™ is comprised of Hilti TE-YD or TE-CD Hollow Drill Bits with a Hilti vacuum with a minimum value for the maximum volumetric flow rate of 129 CFM (61 l/s). The Hollow Drill Bits are not permitted for use with the 1/4-inch- and 3/8-inch-diameter anchors. The nominal drill bit diameter must be equal to that of the anchor. The minimum drilled hole depth, h_0 , is given in [Tables 1, 2, 6](#) and [8](#). When drilling dust is not removed after hole drilling, make sure to drill deep enough to achieve h_{nom} , taking into account the depth of debris remaining in the hole. If dust and debris is removed from the drilled hole with the Hilti TE-YD or TE-CD Hollow Drill Bits or compressed air, vacuum, or a manual pump, h_{nom} is achieved at the specified value of h_0 . 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 maximum impact wrench torque, $T_{impact,max}$ and maximum installation torque, $T_{inst,max}$ for the manual torque wrench must be in accordance with [Tables 1, 2](#) and [6](#). The KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I and KH-EZ CRC may be loosened by a maximum of one turn and retightened with a torque wrench or powered impact wrench to facilitate fixture attachment or realignment. Complete removal and reinstallation of the anchor is not allowed.

For installation in the soffit of concrete on steel deck assemblies, the hole diameter in the steel deck must not exceed the diameter of the hole in the concrete by more than 1/8 inch (3.2 mm). For member thickness and edge distance restrictions for installations into the soffit of concrete on steel deck assemblies, see [Figure 12](#).

For installation of 1/4-inch, 3/8-inch and 1/2-inch KH-EZ KH-EZ P, KH-EZ PM, KH-EZ PL and KH-EZ C, anchors on the top of steel deck assemblies, see [Table 9](#) for installation setting information.

4.4 Special Inspection:

Periodic special inspection is required, in accordance with Section 1705.1.1 and Table 1705.3 of the 2024 IBC. The special inspector must be on the site periodically during anchor installation to verify anchor type, anchor dimensions, hole dimensions, concrete type, concrete compressive strength, drill bit type and size, hole dimensions, hole cleaning procedures, anchor spacing(s), edge distance(s), concrete member thickness, anchor embedment, installation torque, impact wrench power and adherence to the manufacturer's printed installation instructions and the conditions of this report (in case of conflict, this report governs). The special inspector must be present as often as required in accordance with the "statement of special inspection." Under the IBC, additional requirements as set forth in Sections 1705, 1706 and 1707 must be observed, where applicable.

5.0 CONDITIONS OF USE:

Hilti KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I and KH-EZ CRC concrete anchors described in this report are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The anchors must be installed in accordance with the manufacturer's published installation instructions and this report. In case of conflict, this report governs.
- 5.2 Anchor sizes, dimensions, and minimum embedment depths are as set forth in this report.
- 5.3 Anchors must be installed in accordance with Section 4.3 of this report in uncracked or cracked normal-weight concrete and lightweight concrete having a specified compressive strength, f'_c , of 2,500 psi to 8,500 psi (17.2 MPa to 58.6 MPa), and cracked and uncracked normal-weight or sand-lightweight concrete over metal deck having a minimum specified compressive strength, f'_c , of 3,000 psi (20.7 MPa).
- 5.4 The value of f'_c used for calculation purposes must not exceed 8,000 psi (55.2 MPa).
- 5.5 The concrete must have attained its minimum design strength prior to installation of the anchors.
- 5.6 Strength design values must be established in accordance with Section 4.1 of this report.
- 5.7 Allowable stress design values must be established in accordance with Section 4.2 of this report.
- 5.8 Anchor spacing(s) and edge distance(s), and minimum member thickness, must comply with [Tables 1, 2 and 6](#) and [Figure 12](#) of this report.
- 5.9 Reported values for the KH-EZ I with an internally threaded hex washer head do not consider the steel insert element which must be verified by the design professional. Shear design values in this report for the KH-EZ I are for threaded inserts with F_u equal to or greater than 125 ksi. For use with inserts with F_u less than 125 ksi, the shear values are multiplied by the ratio of F_u of insert and 125 ksi.
- 5.10 Prior to 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.
- 5.11 Since an ICC-ES acceptance criteria for evaluating data to determine the performance of 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.
- 5.12 Anchors may be installed in regions of concrete where cracking has occurred or where analysis indicates cracking may occur ($f_t > f_r$), subject to the conditions of this report.
- 5.13 Anchors may be used to resist short-term loading due to wind or seismic forces, subject to the conditions of this report.
- 5.14 Anchors are not permitted to support fire-resistance-rated construction. Where not otherwise prohibited in the code, anchors are permitted for use with fire-resistance-rated 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-resistance-rated envelope or a fire-resistance-rated membrane, are protected by approved fire-resistance-rated materials, or have been evaluated for resistance to fire exposure in accordance with recognized standards.
 - Anchors are used to support nonstructural elements.

- 5.15 Anchors have been evaluated for reliability against brittle failure and found to be not significantly sensitive to stress-induced hydrogen embrittlement.
- 5.16 Use of KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, and KH-EZ I carbon steel anchors are limited to dry, interior locations.
- 5.17 Use of KH-EZ SS316, KH-EZ C SS316 and KH-EZ CRC are permitted for exterior exposure or damp environments.
- 5.18 Special inspection must be provided in accordance with Sections 4.4.
- 5.19 KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I and KH-EZ CRC 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 Mechanical Anchors in Concrete Elements \(AC193\(24\)\)](#), dated April 2025.

7.0 IDENTIFICATION

- 7.1 HILTI KH-EZ, KH-EZ SS316, KH-EZ P, KH-EZ PL, KH-EZ C, KH-EZ C SS316, KH-EZ E, KH-EZ I 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). The anchors with hex washer head, pan head and countersunk head, have KH-EZ, HILTI, and anchor size and anchor length embossed on the anchor head. Identifications are visible after installation, for verification.
- 7.2 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

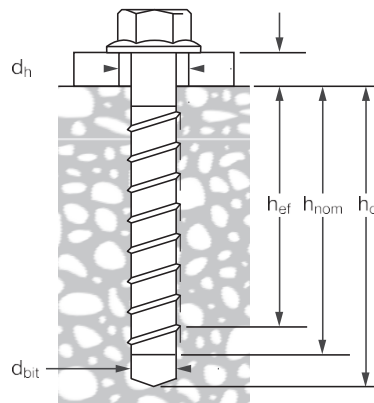


FIGURE 1—KWIK HUS EZ ANCHOR



FIGURE 2—HILTI KH-EZ CONCRETE SCREW ANCHOR



FIGURE 3—HILTI KH-EZ I SCREW ANCHOR

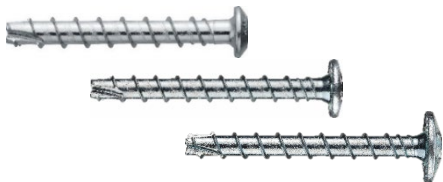


FIGURE 4—HILTI KH-EZ P, PM, PL SCREW ANCHORS



FIGURE 5—HILTI KH-EZ E SCREW ANCHOR



FIGURE 6—HILTI KH-EZ CRC SCREW ANCHOR



FIGURE 7—HILTI KH-EZ C SCREW ANCHOR



FIGURE 8—HILTI KH-EZ SS316 SCREW ANCHOR



FIGURE 9—HILTI KH-EZ C SS316 SCREW ANCHOR

Hilti SafeSet™ System with Hollow Drill Bit	 <p>Hilti TE-CD or TE-YD Hollow Carbide Drill Bit with a Hilti Vacuum (per section 4.3)</p>	
Hilti Dust Removal Systems	 <p>Hilti Rotary Hammer Drill with DRS (Dust Removal System) Module</p>	 <p>Hilti TE DRS-D Dust Removal System with Hilti Vacuum</p>

FIGURE 10—HILTI SAFESET™ AND DUST REMOVAL SYSTEMS

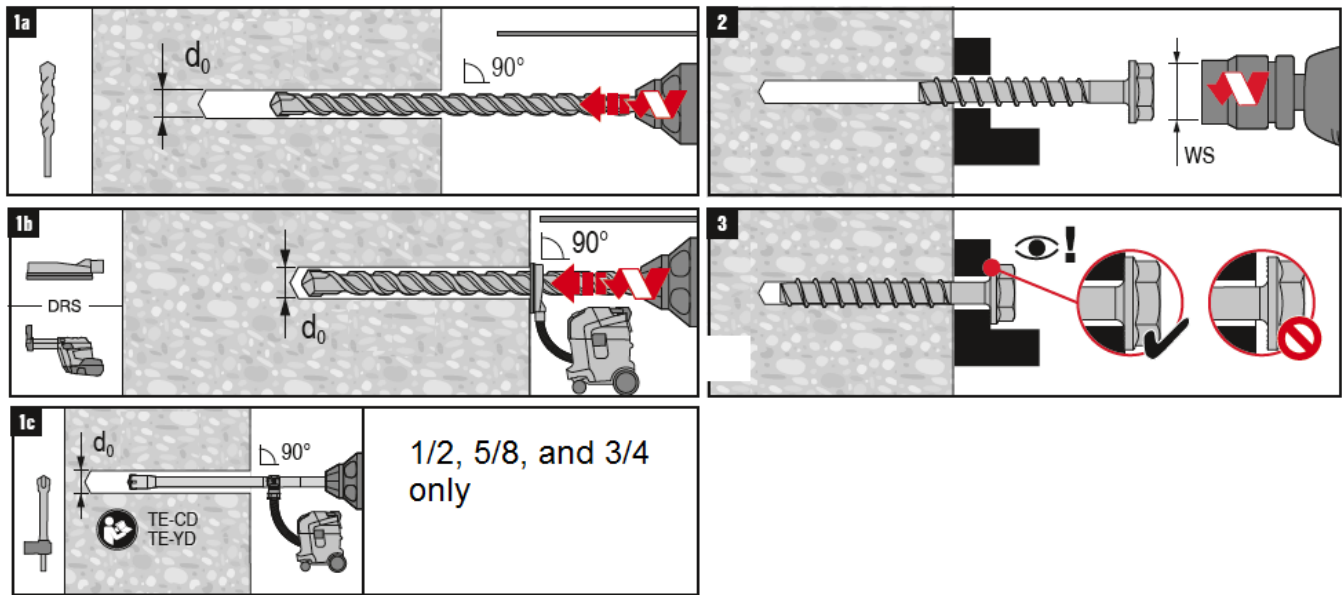


FIGURE 11A—INSTALLATION INSTRUCTIONS – HILTI KH-EZ, KH-EZ SS316 AND KH-EZ CRC SCREW ANCHORS

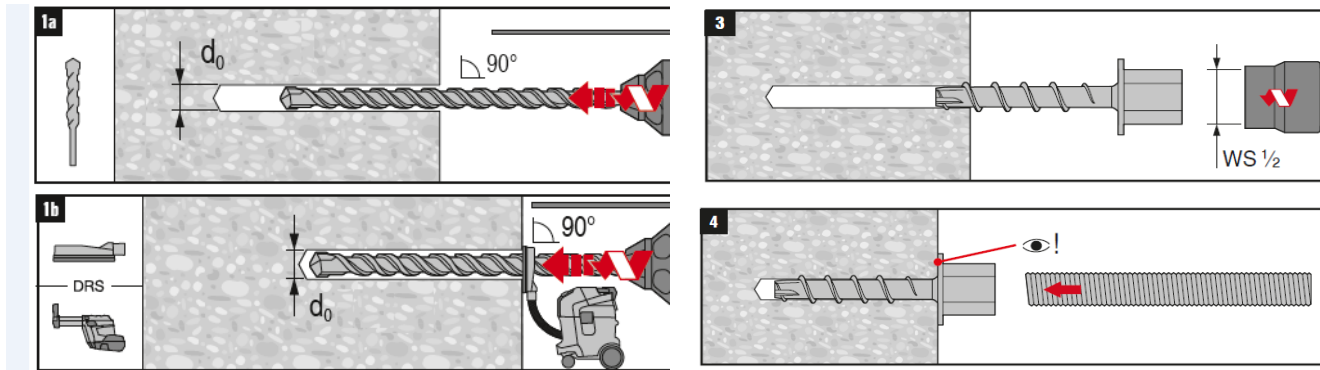


FIGURE 11B—INSTALLATION INSTRUCTIONS – HILTI KH-EZ I SCREW ANCHORS

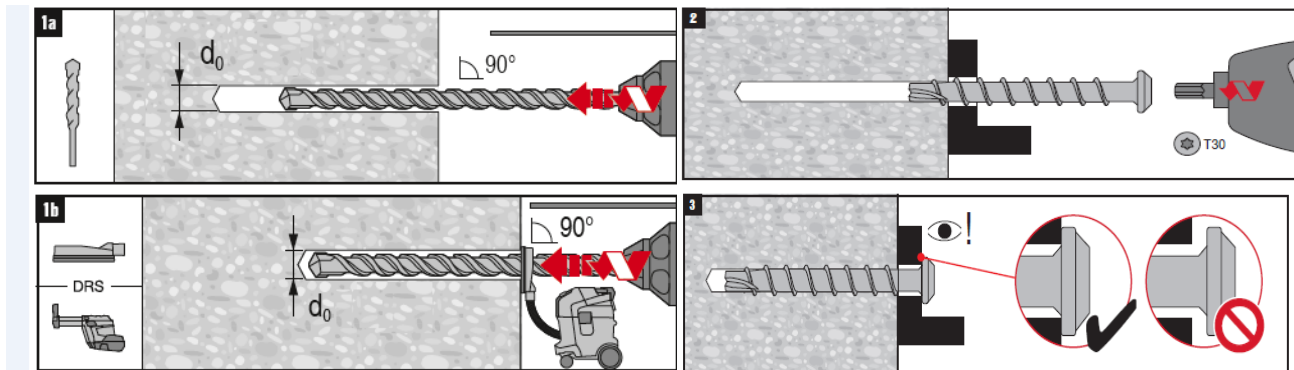


FIGURE 11C—INSTALLATION INSTRUCTIONS – HILTI KH-EZ P, PM, PL SCREW ANCHORS

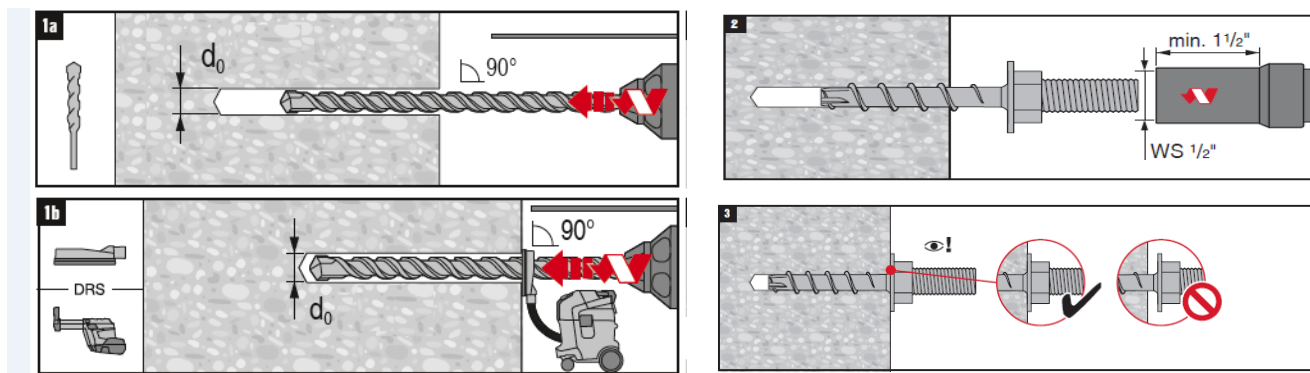


FIGURE 11D—INSTALLATION INSTRUCTIONS – HILTI KH-EZ E SCREW ANCHORS

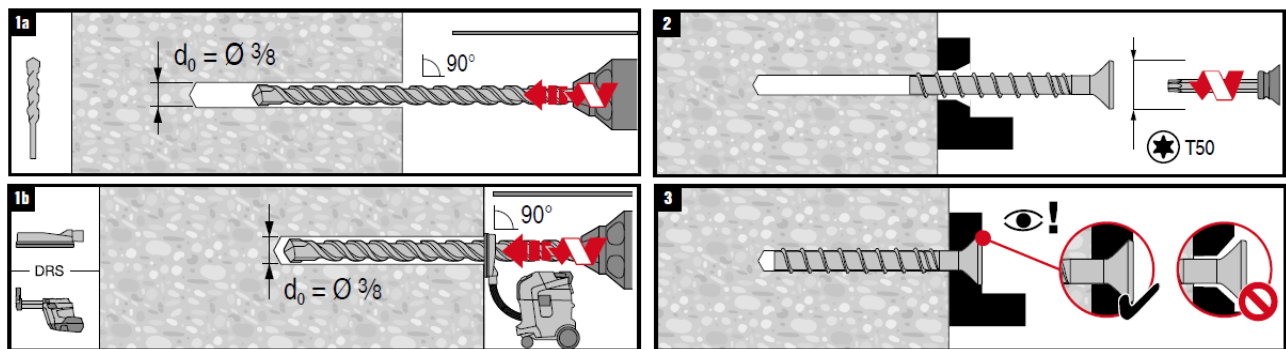


FIGURE 11E—INSTALLATION INSTRUCTIONS – HILTI KH-EZ C AND KH-EZ C SS316 SCREW ANCHORS

TABLE 1—HILTI KH-EZ, KH-EZ P, KH-EZ PL, KH-EZ C AND KH-EZ CRC INSTALLATION INFORMATION AND ANCHOR SPECIFICATION¹

Characteristic	Symbol	Units	Nominal Anchor Diameter (inches)																			
			1/4		3/8					1/2				5/8				3/4				
Nominal drill bit diameter	d _{bit}	in. (mm)	1/4 (6.4)		3/8 (9.5)					1/2 (12.7)				5/8 (15.9)				3/4 (19.1)				
Head Style and Coating	-	-	Hex, P, PM, PL, C Head		Hex, C Head		Hex, C Head (including CRC)		Hex Head (including CRC)		Hex Head (including CRC)				Hex Head (including CRC)				Hex Head (including CRC)			
Minimum Nominal Embedment depth	h _{nom}	in. (mm)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	1 ⁵ / ₈ (41)	2 ¹ / ₈ (54)	2 ¹ / ₂ (64)	3 ¹ / ₄ (83)	4 ¹ / ₂ (114)	2 ¹ / ₄ (57)	3 (76)	4 ¹ / ₄ (108)	5 ¹ / ₂ (140)	3 ¹ / ₄ (83)	4 (102)	5 (127)	6 (152)	4 (102)	5 (127)	6 ¹ / ₄ (159)	7 ¹ / ₄ (184)	
Effective Embedment (min.)	h _{ef}	in. (mm)	1.18 (30)	1.92 (49)	1.11 (28)	1.54 (39)	1.86 (47)	2.50 (64)	3.55 (90)	1.52 (39)	2.16 (55)	3.22 (82)	4.28 (109)	2.39 (61)	3.03 (77)	3.88 (99)	4.73 (120)	2.92 (74)	3.77 (96)	4.84 (123)	5.69 (145)	
Minimum Hole Depth (min.)	h _o	in. (mm)	2 (51)	2 ⁷ / ₈ (73)	1 ⁷ / ₈ (48)	2 ³ / ₈ (60)	2 ³ / ₄ (70)	3 ¹ / ₂ (89)	4 ³ / ₄ (121)	2 ⁵ / ₈ (67)	3 ³ / ₈ (86)	4 ⁵ / ₈ (117)	5 ⁷ / ₈ (149)	3 ⁵ / ₈ (92)	4 ³ / ₈ (111)	5 ³ / ₈ (137)	6 ³ / ₈ (162)	4 ³ / ₈ (111)	5 ³ / ₈ (137)	6 ⁵ / ₈ (168)	7 ⁵ / ₈ (194)	
Minimum Baseplate Clearance Hole Diameter	d _h	in. (mm)	3/8 (9.5)		1/2 (12.7)					5/8 (15.9)				3/4 (19.1)				7/8 (22.2)				
Maximum Installation Torque	T _{inst,max} ⁴	ft-lbf (Nm)	18 (24)		19 (26)	40 (54)				45 (61)		50 (68)		85 (115)				95 ⁶ (129)				
Maximum Impact Wrench Torque Rating ³	T _{impact,max}	ft-lbf (Nm)	157 (213)		157 (213)	450 (610)				137 (186)	450 (610)			590 (800)				590 (800)				
Wrench socket size	WS	in. (mm)	7/16 (11.1)		9/16 (14.3)					3/4 (19.1)				15/16 (23.8)				1 ¹ / ₈ (28.6)				
Minimum Concrete Thickness	h _{min}	in. (mm)	3.25 (83)	4.125 (105)	3.25 (83)	3.67 (93)	4 (102)	4.75 (121)	7.75 (197)	4.5 (114)	4.75 (121)	6.75 (171)	8.75 (222)	5 (127)	6 (152)	7 (178)	9.5 (241)	6 (152)	7 (178)	8.125 (206)	11.5 (292)	
Minimum edge distance ²	c _{min}	in. (mm)	1 ¹ / ₂ (38)		1 ¹ / ₂ (38)					1 ³ / ₄ (44)				1 ³ / ₄ (44)				1 ³ / ₄ (44)				
	for s ≥	in. (mm)	3 (76)		3 (76)					3 (76)				4 (102)				4 (102)				
Minimum spacing ²	s _{min}	in. (mm)	1 ¹ / ₂ (38)		2 ¹ / ₄ (57)					3 (76)				3 (76)				3 (76)				
	for c ≥	in. (mm)	2.00 (51)	2.78 (71)	2.63 (67)	2.75 (70)	2.92 (74)	3.75 (95)	14.2 (361)	2.75 (70)	3.75 (95)	5.25 (133)	17.1 (434)	3.63 (92)	4.57 (116)	5.82 (148)	18.9 (480)	4.41 (112)	5.69 (145)	7.28 (185)	22.8 (579)	
Max. Head height	-	in.	0.17 (P Head) 0.24 (Hex Head)		0.35					0.49				0.57				0.70				
		(mm)	(4.3) P Head (6.1) Hex Head		(8.9)					(12.4)				(14.5)				(17.8)				

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹The data presented in this table is to be used in conjunction with the design criteria of ACI 318-19 Chapter 17.

²Linear interpolation permitted for minimum spacing and edge distance.

³Because of variability in measurement procedures, the published torque of an impact tool may not correlate properly with the above setting torques. Over-torqueing can damage the anchor and/or reduce its holding capacity.

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

⁵Additional combinations for minimum edge distance, c_{min} , and minimum spacing distance, s_{min} or $s_{min,cac}$, may be derived by linear interpolation between the given boundary values.

⁶Maximum installation torque for $\frac{3}{4}$ -in diameter KH-EZ CRC is 85 ft-lbs (115 Nm).

TABLE 2—HILTI KH-EZ SS316 AND KH-EZ C SS316 INSTALLATION INFORMATION AND ANCHOR SPECIFICATION¹

Characteristic	Symbol	Units	Nominal anchor diameter (in)							
			¹ / ₄		³ / ₈			¹ / ₂		
Nominal drill bit diameter	<i>d_{bit}</i>	in.	¹ / ₄		³ / ₈			¹ / ₂		
Head style	-	-	Hex and C		Hex and C			Hex		
Effective embedment (min.)	<i>h_{ef}</i>	in. (mm)	1.19 (30)	1.93 (49)	1.49 (38)	1.92 (49)	2.55 (65)	1.56 (40)	2.20 (56)	3.26 (83)
Nominal embedment	<i>h_{nom}</i>	in. (mm)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	2 (51)	2 ¹ / ₂ (64)	3 ¹ / ₄ (83)	2 ¹ / ₄ (57)	3 (76)	4 ¹ / ₄ (108)
Hole depth in concrete (min.)	<i>h_o</i>	in. (mm)	2 (51)	2 ⁷ / ₈ (73)	2 ¹ / ₄ (57)	2 ³ / ₄ (70)	3 ¹ / ₂ (89)	2 ⁵ / ₈ (67)	3 ³ / ₈ (86)	4 ⁵ / ₈ (117)
Fixture hole diameter	<i>d_h</i>	in. (mm)	³ / ₈ (9.5)		¹ / ₂ (12.7)			⁵ / ₈ (15.9)		
Maximum impact wrench ² torque rating	<i>T_{impact,max}</i>	ft-lb (Nm)	100 (136)		157 (213)			332 (450)		
Wrench socket size	<i>WS</i>	in.	⁷ / ₁₆		⁹ / ₁₆			³ / ₄		
Minimum concrete thickness	<i>h_{min}</i>	in. (mm)	3 ¹ / ₄ (83)	4 ¹ / ₈ (105)	3 ¹ / ₂ (89)	4 (102)	4 ³ / ₄ (121)	4 ¹ / ₂ (114)	4 ³ / ₄ (121)	6 ³ / ₄ (171)
Minimum edge distance ³	<i>c_{min}</i>	in. (mm)	1 ¹ / ₂ (38)	1 ¹ / ₂ (38)	1 ¹ / ₂ (38)	1 ¹ / ₂ (38)	1 ¹ / ₂ (38)	1 ³ / ₄ (44)	1 ³ / ₄ (44)	1 ³ / ₄ (44)
	<i>for s ≥</i>	in. (mm)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)
Minimum anchor spacing ³	<i>s_{min}</i>	in. (mm)	1 ¹ / ₂ (38)	1 ¹ / ₂ (38)	2 ¹ / ₄ (57)	2 ¹ / ₄ (57)	2 ¹ / ₄ (57)	3 (76)	3 (76)	3 (76)
	<i>for c ≥</i>	in. (mm)	2 (51)	2 (51)	3 (76)	3 (76)	3 (76)	1 ³ / ₄ (44)	1 ³ / ₄ (44)	1 ³ / ₄ (44)

or **SI**: 1 inch = 25.4mm, 1 ft-lb = 1.3558 Nm

¹The data presented in this table is to be used in conjunction with the design criteria of ACI 318-19 Chapter 17.

²Because 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.

³Linear interpolation permitted for minimum spacing and edge distance.

TABLE 3—HILTI KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C AND KH-EZ CRC TENSION AND SHEAR STRENGTH DESIGN DATA^{1,2,3,6}

Characteristic	Symbol	Units	Nominal Anchor Diameter (inches)																			
			1/4		3/8				1/2				5/8				3/4					
Head style and coating	-	-	Hex, P, PM, PL, C Head		Hex, C Head		Hex, C Head (including CRC)		Hex Head (including CRC)		Hex Head (including CRC)				Hex Head (including CRC)				Hex Head (including CRC)			
Nominal diameter	d_a	in. (mm)	0.250 (6.4)		0.375 (9.5)				0.500 (12.7)				0.625 (15.9)				0.750 (19.1)					
Effective embedment	h_{ef}	in. (mm)	1.18 (30)	1.92 (49)	1.11 (28)	1.54 (39)	1.86 (47)	2.50 (64)	3.55 (90)	1.52 (39)	2.16 (55)	3.22 (82)	4.28 (109)	2.39 (61)	3.03 (77)	3.88 (99)	4.73 (120)	2.92 (74)	3.77 (96)	4.84 (123)	5.69 (145)	
Nominal embedment	h_{nom}	in. (mm)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	1 ⁵ / ₈ (41)	2 ¹ / ₈ (54)	2 ¹ / ₂ (64)	3 ¹ / ₄ (83)	4 ¹ / ₂ (114)	2 ¹ / ₄ (57)	3 (76)	4 ¹ / ₄ (108)	5 ¹ / ₂ (140)	3 ¹ / ₄ (83)	4 (102)	5 (127)	6 (127)	4 (102)	5 (127)	6 ¹ / ₄ (159)	7 ¹ / ₄ (184)	
Strength reduction factor for steel in tension ^{2,7}	ϕ_{sa}	-	0.65		0.65				0.65				0.65				0.65					
Effective tensile stress area	A_{se}	in. ² (mm ²)	0.045 (29.0)		0.086 (55.5)				0.161 (103.9)				0.268 (172.9)				0.392 (252.9)					
Minimum specified ultimate strength	f_{uta}	psi (MPa)	125,000 (862)		106,975 (738)		120,300 (829)		112,540 (776)				90,180 (622)				81,600 (563)					
Tension resistance of steel	N_{sa}	lbf. (kN)	5,660 (25)		9,200 (41)		10,335 (46)		18,120 (81)				24,210 (108)				32,015 (142)					
Anchor category	-	-	3	1	1				1				1		2	1						
Strength reduction factor for concrete failure modes in tension ²	$\phi_{c,N}$	-	0.45	0.65	0.65				0.65				0.65		0.55	0.65						
Effectiveness factor – uncracked concrete	k_{uncr}	-	24		24				27		24		27		24	27			24			
Effectiveness factor – cracked concrete	k_{cr}	-	17		17				17				17		17							
Modification factor for cracked and uncracked concrete ⁶	$\Psi_{c,N}$	-	1.0		1.0				1.0				1.0		1.0							
Critical edge distance	c_{ac}	in. (mm)	2.00 (51)	2.78 (71)	2.63 (67)	2.75 (70)	2.92 (74)	3.75 (95)	14.2 (361)	2.75 (70)	3.75 (95)	5.25 (133)	17.1 (434)	3.63 (92)	4.57 (116)	5.82 (148)	18.9 (480)	4.41 (112)	5.69 (145)	7.28 (185)	22.8 (578)	
Pullout strength in uncracked concrete	$N_{p,uncr}$ ⁶	lbf. (kN)	1,305 ⁵ (5.8)	2,350 ⁴ (10.5)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Pullout strength in cracked concrete	$N_{p,cr}$ ⁶	lbf. (kN)	665 ⁵ (3.0)	1,165 ⁴ (5.2)	725 ⁴ (3.2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Pullout strength in cracked concrete, seismic	$N_{p,eq}$ ⁶	lbf. (kN)	535 ⁵ (2.4)	1,165 ⁴ (5.2)	725 ⁴ (3.2)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Strength reduction factor for steel in shear ^{2,7}	ϕ_{sa}	-	0.60		0.60				0.60				0.60				0.60					
Nominal steel strength in shear ⁸	V_{sa}	lbf. (kN)	1,550 (6.9)		3,670 (16.3)		5,185 (23.1)		9,245 (41.1)				11,220 (49.9)				16,660 (74.1)					
Nominal steel strength in shear, seismic ⁸	$V_{sa,eq}$	lbf. (kN)	1,395 (6.2)		3,670 (16.3)		3,110 (13.8)		5,545 (24.7)				6,735 (30.0)				11,555 (51.4)					
Load bearing length of anchor	ℓ_e	in. (mm)	1.18 (30)	1.92 (49)	1.11 (28)	1.54 (39)	1.86 (47)	2.50 (64)	3 (76)	1.52 (39)	2.16 (55)	3.22 (82)	4 (102)	2.39 (61)	3.03 (77)	3.88 (99)	4.73 (120)	2.92 (74)	3.77 (96)	4.84 (123)	5.69 (145)	
Strength reduction factor for concrete failure modes in shear ²	$\phi_{c,V}$	-	0.70		0.70				0.70				0.70				0.70					
Effectiveness factor for pryout	k_{cp}	-	1.0	1.0	1.0	1.0	1.0	2.0	2.0	1.0	1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Mean axial stiffness, uncracked concrete	β_{uncr}	lb/in.	437,000		540,000				835,000				819,000				261,000					
Mean axial stiffness, cracked concrete	β_{cr}		284,000		239,000				272,000				332,000				252,000					

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹The data in this table is intended for use with the design provisions of ACI 318-19 Chapter 17 for anchors resisting seismic load combinations the additional requirements of ACI 318-19 Section 17.10 shall apply.

²The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 Section 17.5.3

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

⁴The characteristic pullout resistance for concrete compressive strengths greater than 2,500 psi may be increased by multiplying the value in the table by $(f'_c/2,500)^{0.5}$ for psi or $(f'_c/17.2)^{0.5}$ for MPa.

⁵The characteristic pullout resistance for concrete compressive strengths greater than 2,500 psi may be increased by multiplying the value in the table by $(f'_c/2,500)^{0.3}$ for psi or $(f'_c/17.2)^{0.3}$ for MPa.

⁶For lightweight concrete, calculate values according to Section 4.1.12 of this report.

⁷The KH-EZ, KH-EZ P, PM, PL and KH-EZ CRC are considered brittle steel elements as defined by ACI 318-19 Section 2.3.

⁸Reported 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 17.7.1.2b of ACI 318-19.

TABLE 4—HILTI KH-EZ SS316 AND KH-EZ C SS316 TENSION AND SHEAR STRENGTH DESIGN DATA¹

Characteristic	Symbol	Units	Nominal anchor diameter (in)							
			¹ / ₄		³ / ₈			¹ / ₂		
Head style	-	-	Hex and C		Hex and C			Hex		
Anchor O.D.	d_a	in. (mm)	0.250 (6.4)		0.375 (9.5)			0.5 (12.7)		
Effective embedment	h_{ef}	in. (mm)	1.19 (30)	1.93 (49)	1.49 (38)	1.92 (49)	2.55 (65)	1.56 (40)	2.20 (56)	3.26 (83)
Nominal embedment	h_{nom}	in. (mm)	¹ ⁵ / ₈ (41)	² ¹ / ₂ (64)	2 (51)	² ¹ / ₂ (64)	³ ¹ / ₄ (83)	² ¹ / ₄ (57)	3 (76)	⁴ ¹ / ₄ (108)
Strength reduction factor for steel in tension ^{1,2}	$\phi_{sa,N}$	-	0.75		0.75			0.75		
Min. specified yield strength	f_{ya}	psi (N/mm ²)	135,600 (935)		125,000 (862)			101,400 (699)		
Min. specified ult. strength	f_{uta}	psi (N/mm ²)	153,000 (1055)		139,300 (961)			120,100 (828)		
Effective-cross sectional steel area in tension	$A_{se,N}$	in ² (mm ²)	0.040 (25.5)		0.094 (60.8)			0.172 (111.2)		
Nominal steel strength in tension ⁴	N_{sa}	lb (kN)	6,120 (27.2)		13,095 (58.2)			20,655 (91.9)		
Anchor category	-	-	2	3	1			2		
Strength reduction factor for concrete failure modes in tension ²	$\phi_{c,N}$	-	0.55	0.45	0.65			0.55		
Effectiveness factor for uncracked concrete	k_{uncr}	in-lb (SI)	24 (10.0)		27 (11.3)			27 (11.3)		
Effectiveness factor for cracked concrete	k_{cr}	in-lb (SI)	17 (7.1)		17 (7.1)			21 (8.8)		
Modification factor for anchor resistance, tension, uncracked conc. ³	$\psi_{c,N}$	-	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Critical edge distance	c_{ac}	in. (mm)	4.76 (121)	7.72 (196)	5.96 (151)	7.68 (195)	10.20 (259)	6.24 (158)	8.80 (224)	7.50 (191)
Pullout strength in uncracked concrete	$N_{p,uncr}$	lb (kN)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pullout strength in cracked concrete ⁴	$N_{p,cr}$	lb (kN)	570 (2.5)	1,100 (4.9)	1,510 (6.7)	2,215 (9.9)	N/A	N/A	N/A	N/A
Pullout strength in cracked concrete, seismic ⁴	$N_{p,eq}$	lb (kN)	390 (1.7)	1,100 (4.9)	1,510 (6.7)	2,215 (9.9)	N/A	N/A	N/A	N/A
Strength reduction factor for steel in shear ^{1,2}	$\phi_{sa,V}$	-	0.65		0.65			0.65		
Nominal steel strength in shear	V_{sa}	lb (kN)	1,830 (8.1)	1,830 (8.1)	4,355 (19.4)	4,355 (19.4)	4,355 (19.4)	4,790 (21.3)	4,790 (21.3)	4,790 (21.3)
Nominal steel strength in shear, seismic	$V_{sa,eq}$	lb (kN)	1,200 (5.3)	1,200 (5.3)	4,355 (19.4)	4,355 (19.4)	4,355 (19.4)	4,790 (21.3)	4,790 (21.3)	4,790 (21.3)
Strength reduction factor for concrete failure modes in shear ²	$\phi_{c,V}$	-	0.70		0.70			0.70		
Effectiveness factor for pryout	k_{cp}	-	1.0	1.0	1.0	1.0	2.0	1.0	1.0	2.0
Mean axial stiffness, uncracked concrete ⁵	β_{uncr}	lbf/in	519,400		770,900			1,244,000		
Mean axial stiffness, cracked concrete ⁵	β_{cr}	lbf/in	341,600		452,600			757,000		

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹ The KH-EZ SS is considered a ductile steel element as defined by ICC-ES AC193 Section 6.3.6.

² The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 Section 17.5.3 are met.

³ For all design cases, $\psi_{c,N} = 1.0$. The appropriate effectiveness factor for cracked concrete (k_{cr}) or uncracked concrete (k_{uncr}) must be used.

⁴ For all design cases, $\psi_{c,P} = 1.0$. Tabular value for pullout strength is for a concrete compressive strength of 2,500 psi (17.2 MPa). Pullout strength for concrete compressive strength greater than 2,500 psi (17.2 MPa) may be increased by multiplying the tabular pullout strength by $(f'_c / 2,500)^n$ for psi or $(f'_c / 17.2)^n$ for MPa where $n=0.15$ for 1/4" x 1-5/8" and $n=0.35$ for 1/4" x 2-1/2". NA (not applicable) denotes that pullout strength does not need to be considered for design.

⁵ Mean values shown. Actual stiffness varies considerably depending on concrete strength, loading, and geometry of application.

TABLE 5—HILTI KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C AND KH-EZ CRC TENSION AND SHEAR DESIGN DATA FOR INSTALLATION IN THE UNDERSIDE OF CONCRETE-FILLED PROFILE STEEL DECK ASSEMBLIES^{1,5,6,7}

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		
Head Style and Coating	-	-	Hex, P, PM, PL, C Head		Hex, C Head	Hex Head (including CRC)								Same as previous					
Embedment	h_{nom}	in. (mm)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	3 ¹ / ₄ (83)	2 ¹ / ₄ (57)	3 (76)	4 ¹ / ₄ (108)	3 ¹ / ₄ (83)	5 (127)	4 (102)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	2 ¹ / ₄ (57)	
Minimum Hole Depth	h_o	in. (mm)	2 (51)	2 ⁷ / ₈ (73)	1 ⁷ / ₈ (47)	2 ³ / ₄ (70)	3 ¹ / ₂ (83)	2 ⁵ / ₈ (67)	3 ³ / ₈ (86)	4 ⁵ / ₈ (117)	3 ⁵ / ₈ (92)	5 ³ / ₈ (137)	4 ³ / ₈ (111)	2 (51)	2 ⁷ / ₈ (73)	1 ⁷ / ₈ (48)	2 ⁷ / ₈ (73)	2 ⁵ / ₈ (67)	
Effective Embedment Depth	h_{ef}	in. (mm)	1.18 (30)	1.92 (49)	1.11 (28)	1.86 (47)	2.50 (64)	1.52 (39)	2.16 (55)	3.22 (82)	2.39 (61)	3.88 (99)	2.92 (74)	1.18 (30)	1.92 (49)	1.11 (28)	1.86 (47)	1.52 (39)	
Pullout Resistance, (uncracked concrete) ²	$N_{p,deck,uncr}$	lbf. (kN)	1,210 (5.4)	1,875 (8.3)	1,300 (5.8)	2,240 (10.0)	3,920 (17.4)	1,305 (5.8)	3,060 (13.6)	5,360 (23.8)	4,180 (18.6)	9,495 (42.2)	4,180 (18.6)	1,490 (6.6)	1,960 (8.7)	1,490 (6.6)	2,920 (13.0)	1,395 (6.2)	
Pullout Resistance (cracked conc. / seismic loads) ³	$N_{p,deck,cr}$	lbf. (kN)	620 (2.8)	930 (4.1)	810 (3.6)	1,590 (7.1)	2,780 (12.4)	820 (3.6)	1,930 (8.6)	3,375 (15.0)	2,630 (11.7)	5,980 (26.6)	2,630 (11.7)	760 (3.4)	975 (4.3)	1,185 (5.3)	2,070 (9.2)	985 (4.4)	
Steel Strength in Shear ⁴	$V_{sa,deck}$	lbf. (kN)	1,205 (5.4)	2,210 (9.8)	1,510 (6.7)	1,510 (6.7)	3,605 (16.0)	1,605 (7.1)	2,920 (13.0)	3,590 (16.0)	3,470 (15.4)	4,190 (18.6)	3,760 (16.7)	1,205 (5.4)	3,265 (14.5)	3,670 (16.3)	6,090 (27.1)	7,850 (34.9)	
Steel Strength in Shear, Seismic	$V_{sa,deck,eq}$	lbf. (kN)	905 (4.0)	1,990 (8.9)	905 (4.0)	905 (4.0)	2,165 (9.6)	965 (4.3)	1,750 (7.8)	2,155 (9.6)	2,080 (9.3)	2,515 (11.2)	2,610 (11.6)	1,080 (4.8)	2,940 (13.1)	3,670 (16.3)	3,650 (16.2)	4,710 (21.0)	

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹Installation must comply with Sections 4.1.10 and 4.3 and Figure 12 of this report.

²The values listed must be used in accordance with Section 4.1.4 of this report.

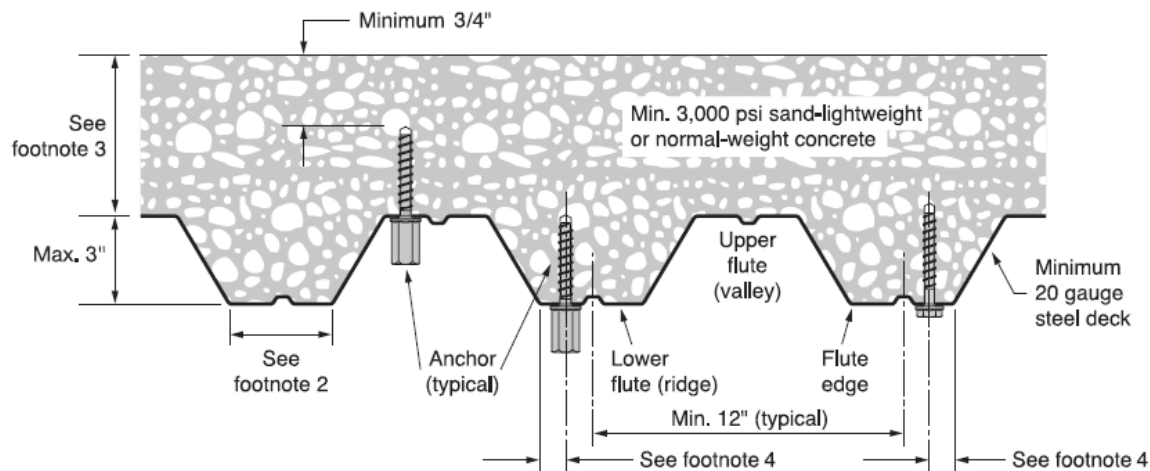
³The values listed must be used in accordance with Section 4.1.4 and 4.1.8.2 of this report.

⁴The values listed must be used in accordance with Section 4.1.5 and 4.1.8.3 of this report.

⁵The values for ϕ_p in tension and the values for ϕ_{sa} in shear can be found in Table 3 of this report.

⁶For the 1/4-inch-diameter (KH-EZ) at 2 1/2-inch nominal embedment and the 3/8-inch- through 3/4-inch-diameter anchors the characteristic pullout resistance for concrete compressive strengths greater than 3,000 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.

⁷For the 1/4-inch-diameter anchors (KH-EZ and KH-EZ P, PM, PL) at 1 5/8-inch nominal embedment characteristic pullout resistance for concrete compressive strengths greater than 3,000 psi may be increased by multiplying the value in the table by $(f'_c/3,000)^{0.3}$ for psi or $(f'_c/20.7)^{0.3}$ for MPa.

**FIGURE 12—INSTALLATION OF KH-EZ, KH-EZ CRC AND KH-EZ I IN SOFFIT OF CONCRETE OVER STEEL DECK FLOOR AND ROOF ASSEMBLIES¹**

¹Anchors may be placed in the upper or lower flute of the steel deck profile provided the minimum hole clearance 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.

²Minimum flute width for 1/4-inch diameter KH-EZ and KH-EZ I and 3/8-inch diameter KH-EZ I is 3 3/8 inches. Minimum flute width for KH-EZ 3/8-, 1/2-, 5/8- and 3/4-inch diameters is 4 1/2 inches.

³Minimum concrete thickness above upper flute for 1/4-inch diameter KH-EZ and 3/8-inch KH-EZ I is 2 1/2 inches. Minimum concrete thickness above upper flute for KH-EZ 3/8-, 1/2-, 5/8- and 3/4-inch diameter is 3 1/4 inches.

⁴Minimum distance from edge of flute to centerline of anchor for KH-EZ and KH-EZ I 1/4-inch diameter is 1-inch. Minimum distance from edge of flute to centerline of anchor for KH-EZ 3/8-, 1/2-, 5/8- and 3/4-inch diameter is 1 1/4 inches.

TABLE 6—HILTI KH-EZ E AND KH-EZ I, INSTALLATION INFORMATION AND ANCHOR SPECIFICATION¹

Characteristic	Symbol	Units	Nominal Anchor Diameter (inches)	
			¹ / ₄ (KH-EZ I and KH-EZ E)	³ / ₈ (KH-EZ I)
Nominal drill bit diameter	d_{bit}	in.	¹ / ₄	³ / ₈
Head style	-	-	Internally (I) or Externally (E) Threaded	
Effective embedment	h_{ef}	in. (mm)	1.18 (30)	1.92 (49)
Nominal embedment	h_{nom}	in. (mm)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)
Hole depth in concrete Hole depth in concrete (min.)	h_o	in. (mm)	2 (51)	2 ⁷ / ₈ (73)
Maximum installation torque	$T_{inst,max}^4$	ft-lbf (Nm)	18 (24)	40 (54)
Maximum impact wrench torque rating ³	$T_{impact,max}$	ft-lbf (Nm)	114 (155)	137 (186)
Wrench socket size – KH-EZ I	¹ / ₄ " Internal Thread	in. (mm)	³ / ₈ (9.5)	N/A
	³ / ₈ " Internal Thread	in. (mm)	¹ / ₂ (12.7)	N/A
	¹ / ₂ " Internal Thread	in. (mm)	N/A	³ / ₄ (19.1)
Wrench socket size – KH-EZ E	WS	in. (mm)	¹ / ₂ (12.7)	N/A
Minimum concrete thickness	h_{min}	in. (mm)	3 ¹ / ₄ (83)	4 ¹ / ₈ (105)
Minimum edge distance ²	c_{min}^6	in. (mm)	1 ¹ / ₂ (38)	1 ¹ / ₂ (38)
	for $s \geq^6$	in. (mm)	3 (76)	3 (76)
Minimum anchor spacing	s_{min}^6	in. (mm)	1 ¹ / ₂ (38)	2 ¹ / ₄ (57)
	for $c \geq^6$	in. (mm)	2.00 (51)	2.78 (71)
Max. head height – KH-EZ I	¹ / ₄ " Internal Thread	in. (mm)	⁵ / ₈ (15.9)	N/A
	³ / ₈ " Internal Thread	in. (mm)	¹¹ / ₁₆ (17.5)	N/A
	¹ / ₂ " Internal Thread	in. (mm)	N/A	³ / ₄ (19.1)
Max. head height KH-EZ E	³ / ₈ " External thread	in. (mm)	1 ³ / ₈ (35)	N/A

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹The data presented in this table is to be used in conjunction with the design criteria of ACI 318-19 Chapter 17.

²For installations through the soffit of steel deck into concrete (see [Figure 12](#)) anchors installed in the lower flute may be installed with a maximum 1 inch offset in either direction from the center of the flute.

³Because 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.

⁵The KH-EZ I and KH-EZ E versions are driven directly to the supporting member surface.

⁶Additional combinations for minimum edge distance, c_{min} , and minimum spacing distance, s_{min} , may be derived by linear interpolation between the given boundary values.

TABLE 7—HILTI KH-EZ E AND KH-EZ I TENSION AND SHEAR STRENGTH DESIGN DATA^{1,2,3,6}

Characteristic	Symbol	Units	Nominal Anchor Dimension		
			¹ / ₄ (KH-EZ I and KH-EZ E)	³ / ₈ (KH-EZ I)	
Head style	-	-	Internally (I) or Externally (E) Threaded		Internally (I)
Nominal diameter	d_a	in. (mm)	0.250 (6.4)		0.375 (9.5)
Effective embedment	h_{ef}	in. (mm)	1.18 (30)	1.92 (49)	1.54 (39)
Nominal embedment	h_{nom}	in. (mm)	1 ⁵ / ₈ (41)	2 ¹ / ₂ (64)	2 ¹ / ₈ (54)
Strength reduction factor for steel in tension ^{2,7}	ϕ_{sa}	-	0.65		0.65
Min. specified ult. strength	A_{se}	in. ² (mm ²)	0.045 (29.0)		0.086 (55.5)
Effective-cross sectional steel area in tension	f_{uta}	psi (MPa)	125,000 (862)		106,975 (738)
Nominal steel strength in tension	N_{sa}	lbf. (kN)	5,660 (25)		9,200 (41)
Anchor category 1, 2 or 3	-	-	3	1	1
Strength reduction factor for concrete failure modes in tension ²	$\phi_{c,N}$	-	0.45	0.65	0.65
Effectiveness factor for uncracked concrete	k_{uncr}	-	24		24
Effectiveness factor for cracked concrete	k_{cr}	-	17		17
Modification factor for anchor resistance, tension, uncracked concrete	$\psi_{c,N}$	-	1.0		1.0
Critical edge distance	c_{ac}	in. (mm)	2.00 (51)	2.78 (71)	2.75 (70)
Pullout strength in uncracked concrete	$N_{p,uncr}$ ⁶	lbf. (kN)	1,305 ⁵ (5.8)	2,350 ⁴ (10.5)	N/A
Pullout strength in cracked concrete	$N_{p,cr}$ ⁶	lbf. (kN)	665 ⁵ (3.0)	1,165 ⁴ (5.2)	N/A
Pullout strength in cracked concrete, seismic	$N_{p,eq}$ ⁶	lbf. (kN)	535 ⁵ (2.4)	1,165 ⁴ (5.2)	N/A
Strength reduction factor for steel in shear ²	$\phi_{sa,V}$	-	0.60		0.60
Nominal steel strength in shear ⁸	V_{sa}	lbf. (mm)	1,360 (6.4)	1,315 (9.5)	1,885 (12.7)
Nominal steel strength in shear, seismic ⁸	$V_{sa,eq}$	lbf. (kN)	605 (2.7)	1,120 (5.0)	1,885 (8.4)
Load bearing length of anchor	ℓ_e	in. (mm)	1.18 (30)	1.92 (49)	1.54 (39)
Strength reduction factor for concrete failure modes in shear ²	$\phi_{c,V}$	-	0.70		0.70
Coefficient for Pryout Strength	k_{cp}	-	1.0	1.0	1.0
Mean axial stiffness, uncracked concrete	β_{uncr}	lb/in. (N/mm)	760,000 (133,000)		
Mean axial stiffness, cracked concrete	β_{cr}	lb/in. (N/mm)	293,000 (51,275)		

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹The data in this table is intended for use with the design provisions of ACI 318-19 Chapter 17 for anchors resisting seismic load combinations the additional requirements of ACI 318-19 Section 17.10 shall apply.

²The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 Section 17.5.3 are met.

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

⁴The characteristic pullout resistance for concrete compressive strengths greater than 2,500 psi may be increased by multiplying the value in the table by $(f'_c/2,500)^{0.5}$ for psi or $(f'_c/17.2)^{0.5}$ for MPa.

⁵The characteristic pullout resistance for concrete compressive strengths greater than 2,500 psi may be increased by multiplying the value in the table by $(f'_c/2,500)^{0.3}$ for psi or $(f'_c/17.2)^{0.3}$ for MPa.

⁶For lightweight concrete, calculate values according to Section 4.1.12 of this report.

⁷The KH-EZ E and KH-EZ I are considered brittle steel elements as defined by ACI 318-19 Section 2.3.

⁸Reported 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 17.7.1.2b of ACI 318-19.

TABLE 8—HILTI KH-EZ I AND KH-EZ E TENSION AND SHEAR DESIGN DATA FOR INSTALLATION IN THE UNDERSIDE OF CONCRETE-FILLED PROFILE STEEL DECK ASSEMBLIES^{1,6,7}

Characteristic	Symbol	Units	Lower Flute					Upper Flute				
			Nominal Anchor Diameter									
			1/4				3/8	1/4				3/8
Head Style	-	-	Internally (I) Threaded and Externally (E) Threaded				Internally Threaded	Internally (I) Threaded and Externally (E) Threaded				Internally Threaded
Embedment	h_{nom}	in. (mm)	15/8 (41)	21/2 (64)	15/8 (41)	21/2 (64)	21/8 (54)	15/8 (41)	21/2 (64)	15/8 (41)	21/2 (64)	21/8 (54)
Minimum Hole Depth	h_o	in. (mm)	2 (51)	27/8 (73)	2 (51)	27/8 (73)	23/8 (60)	2 (51)	27/8 (73)	2 (51)	27/8 (73)	23/8 (60)
Internal Thread Diameter	-	in. (mm)	1/4 (6.4)		3/8 (9.5)		1/2 (12.7)	1/4 (6.4)		3/8 (9.5)		1/2 (12.7)
Effective Embedment Depth	h_{ef}	in. (mm)	1.18 (30)	1.92 (49)	1.18 (30)	1.92 (49)	1.54 (39)	1.18 (30)	1.92 (49)	1.18 (30)	1.92 (49)	1.54 (39)
Pullout Resistance, (uncracked concrete) ²	$N_{p,deck,uncr}$	lbf. (kN)	1,210 (5.4)	1,875 (8.3)	1,210 (5.4)	1,875 (8.3)	1,720 (7.7)	1,490 (6.6)	1,960 (8.7)	1,490 (6.6)	1,960 (8.7)	2,660 (11.8)
Pullout Resistance (cracked concrete and seismic loads) ³	$N_{p,deck,cr}$	lbf. (kN)	620 (2.8)	930 (4.1)	620 (2.8)	930 (4.1)	1,220 (5.4)	730 (3.2)	975 (4.3)	730 (3.2)	975 (4.3)	1,885 (8.4)
Steel Strength in Shear ⁴	$V_{sa,deck}$	lbf. (kN)	860 (3.8)		1,025 (4.6)		2,380 (10.6)	1,015 (4.5)		1,525 (6.8)		3,650 (16.2)
Steel Strength in Shear, Seismic	$V_{sa,deck,eq}$	lbf. (kN)	385 (1.7)		875 (3.9)		2,380 (10.6)	445 (2.0)		1,295 (5.8)		3,650 (16.2)

For SI: 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m, 1 psi = 6.89 kPa, 1 in² = 645 mm², 1 lb/in = 0.175 N/mm.

¹Installation must comply with Sections 4.1.10 and 4.3 and [Figures 11B, 11D, and 12](#) of this report.

²The values listed must be used in accordance with Section 4.1.4 of this report.

³The values listed must be used in accordance with Section 4.1.4 and 4.1.8.2 of this report.

⁴The values listed must be used in accordance with Section 4.1.5 and 4.1.8.3 of this report.

⁵The values for ϕ_p in tension and the values for ϕ_{sa} in shear can be found in [Table 3](#) of this report.

⁶For the ¹/₄-inch-diameter (KH-EZ I) at 2-¹/₂ inch nominal embedment the characteristic pullout resistance for concrete compressive strengths greater than 3,000 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.

⁷For the ¹/₄-inch-diameter anchors (KH-EZ I and KH-EZ E) at ¹⁵/₈-inch nominal embedment characteristic pullout resistance for concrete compressive strengths greater than 3,000 psi may be increased by multiplying the value in the table by $(f'_c/3,000)^{0.3}$ for psi or $(f'_c/20.7)^{0.3}$ for MPa.

TABLE 9—HILTI KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C AND KH-EZ E, SETTING INFORMATION FOR INSTALLATION ON THE TOP OF CONCRETE-FILLED PROFILE STEEL DECK ASSEMBLIES.^{1,2,3,4,5,6,7}

DESIGN INFORMATION	Symbol	Units	Nominal Anchor Diameter						
			¹ / ₄		³ / ₈		¹ / ₂		
			¹ / ₄	³ / ₈	¹ / ₄	³ / ₈	¹ / ₂	³ / ₈	¹ / ₂
Effective Embedment Depth	h_{ef}	in. (mm)	1.18 (30)	1.92 (49)	1.11 (28)	1.86 (47)	2.50 (64)	1.52 (39)	2.16 (55)
Nominal Embedment Depth	h_{nom}	in. (mm)	¹⁵ / ₈ (41)	²¹ / ₂ (64)	¹⁵ / ₈ (41)	²¹ / ₂ (64)	³¹ / ₄ (83)	²¹ / ₄ (57)	3 (76)
Minimum concrete thickness	$h_{min,deck}$	in. (mm)	²¹ / ₂ (64)	²¹ / ₂ (64)	²¹ / ₂ (64)	²¹ / ₂ (64)	³¹ / ₄ (83)	²¹ / ₂ (64)	³¹ / ₄ (83)
Critical edge distance	$C_{ac,deck,top}$	in. (mm)	4 (104)	⁷ / ₂ (191)	3 (76)	⁷ / ₂ (191)	⁴¹ / ₄ (108)	6 (152)	⁸³ / ₄ (83)
Minimum edge distance	$C_{min,deck,top}$	in. (mm)	¹³ / ₄ (44)	¹³ / ₄ (44)	¹³ / ₄ (44)	3 (76)	¹³ / ₄ (44)	3 (76)	¹³ / ₄ (222)
Minimum spacing	$S_{min,deck,top}$	in. (mm)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)	3 (76)

For SI: 1 inch = 25.4 mm.

¹Installation must comply with Sections 4.1.10 and 4.3 of this report.

²For all other anchor diameters and embedment depths refer to [Table 1](#) for values of h_{min} , C_{min} and S_{min} .

³Design capacity must be based on calculations according to values in [Tables 3 and 6](#) of this report.

⁴Applicable for ²¹/₂-inch $\leq h_{min,deck} < \sup{31}{4}-inch. For $h_{min,deck} \geq \sup{31}{4}-inch, use setting information in [Tables 3 and 6](#) of this report.$$

⁵Minimum concrete thickness ($h_{min,deck}$) refers to concrete thickness above upper flute.

⁶Minimum flute depth (distance from top of flute to bottom of flute) is 3 inches.

⁷Steel deck thickness must be minimum 20 gauge.

TABLE 10— APPLICABLE SECTIONS OF THE IBC UNDER EACH EDITION OF THE IBC

2024 IBC	2021 IBC	2018 IBC	2015 IBC
Section 1605.1		Section 1605.2 or 1605.3	
1705			
Section 1705.1.1 and Table 1705.3			
1706			
1707			
Section 1901.3			
Sections 1903 and 1905			
Section 1905.7	Section 1905.1.8		

TABLE 11— APPLICABLE SECTIONS OF ACI 318 UNDER EACH EDITION OF THE IBC

2024 IBC	2021 IBC	2018 IBC	2015 IBC
ACI 318-19		ACI 318-14	
2.3		2.3	
5.3		5.3	
Chapter 17		Chapter 17	
17.3.1		17.2.7	
17.5.1.2		17.3.1	
17.5.3		17.3.3	
17.6.1		17.4.1	
17.6.1.2		17.4.1.2	
17.6.2		17.4.2	
17.6.2.1		17.4.2.1	
17.6.2.2		17.4.2.2	
17.6.2.3.1		17.4.2.4	
17.6.2.4.1		17.4.2.5	
17.6.2.5		17.4.2.6	
17.6.3		17.4.3	
17.6.3.1		17.4.3.1	
17.6.3.2.1		17.4.3.2	
17.6.3.3		17.4.3.6	
17.7.1.2		17.5.1.2	
Eq. 17.7.1.2b		Eq. 17.5.1.2b	
17.7.2		17.5.2	
17.7.2.2.1		17.5.2.2	
17.7.3		17.5.3	
17.8		17.6	
17.9		17.7	
17.9.2		17.7.1 and 17.7.3	
17.9.4		17.7.5	
17.9.5		17.7.6	
17.10		17.2.3	
17.10.5		17.2.3.4	
17.10.6		17.2.3.5	

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 KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, AND KH-EZ CRC CARBON STEEL SCREW ANCHORS AND KH-EZ SS316 AND KH-EZ C SS316 STAINLESS STEEL SCREW ANCHORS FOR USE 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 KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, and KH-EZ CRC carbon steel screw anchors and KH-EZ SS316 and KH-EZ C SS316 stainless steel screw anchors in cracked and uncracked concrete, described in ICC-ES evaluation report [ESR-3027](#), have also been evaluated for compliance with the codes noted below as adopted by 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 KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, and KH-EZ CRC carbon steel screw anchors and KH-EZ SS316 and KH-EZ C SS316 stainless steel screw anchors in cracked and uncracked concrete, described in Sections 2.0 through 7.0 of the evaluation report [ESR-3027](#), comply with the LABC Chapter 19, and the LARC, and are subject to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, and KH-EZ CRC carbon steel screw anchors and KH-EZ SS316 and KH-EZ C SS316 stainless steel screw anchors described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report [ESR-3027](#).
- The design, installation, conditions of use and identification of the anchors are in accordance with the 2021 *International Building Code*® (IBC) and 2021 *International Residential Code*® (IRC) provisions, as applicable, noted in the evaluation report [ESR-3027](#).
- 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 allowable and strength design values established with 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 diaphragm applications, anchors shall be designed per the requirements of City of Los Angeles Information Bulletin P/BC 2023-071.

This supplement expires concurrently with the evaluation report, reissued December 2023 and revised October 2025.

ICC-ES Evaluation Report

ESR-3027 FL Supplement w/ HVHZ

Reissued December 2023

Revised October 2025

This report is subject to renewal December 2025.

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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 KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, AND KH-EZ CRC CARBON STEEL SCREW ANCHORS AND KH-EZ SS316 AND KH-EZ C SS316 STAINLESS STEEL SCREW ANCHORS FOR USE IN CRACKED AND UNCRACKED CONCRETE

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, and KH-EZ CRC carbon steel screw anchors and KH-EZ SS316 and KH-EZ C SS316 stainless steel screw anchors in cracked and uncracked concrete, described in ICC-ES evaluation report ESR-3027, have 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 CONCLUSIONS

The Hilti KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, and KH-EZ CRC carbon steel screw anchors and KH-EZ SS316 and KH-EZ C SS316 stainless steel screw anchors, described in Sections 2.0 through 7.0 of the evaluation report ESR-3027, comply with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided 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-3027 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 KH-EZ, KH-EZ P, KH-EZ PM, KH-EZ PL, KH-EZ C, KH-EZ E, KH-EZ I, and KH-EZ CRC carbon steel screw anchors, and KH-EZ SS316 and KH-EZ C SS316 stainless steel screw anchors in cracked and uncracked concrete have also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential*, with the following condition:

- a) For anchorage of wood members, the connection subject to uplift 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 and revised October 2025.