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DIVISION: 04—MASONRY
Section: 04081—Masonry Anchorage

REPORT HOLDER:

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EVALUATION SUBJECT:

KWIK BOLT 3 MASONRY ANCHORS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (IRC)
- 1997 *Uniform Building Code*™ (UBC)

Properties evaluated:

Structural

2.0 USES

The Kwik Bolt 3 (KB3) Masonry Anchor is used to resist static and transient seismic and wind tension and shear loads in uncracked, grout-filled concrete masonry. The anchor system is an alternative to cast-in-place anchors described in Section 2107 (ACI 530) of the IBC and Section 2107.1.5 of the UBC. The anchor systems may also be used where an engineered design is submitted in accordance with Section R301.1.2 of the IRC.

3.0 DESCRIPTION

The Kwik Bolt 3 expansion anchors consist of a stud, wedge, nut, and washer. The stud is manufactured from carbon or stainless steel material. The carbon steel Kwik Bolt 3 anchors have a 5 µm (0.0002 inch) zinc plating. The anchor is illustrated in Figure 1 of this report.

The wedges for the carbon steel anchors are made from carbon steel, except for all $^1/_4$-inch (6.4 mm) lengths and the $^3/_4$-inch-by-12-inch, 1-inch-by-6-inch, 1-inch-by-9-inch and 1-inch-by-12-inch (19.1 mm by 305 mm, 25 mm by 152 mm, 25 mm by 229 mm, and 25 mm by 305 mm) sizes, which have AISI 316 stainless steel wedges. All carbon steel components are zinc-plated. The $^1/_2$-, $^5/_8$-, and $^3/_4$-inch-diameter (12.7, 15.9, and 19.1 mm) carbon steel Kwik Bolt 3 anchors are available with a hot-dipped galvanized plating complying with ASTM A 153. The studs, nuts and washers of the 304 and 316 stainless steel Kwik Bolt 3 anchors are also made from stainless steel. All 304 stainless steel, 316 stainless steel, and hot-dipped galvanized Kwik Bolt 3 anchors use 316 stainless steel wedges.

The stud consists of a high-strength rod threaded at one end. The standard Kwik Bolt 3 has a thread length equal to or less than three bolt diameters, while the Long Thread Kwik Bolt 3 has a thread length greater than three bolt diameters. The tapered mandrel has an increasing diameter toward the anchor base, and is enclosed by a three-section wedge that freely moves around the mandrel. In the vertical direction, the wedge movement is restrained by the mandrel taper at the bottom and by a collar at the top of the mandrel. When the anchor nut is tightened, the wedge is forced against the wall of the predrilled hole to provide anchorage.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Minimum embedment depth, edge distance, and spacing requirements are set forth in Table 1. Allowable stress design tension and shear loads are as noted in Tables 2 and 3. Allowable loads for Kwik Bolt 3 anchors subjected to combined shear and tension forces are determined by the following equation:

$$(P_s/P_t)^{5/3} + (V_s/V_t)^{5/3} \leq 1$$

where:

P_s = Applied service tension load (lbf or N).

P_t = Allowable service tension load (lbf or N).

V_s = Applied service shear load (lbf or N).

V_t = Allowable service shear load (lbf or N).

4.2 Installation Requirements:

Kwik Bolt 3 shall be installed in holes drilled into the base material using carbide-tipped masonry drill bits complying with ANSI B212.15-1994 or where permitted by the tables, Hilti Matched-Tolerance Diamond Core Bits. The nominal drill bit diameter shall be equal to that of the anchor. The drilled hole shall exceed the depth of anchor embedment by at least one anchor diameter to permit over-driving of anchors and to provide a dust collection area. The anchor shall be hammered into the predrilled hole until at least six threads are below the fixture surface. The nut shall be tightened against the washer until the torque values specified in Table 1 are attained.

4.3 Special Inspection:

Special inspection shall be provided in accordance with Section 1704 of the IBC or Section 1701 of the UBC when design loads are based on special inspections being provided

***Corrected May 2007**

during anchor installation, as set forth in Tables 2 and 3. Special inspection in accordance with Section 1704 of the IBC shall be provided under the IRC when special inspection is specified in Tables 2 and 3. The code official shall receive a report, from an approved special inspector, that includes the following details:

1. Anchor description, including the anchor product name, nominal anchor and bolt diameters, and anchor length.
2. Hole description, including verification of drill bit compliance with ANSI B212.15-1994 or the Hilti specification for matched tolerance diamond core bits, hole depth, and cleanliness.
3. Installation description, including verification of masonry compressive strength, and verification of anchor installation and location (spacing and edge distance) in accordance with Hilti's published installation instructions and this report.

5.0 CONDITIONS OF USE

The Kwik Bolt 3 Masonry Anchors described in this report comply with, or 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 Anchor sizes, dimensions, and installation shall comply with this report and Hilti's published installation instructions.

5.2 Allowable tension and shear loads shall be as noted in Tables 3 through 14 of this report.

5.3 Calculations and details demonstrating compliance with this report shall be submitted to the code official for approval.

5.4 The use of anchors shall be limited to installation in uncracked grout filled concrete masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.5 Design of Kwik Bolt 3 Masonry Anchors installed in grout-filled concrete masonry to resist dead, live, wind and earthquake load applications must be in accordance with Section 4.1

5.6 When using the basic load combinations in accordance with IBC Section 1605.3.1 or UBC Section 1612.3.1, allowable loads are not permitted to be increased for wind or earthquake loading. When using the alternative basic load combinations in IBC Section 1605.3.2 or UBC Section 1612.3.2 that include wind or seismic loads, the allowable shear and tension loads for anchors are permitted to be increased by $33^1/_3$ percent. Alternatively, the basic load combinations may be reduced by a factor of 0.75 when using IBC Section 1605.3.2.

5.7 Where not otherwise prohibited in the applicable 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 fire-resistance-rated construction or 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.

5.8 Use of carbon steel Kwik Bolt 3 anchors shall be limited to dry, interior locations. Hot-dipped galvanized and stainless steel Kwik Bolt 3 anchors are permitted in exterior exposure or damp environments.

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

5.10 Special inspection shall be provided in accordance with Section 4.3 of this report when required by Tables 3 through 14.

5.11 Anchors shall be manufactured by Hilti, Inc., Feldkircherstrasse 100, Schaan, Liechtenstein, under a quality control program with inspections conducted by Underwriters Laboratories Inc. (AA-668).

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Expansion Anchors in Concrete and Masonry Elements (AC01), dated January 2007, including seismic tests, reduced spacing tests and reduced edge distance tests.

6.2 Quality control manuals.

7.0 IDENTIFICATION

The anchors shall be identified in the field by dimensional characteristics and packaging. The packaging label indicates the manufacturer's name (Hilti, Inc.) and address, the size and type of anchor, the name of the inspection agency (Underwriters Laboratories Inc.), and the ICC-ES report number (ESR-1385). A length identification code letter is stamped on the threaded end of the bolt. The length identification system is described in Table 4.

TABLE 1—INSTALLATION SPECIFICATIONS[1]

SETTING DETAILS		ANCHOR SIZE											
		$^1/_4$ inch		$^3/_8$ inch		$^1/_2$ inch		$^5/_8$ inch		$^3/_4$ inch		1 inch	
Drill bit size = anchor diameter (inches)		$^1/_4$		$^3/_8$		$^1/_2$		$^5/_8$		$^3/_4$		1	
Wedge clearance hole (inches)		$^5/_{16}$		$^7/_{16}$		$^9/_{16}$		$^{11}/_{16}$		$^{13}/_{16}$		$1^1/_8$	
Anchor length (min./max.) (inches)		$1^1/_4$	$4^1/_2$	$2^1/_8$	7	$2^3/_4$	7	$3^1/_2$	10	6	12	6	12
Thread length std./long thread length (inches)		$^3/_4$	3	$^7/_8$	$5^5/_8$	$1^1/_4$	$4^3/_4$	$1^1/_2$	7	$1^1/_2$	6	$2^1/_4$	6
Installation: Torque guide values (ft-lb) in concrete masonry	Carbon steel: Min. Embedment	4		15		25		65		120		—	
	Carbon steel: Std. Embedment	4		15		25		65		120		—	
Min. base material thickness (inches)		3 inches or 1.5 × embedment depth, whichever is greater											

For **SI:** 1 inch = 25.4 mm, 1 ft-lbf = 1.356 N-m.

[1]Installation torques are applicable for all anchors installations unless noted otherwise in this report.

TABLE 2—ALLOWABLE TENSION AND SHEAR VALUES FOR HILTI KWIK BOLT 3 CARBON STEEL ANCHORS INSTALLED IN THE FACE SHELLS OF GROUT-FILLED CONCRETE MASONRY WALLS (in pounds)[1,2,3,4]

ANCHOR DIAMETER (inch)	EMBEDMENT DEPTH[5] (inches)	MINIMUM DISTANCE FROM EDGE OF WALL[6] (inches)	TENSION			SHEAR	
			UBC With Special Inspection[7]	UBC Without Special Inspection	IBC/IRC[8]	UBC	IBC/IRC[8]
$^1/_4$	$1^1/_8$	4	152	76	121	380	304
		12	152	76	121	380	304
	2	4	540	270	432	427	342
		12	540	270	432	427	342
$^3/_8$	$1^5/_8$	4	321	161	257	736	589
		12	342	171	273	938	751
	$2^1/_2$	4	782	391	626	955	764
		12	782	391	626	1,317	1,054
$^1/_2$	$2^1/_4$	4	628	314	502	830	664
		12	667	333	533	1,464	1,171
	$3^1/_2$	4	905	452	724	1,051	840
		12	905	452	724	2,317	1,853
$^5/_8$	$2^3/_4$	4	814	407	651	888	710
		12	866	433	692	2,165	1,732
	4	4	1,242	621	994	929	743
		12	1,294	647	1,035	2,654	2,123
$^3/_4$	$3^1/_4$	4	1,036	518	829	784	627
		12	1,036	518	829	3,135	2,508
	$4^3/_8$	4	1,645	823	1,316	821	657
		12	1,711	855	1,368	3,283	2,627

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

[1]Values valid for anchors installed in face shells of Type 1, Grade N, lightweight, medium-weight, or normal-weight concrete masonry units conforming to ASTM C 90 or UBC Standard 21-4. The masonry units shall be fully grouted with coarse grout conforming to IBC 2103.10 and ASTM C 476 or UBC Section 2103.4 and UBC Standard 21-19. Mortar shall comply with IBC Section 2103.7 and ASTM C 270 or UBC Section 2103.3 and UBC Standard 21-15, Type S, N, or M. Masonry prism strength shall be at least 1,500 psi at the time of anchor installation when tested in accordance with IBC Section 2105.2.2.2 and ASTM C 1314 or UBC Section 2105.3.2 and UBC Standard 21-17.
[2]Anchors shall be installed a minimum of $1^3/_8$ inches from any vertical mortar joint in accordance with Figure 2.
[3]Anchor locations are limited to one per masonry cell with a minimum spacing of 8 inches on center.
[4]Allowable loads or applied loads may be modified in accordance with Section 5.6 of this report due to short-term wind or seismic loads.
[5]Embedment depth shall be measured from the outside face of the concrete masonry unit.
[6]For intermediate edge distances, allowable loads may be determined by linearly interpolating between the allowable loads at the two tabulated edge distances.
[7]These tension values are only applicable when anchors are installed with special inspection in accordance with Section 4.3 of this report.
[8]Special inspection shall comply with Section 1704.5 of the IBC for anchorages in masonry.

TABLE 3—ALLOWABLE TENSION AND SHEAR VALUES FOR HILTI KWIK BOLT 3 CARBON STEEL ANCHORS INSTALLED IN TOP OF GROUT-FILLED CONCRETE MASONRY WALLS[1,2,3,4] (in pounds)

ANCHOR DIAMETER (inch)	EMBEDMENT DEPTH[5] (inches)	TENSION			SHEAR			
					Perpendicular to Wall		Parallel to Wall	
		UBC With Special Inspection[6]	UBC Without Special Inspection	IBC/IRC[7]	UBC	IBC/IRC[7]	UBC	IBC/IRC[7]
$^1/_2$	3	646	323	517	311	249	614	491
$^5/_8$	$3^1/_2$	852	426	682	311	249	614	491

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

[1]Values valid for anchors installed into top cells of Type 1, Grade N, lightweight, medium-weight, or normal-weight concrete masonry units conforming to ASTM C 90 or UBC Standard 21-4. The masonry units must be fully grouted with coarse grout conforming to IBC 2103.10 and ASTM C 476 or UBC Section 2103.4 and UBC Standard 21-19. Mortar shall comply with IBC Section 2103.7 and ASTM C 270 or UBC Section 2103.3 and UBC Standard 21-15, Type S, N, or M. Masonry prism strength shall be at leasst 1,500 psi at the time of anchor installation when tested in accordance with IBC Section 2105.2.2.2 and ASTM C 1314 or UBC Section 2105.3.2 and UBC Standard 21-17.
[2]Anchors must be installed a minimum of $1^3/_4$ inches from edge of the block.
[3]Anchor locations shall be limited to one per masonry cell with a minimum spacing of 8 inches on center.
[4]Allowable loads or applied loads may be modified in accordance with Section 5.6 of this report due to short-term wind or seismic loads.
[5]Embedment depth is measured from the top edge of the concrete masonry unit.
[6]These tension values are only applicable when anchors are installed with special inspection in accordance with Section 4.3 of this report.
[7]Special inspection shall comply with Section 1704.5 of the IBC for anchorages in masonry.

TABLE 4—LENGTH IDENTIFICATION CODES

STAMP ON ANCHOR		A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Length of Anchor (inches)	From	$1^1/_2$	2	$2^1/_2$	3	$3^1/_2$	4	$4^1/_2$	5	$5^1/_2$	6	$6^1/_2$	7	$7^1/_2$	8	$8^1/_2$	9	$9^1/_2$	10	11	12	13	14	15	16	17	18
	Up to but not including	2	$2^1/_2$	3	$3^1/_2$	4	$4^1/_2$	5	$5^1/_2$	6	$6^1/_2$	7	$7^1/_2$	8	$8^1/_2$	9	$9^1/_2$	10	11	12	13	14	15	16	17	18	18

For **SI:** 1 inch = 25.4 mm.

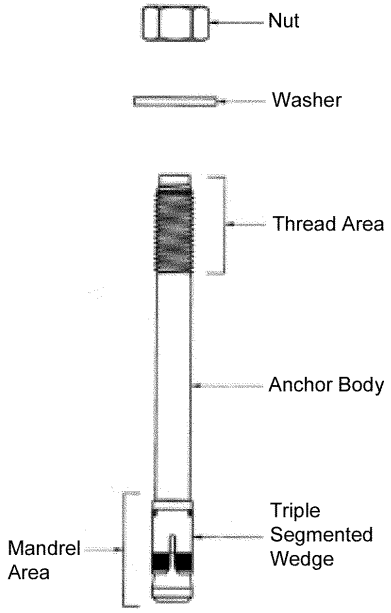

FIGURE 1—KWIK BOLT 3

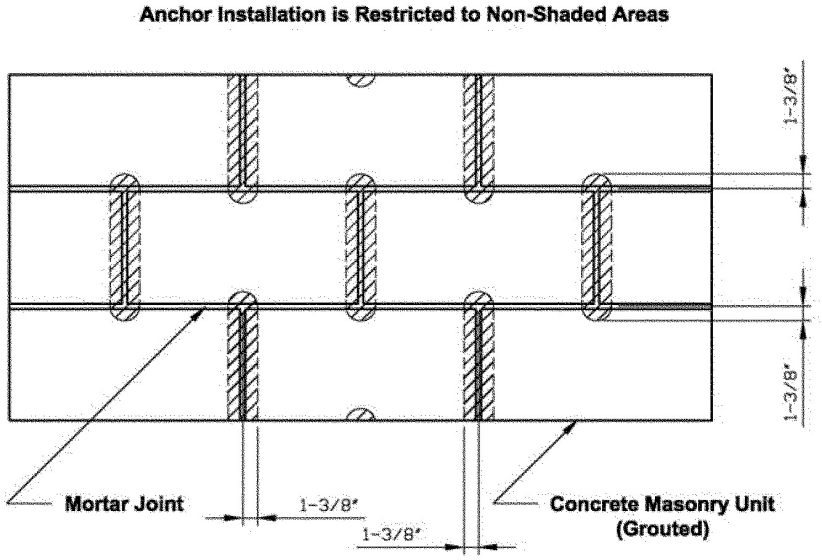

FIGURE 2—ACCEPTANCE LOCATIONS (NON-SHADED AREAS) FOR HILTI KWIK BOLT 3 ANCHORS IN GROUT-FILLED CONCRETE MASONRY ANCHORS