ICC-ES Evaluation Report

ESR-1663

Reissued March 1, 2011

This report is subject to renewal in two years.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories
Section: 03 16 00—Concrete Anchors

DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Fastenings

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

DIVISION: 09 00 00—FINISHES
Section: 09 22 16.23—Fasteners

REPORT HOLDER:

HILTI, INC.
5400 SOUTH 122nd EAST AVENUE
TULSA, OKLAHOMA 74146
(800) 879-8000
www.us.hilti.com
HNATechnicalServices@hilti.com

EVALUATION SUBJECT:

HILTI LOW-VELOCITY POWER-DRIVEN FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2009 *International Building Code*® (2009 IBC)
- 2009 *International Residential Code*® (2009 IRC)
- 2006 *International Building Code*® (2006 IBC)*
- 2006 *International Residential Code*® (2006 IRC)*
- 2003 *International Building Code*® (2003 IBC)*
- 2003 *International Residential Code*® (2003 IRC)*
- 2000 *International Building Code*® (2000 IBC)*
- 2000 *International Residential Code*® (2000 IRC)*

*Codes indicated with an asterisk are addressed in Section 8.0.

Property evaluated:

Structural

2.0 USES

Hilti power-driven fasteners are used to attach wood, light gage steel, and other building elements to normal-weight and structural sand-lightweight concrete, steel deck panels with structural sand-lightweight concrete fill, concrete masonry units (CMUs) and steel base materials. The fasteners are alternatives to the cast-in-place anchors described in IBC Sections 1911 and 1912 for placement in concrete; the embedded anchors described in Section 2.1.4 of TMS 402/ACI 530/ASCE 5 (which is referenced in IBC Section 2107); and the bolts used to attach materials to steel, described in IBC Section 2204.2. The fasteners may also be used under the IRC where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Fasteners:

The fasteners are manufactured as nails or threaded studs with various shank diameters, thread diameters, lengths, and smooth or knurled shanks. The carbon steel fasteners are manufactured from austempered steel conforming to SAE 1060 or 1070 (modified). The carbon steel fasteners are zinc-plated to ASTM B 633, SC 1, Type III. The stainless steel X-CR fasteners are manufactured from a proprietary CrNiMo alloy complying with the requirements of SAE 316. The premounted washers for the X-CR fasteners are manufactured from stainless steel conforming to SAE 316. All fasteners have a Rockwell C 49-61 hardness.

3.2 Normal-weight Concrete:

Normal-weight concrete must be normal-weight, stone-aggregate concrete complying with IBC Section 1905 or IRC Section R402.2, as applicable. The minimum concrete compressive strength at the time of fastener installation is noted in Table 2.

3.3 Structural Lightweight Concrete:

Structural lightweight concrete must be sand-lightweight complying with IBC Section 1905, and must have a minimum 3,000 psi (19.17 MPa) compressive strength at the time of fastener installation.

3.4 Masonry:

Masonry must be comprised of normal-weight concrete masonry units (CMUs) complying with ASTM C 90 and mortar complying with ASTM C 270 Type N in accordance with IBC Section 2103.8 or IRC Section R607, as applicable. Where specified in Table 5 of this report, concrete-masonry construction must be fully grouted and have minimum prism strength, f'_m, of 1,500 psi (10.3 MPa) at the time of fastener installation. Grout must comply with ASTM C 476 in accordance with Section IBC 2103.12 or IRC Section R609.1.1, as applicable.

3.5 Steel Substrates:

3.5.1 Steel: Structural steel used in supports must comply with ASTM A 36, and must have a minimum tensile strength of 58 or 65 ksi (400 or 450 MPa) and thicknesses, as shown in Table 1 of this report, unless otherwise noted.

3.5.2 Steel Deck Panels: Steel deck panels must have a minimum 0.0329-inch (0.836 mm) base-metal thickness and conform to the applicable material standard, with minimum yield strengths of 33 ksi (228 MPa) and 38 ksi (262 MPa), as noted in Tables 3 and 4, respectively. See Figures 1 through 3 for panel configuration requirements.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The allowable tension and shear loads, along with fastener descriptions and shank diameters for power-driven fasteners installed in carbon steel base materials, are shown in Table 1. The allowable tension and shear loads with minimum required embedment depths, along with fastener descriptions and shank diameters for fasteners in normal-weight and structural sand-lightweight concrete base materials, are shown in Tables 2, 3, and 4. The allowable tension and shear loads with minimum required embedment depths, along with fastener descriptions and shank diameters, for fasteners in concrete masonry units (CMUs), are shown in Table 5. The stress increases and load reductions described in IBC Section 1605.3 are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone. Except for fasteners used with architectural, electrical and mechanical components as described in Section 13.1.4 of ASCE/SEI 7, use of fasteners to resist earthquake loads is outside the scope of this report.

Allowable loads for fasteners subjected to combined shear and tension forces are determined by the following formula:

$$(p/P_a) + (v/V_a) \leq 1$$

where:

p = Actual tension load, pounds (N).

P_a = Allowable tension load, pounds (N).

v = Actual shear load, pounds (N).

V_a = Allowable shear load, pounds (N).

4.2 Wood to Steel, Concrete, or Masonry:

Reference lateral design values for fasteners determined in accordance with Part 11 of ANSI/AF&PA NDS are applicable to Hilti fasteners of equal or greater diameters. The wood element must be considered to be the side member. The fastener bending yield strength must be the value noted in the NDS based on the fastener diameter.

4.3 Installation:

4.2.1 General: The fasteners must be installed in accordance with this report and the manufacturer's published installation instructions. A copy of the instructions must be available on the jobsite at all times during installation. Additional installation requirements are set forth in Tables 1 to 5 of this report.

Fastener placement requires a low-velocity powder-actuated tool used in accordance with Hilti recommendations.

Installers must be certified by Hilti and have a current, Hilti-issued, operator's license.

4.2.2 Fastening to Steel: When installation is in steel, minimum spacing between fasteners must be 1 inch (25.4 mm) on center, and minimum edge distance must be $^1/_2$ inch (12.7 mm).

4.2.3 Fastening to Concrete: Fasteners are to be driven into the concrete after the concrete attains the specified concrete strength. Unless otherwise noted, minimum spacing between fasteners must be 4 inches (102 mm) on center and minimum edge distance must be 3 inches (76 mm). Unless otherwise noted, concrete thickness must be a minimum of three times the embedment depth of the fastener.

4.2.4 Fastening to Masonry: Fasteners are to be driven into the masonry after the mortar and grout materials have attained the specified strength. For CMUs, no more than one power-driven fastener may be installed per individual CMU cell.

4.2.5 DX-Kwik System: Installation of the X-AL-H fastener into normal-weight concrete using the DX Kwik system as an alternate procedure, as described in Table 2, requires that a 0.709-inch-deep (18 mm) pilot hole with a diameter of 0.197 inch (5 mm) be drilled into the concrete prior to the placement of the fastener. The fastener must be driven into the predrilled hole and must penetrate the concrete beyond the bottom of the hole.

4.2.6 Fastening to Structural Sand-lightweight Concrete-filled Steel Deck Panels: Installation in structural sand-lightweight concrete-filled steel deck panels must comply with Tables 3 and 4 and Figures 1 through 3. Minimum distances from fastener centerline to rolled deck panel flute edges must be as depicted in Figures 1 through 3.

5.0 CONDITIONS OF USE

The Hilti Low-Velocity Power-Driven Fasteners 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 Fasteners must be manufactured and identified in accordance with this report.

5.2 Fasteners must be installed in accordance with this report and instructions published by Hilti, Inc. In the event of conflict between this report and Hilti, Inc., published instructions, this report governs.

5.3 Allowable loads must be in accordance with Section 4.1. The stress increases and load reductions described in IBC Section 1605.3 are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

5.4 Calculations demonstrating that the applied loads are less than the allowable loads described in this report must be submitted to the code official for approval. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is constructed.

5.5 Except for fasteners used with architectural, electrical and mechanical components as described in Section 13.1.4 of ASCE/SEI 7, use of fasteners to resist earthquake loads is outside the scope of this report.

5.6 The allowable loads in Tables 2, 3, 4, and 5 are limited to installations in uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.7 Hilti X-CR stainless steel fasteners are permitted for use in exterior, damp environments. All other fasteners in this report are limited to installation in dry, interior environments.

5.8 Hilti X-CR stainless steel fasteners may be installed in contact with preservative-treated or fire-retardant-treated wood, as set forth in the applicable code. Use of other fasteners in contact with preservative-treated or fire-retardant-treated wood is outside the scope of this report.

5.9 Installers must be certified by Hilti and have a current, Hilti-issued, operator's license.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-driven in Concrete, Steel, and Masonry Elements (AC70), dated February 2011.

7.0 IDENTIFICATION

All fasteners are identified by an "H" imprinted on the fastener head. Where applicable, the word "Hilti" is stamped on the steel washers. All fasteners are packaged in containers noting the fastener type, size, manufacturer's name, and evaluation report number (ESR-1663).

8.0 OTHER CODES

8.1 Evaluation Scope:

In addition to the 2009 IBC and 2009 IRC referenced in Section 1.0, the products described in this report were evaluated for compliance with the requirements of the following codes:

- 2006 *International Building Code*® (2006 IBC)
- 2006 *International Residential Code*® (2006 IRC)
- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IRC)

8.2 Uses:

Hilti power-driven fasteners are used to connect materials as described in Section 2.0. The fasteners are alternatives to the cast-in-place anchors described in 2006 IBC Sections 1911 and 1912, 2003 and 2000 IBC Sections 1912 and 1913 for placement in concrete; the embedded anchors described in Section 2.1 of ACI 530 (which is referenced in 2006, 2003 and 2000 IBC Section 2107) for placement in grouted masonry; and the bolts used to attach materials to steel, described in 2006 and 2003 IBC Section 2204.2 and 2000 IBC Section 2209. The fasteners may be used where an engineered design is submitted in accordance with 2006 and 2003 IRC Section R301.1.3 or 2000 IRC Section R301.1.2, as applicable.

8.3 Description:

8.3.1 Fasteners: See Section 3.1.

8.3.2 Concrete: See Sections 3.2 and 3.3.

8.3.3 Concrete Masonry Units: See Section 3.4. Under the 2006 IBC, Type N mortar must comply with IBC Section 2103.8 or IRC Section R607, as applicable; grout must comply with IBC Section 2103.12 or IRC Section R609.1.1, as applicable. Under the 2003 and 2000 IBC, mortar and grout must comply with Sections 2103.7 and 2103.10, respectively.

8.3.4 Steel Substrates: See Section 3.5.

8.4 Design and Installation:

8.4.1 Design: See Section 4.1. The stress increases and load reductions described in Section 1605.3 of the 2006, 2003 and 2000 IBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone. Except for fasteners used with architectural, electrical and mechanical components as described in Section 13.1.4 of ASCE/SEI 7-05 (2006 IBC and IRC), Section 9.6.1 of ASCE/SEI 7-02 (2003 IBC and IRC) or Section 9.6.1 of ASCE/SEI 7-98 (2000 IBC and IRC), use of fasteners to resist earthquake loads is outside the scope of this report.

8.4.2 Wood to Steel, Concrete, or Masonry: See Section 4.2. Reference lateral design values for fasteners determined in accordance with Part 11 of ANSI/AF&PA NDS (2006 and 2003 IBC and IRC), Part 12 of ANSI/AF&PA NDS (2000 IBC and IRC), as applicable, are applicable to Hilti fasteners of equal or greater diameters.

8.4.3 Installation: See Section 4.3.

8.5 Conditions of Use:

See Section 5.0 and the following:

- The stress increases and load reductions described in Section 1605.3 of the 2006, 2003 and 2000 IBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.
- Use of fasteners to resist earthquake loads is outside the scope of this report, except for fasteners used with architectural, electrical and mechanical components as described in Section 13.1.4 of ASCE/SEI 7-05 (2006 IBC and IRC), Section 9.6.1 of ASCE/SEI 7-02 (2003 IBC and IRC) or Section 9.6.1 of ASCE/SEI 7-98 (2000 IBC and IRC).

8.6 Evidence Submitted:

See Section 6.0.

8.7 Identification:

See Section 7.0.

TABLE 1—ALLOWABLE LOADS FOR LOW-VELOCITY FASTENERS DRIVEN INTO STEEL[1,2,6] (pounds)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	STEEL THICKNESS (inch)											
			1/8		3/16		1/4		3/8		1/2		3/4	
			Tension[5]	Shear[5]	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
Heavy Duty Smooth Shank	X-AL-H[3]	0.145	140	270	–	–	–	–	–	–	–	–	–	–
		0.158	–	–	230	665	430	690	–	–	–	–	–	–
		0.177	–	–	–	–	–	–	595	725	595	860	150[4]	600[4]
Heavy Duty Knurled Shank	EDS	0.177	–	–	305	615	625	870	715	870	890	960	–	–
Heavy Duty Smooth Shank	DS	0.177	–	–	365	725	580	725	695	725	735	860	–	–
Stainless Steel Smooth Shank	X-CR	0.145	–	–	460	460	615	500	–	–	–	–	–	–
Stainless Steel Smooth Shank	X-CR[3]	0.145	300	190	615	495	760	500	220	325	225	335	–	–

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 ksi = 6.89 MPa.

[1]The tabulated allowable load values utilize a factor of safety that is greater than or equal to 5, calculated in accordance with AC70. Wood or steel members connected to the substrate must be investigated for compliance with the applicable code in accordance with referenced design criteria.

[2]Fasteners must be driven to where the point of the fastener penetrates through the steel base material, except as noted in this report.

[3]For X-AL-H and noted X-CR fasteners, the steel base material must have a minimum yield strength (F_y) of 50 ksi and minimum tensile strength of 65 ksi. X-AL-H fasteners with a shank length of 5/8 inch have a shank diameter of 0.145 inch. X-AL-H fasteners with shank lengths of 3/4 inch and 7/8 inch have shank diameters of 0.158 inch. X-AL-H fasteners with shank lengths greater than or equal to 1 inch have a shank diameter of 0.177 inch.

[4]X-AL-H fasteners installed into 3/4-inch or thicker steel require 1/2-inch minimum penetration.

[5]1/8-inch-thick steel must have a minimum yield strength of 50 ksi and a minimum tensile strength of 65 ksi.

[6]Except as noted, all allowable load capacities above are based on base steel with minimum yield strength (F_y) of 36 ksi and minimum tensile strength of 58 ksi.

TABLE 2—ALLOWABLE LOADS FOR LOW-VELOCITY FASTENERS DRIVEN INTO NORMAL-WEIGHT CONCRETE[1,2]

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	EMBEDMENT (inches)	CONCRETE COMPRESSIVE STRENGTH					
				2,000 psi		4,000 psi		6,000 psi	
				Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)	Tension (lbs.)	Shear (lbs.)
Standard Nail	X-C	0.138	3/4	45	75	60	105	—	—
			1	85	150	90	200	—	—
			1 1/4	130	210	130	290	—	—
			1 1/2	175	260	245	360	—	—
Drywall Track Nail	X-C22 P8 TH	0.138	3/4	55	130	90	170	—	—
High Performance Nail	X-AL-H	0.177	3/4	65	70	90	95	120	125
			1	130	190	165	195	—	—
			1 1/4	135	265	240	270	240	440
			1 1/2	240	340	240	460	—	—
High Performance Nail	X-AL-H[3]	0.177	1 1/2	355	470	475	565	—	—
Heavy Duty Nail	DS	0.177	3/4	50	120	125	135	—	—
			1	130	195	155	240	—	—
			1 1/4	220	385	270	425	—	—
			1 1/2	300	405	355	450	—	—
1/4-20 Threaded Stud	W6	0.145	3/4	40	55	40	55	—	—
			1	85	195	110	225	—	—
3/8-16 Threaded Stud	W10	0.205	1	85	95	100	105	—	—
			1 1/4	175	345	200	380	—	—
			1 5/8	285	380	385	395	—	—
Stainless Steel Nail	X-CR	0.145	3/4	30	40	65	40	—	—
			1	55	185	120	190	100	170
			1 1/4	110	290	125	300	120	440
			1 1/2	265	405	350	450	—	—

For **SI:** 1 inch = 25.4 mm, 1 psi = 6895 Pa, 1 lbf = 4.4 N.

[1]The tabulated allowable load values utilize a factor of safety that is greater than or equal to 5, calculated in accordance with AC70. Wood or steel members connected to the substrate must be investigated for compliance with the applicable code in accordance with referenced design criteria.
[2]The concrete base material must exhibit the tabulated compressive strength when the fastener is installed.
[3]The X-AL-H fastener must be installed using the DX-Kwik drilled pilot hole installation procedure described in Section 4.2.5.

TABLE 3—ALLOWABLE LOADS FOR LOW-VELOCITY FASTENERS DRIVEN INTO MINIMUM f'_c=3,000 psi STRUCTURAL SAND-LIGHTWEIGHT CONCRETE[1,2]

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	MINIMUM EMBEDMENT (inches)	FASTENER LOCATION				
				Installed into Concrete		Installed Through Steel Deck Panel into Concrete[3,4]		
				Tension (lb.)	Shear (lb.)	Tension (lb.)		Shear (lb.)
						Upper Flute	Lower Flute	
Standard Nail	X-C	0.138	3/4	110	175	120	-	265
			1	135	180	215	145	485
			1 1/4	220	260	250	205	500
			1 1/2	285	315	285	210	555
Drywall Track Nail	X-C20 THP	0.138	5/8	55	110	-	45	285
	X-C22 P8TH	0.138	3/4	110	220	120	60	260
High Performance Nail	X-AL-H	0.177	3/4	115	155	-	-	155
			1	225	350	-	120	340
			1 1/4	330	475	310	195	770
			1 1/2	-	-	-	285	585
Heavy Duty Nail	DS[5]	0.177	3/4	100	200	-	-	200
			1	180	360	-	180	405
			1 1/4	300	520	-	-	515
			1 1/2	450	680	-	325	625
Stainless Steel Nail	X-CR	0.145	1	230	240	-	-	240
			1 1/4	320	400	-	-	400
			1 1/2	405	500	-	-	500
1/4-20 Threaded Stud	W6	0.145	3/4	125	185	125	115	185
			1	175	185	160	180	185
			1 1/4	240	315	-	-	315
			1 1/2	300	365	-	-	365
3/8-16 Threaded Stud	W10	0.205	1	265	185	-	-	185
			1 1/4	280	380	160	210	685
			1 5/8	445	540	435	325	945

For **SI:** 1 inch = 25.4 mm, 1 psi = 6895 Pa, 1 lbf = 4.4 N.

[1]The tabulated allowable load values utilize a factor of safety that is greater than or equal to 5, calculated in accordance with AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
[2]The concrete base material must exhibit the tabulated compressive strength when the fastener is installed.
[3]The steel deck panel profile must be 3-inch-deep composite floor deck panel, with a minimum 0.0329-inch base-metal thickness, and conforming to the applicable material standard, a minimum yield strength of 33 ksi. Lower and upper flute widths must be a minimum of 4 1/2 inches. Figure 1 shows the nominal flute dimensions, fastener locations and load orientations for the deck panel profile.
[4]Structural sand-lightweight concrete fill depth above top of steel deck panel must be a minimum of 3 1/4 inches.
[5]DS fasteners installed at 1 1/2-inch embedment through steel deck panel into the lower flute must be installed at a minimum distance of 6 inches from the edge of the floor deck panel.

TABLE 4—ALLOWABLE LOADS FOR LOW-VELOCITY FASTENERS DRIVEN INTO MINIMUM f'_c = 3,000 psi STRUCTURAL SAND-LIGHTWEIGHT CONCRETE-FILLED $1^1/_2$-INCH-DEEP, B-TYPE STEEL DECK PANEL (pounds)[1,2]

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	EMBEDMENT (inch)	FASTENER LOCATION		
				Installed Through Steel Deck Panel Into Concrete[3,4]		
				Tension (lbs.)		Shear (lbs.)
				Upper Flute	Lower Flute	
Drywall track nail	X-C22 P8 TH	0.138	$^3/_4$	90	110	295
Standard nail	X-C	0.138	$^3/_4$	80	80	315
			1	205	205	445

For **SI:** 1 inch = 25.4 mm, 1 psi = 6895 Pa, 1 lbf = 4.4 N.

[1]The tabulated allowable load values utilize a factor of safety that is greater than or equal to 5, calculated in accordance with AC70. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
[2]The concrete base material must exhibit the tabulated compressive strength when the fastener is installed.
[3]Steel deck panel profiles are $1^1/_2$-inch-deep, B-type deck panel with a minimum base-metal thickness of 0.0329 inch, and conforming to the applicable material standard, with a minimum yield strength of 38 ksi. Fasteners may be installed through the steel deck panel into structural sand-lightweight concrete having both normal or inverted deck panel profile orientations with minimum lower flute widths of $1^3/_4$ and $3^1/_2$ inches, respectively. Fasteners must be placed at centerline of deck panel flutes. Figures 2 and 3 describe additional flute dimensions, fastener locations, and load orientations for both deck panel profiles.
[4]Structural sand-lightweight concrete fill above top of steel deck panel must be a minimum of $2^1/_2$ inches.

TABLE 5—ALLOWABLE LOADS FOR LOW-VELOCITY FASTENERS DRIVEN INTO CONCRETE MASONRY UNITS[1,2,3,4,5,9] (pounds)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (inch)	EMBED-MENT (inch)	HOLLOW CMU				GROUT-FILLED CMU					
				Face Shell		Mortar Joint		Face Shell		Mortar Joint		Top of Grouted Cell[7]	
				Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear[6] (lbs)	Tension (lbs)	Shear (lbs)	Tension (lbs)	Shear[6] (lbs)	Tension (lbs)	Shear[8] (lbs)
Standard Nail	X-C	0.138	1	40	85	15	50	85	85	45	85	115	175
$^1/_4$-20 Threaded Stud	W6	0.145	1	105	175	80	110	125	175	135	150	—	—

For **SI:** 1 inch = 25.4 mm, 1 lbf = 4.4 N.

[1]The tabulated allowable load values utilize a factor of safety of 8 or higher. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
[2]The tabulated allowable load values are for low-velocity fasteners installed in hollow, ungrouted concrete masonry units conforming to the requirements of Section 3.4.
[3]The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with mortar conforming to ASTM C 270 Type N, as noted in Section 3.4.
[4]The tabulated allowable load values are for low-velocity fasteners installed in concrete masonry units with grout conforming to ASTM C 476, as noted in Section 3.4.
[5]No more than one low-velocity fastener may be installed in an individual CMU cell.
[6]Shear direction must be horizontal (bed joint or t-joint) along the CMU wall plane.
[7]Fastener located in center of grouted cell must be installed vertically.
[8]Shear load can be in any direction.
[9]Fasteners must be installed a minimum of 8 inches from the end of the wall. Multiple fasteners in a bed joint must be spaced a minimum of 8 inches.

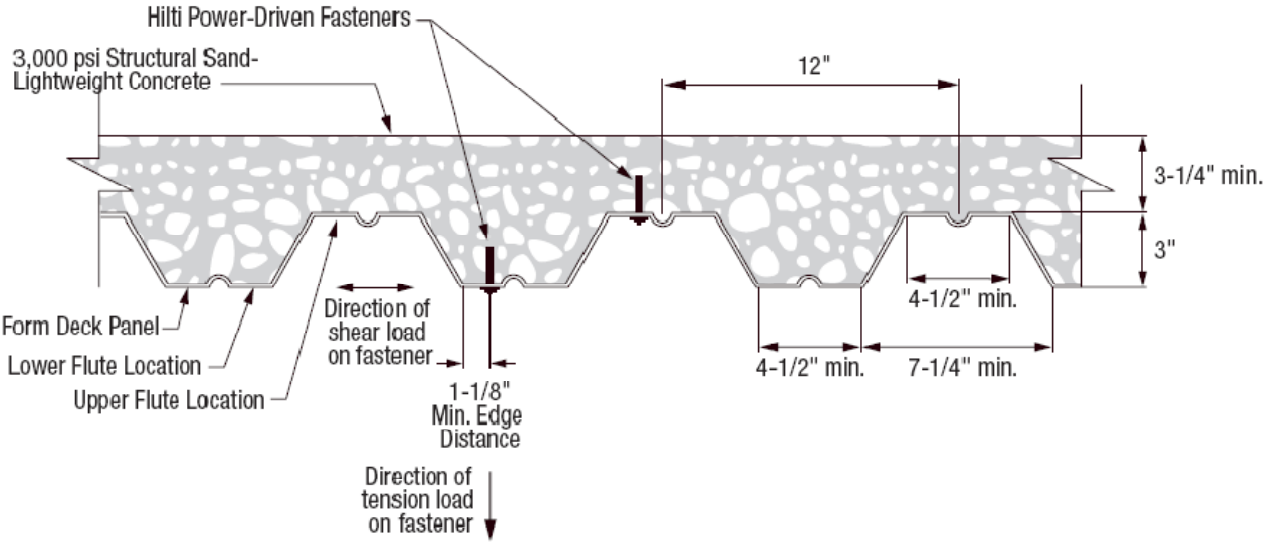


FIGURE 1—HILTI FASTENER LOCATIONS IN 3-INCH-DEEP COMPOSITE FLOOR DECK PANEL

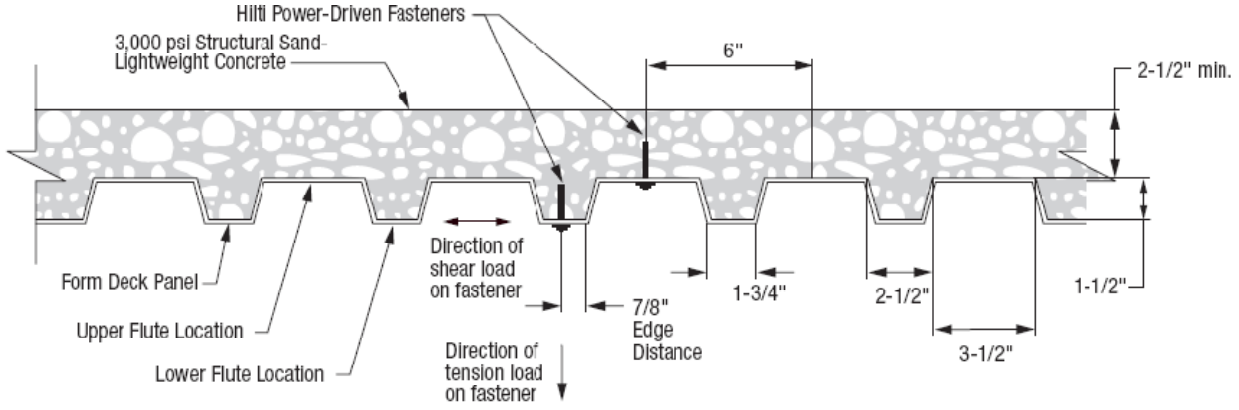
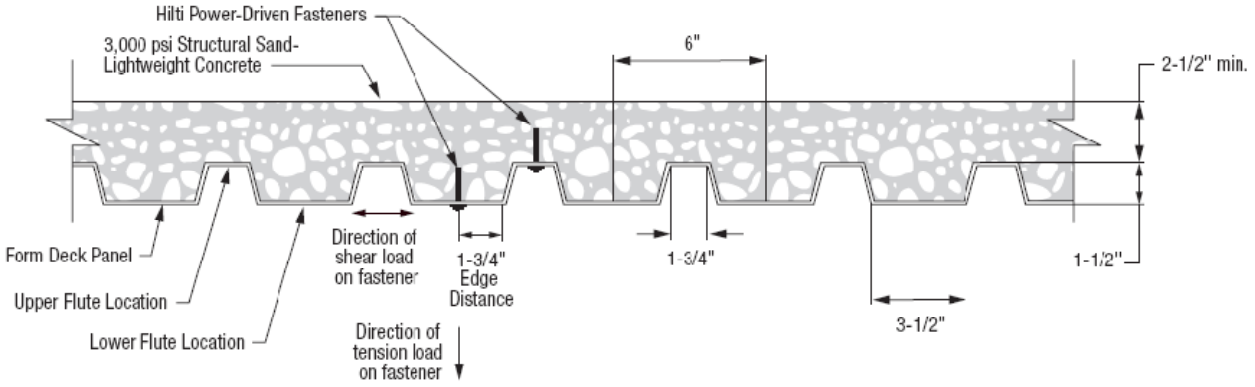


FIGURE 2—HILTI FASTENER LOCATIONS IN $1^1/_2$-INCH-DEEP COMPOSITE FLOOR DECK PANEL, NORMAL DECK PANEL PROFILE ORIENTATION



For **SI:** 1 inch = 25.4 mm, 1 psi = 6895 Pa.

FIGURE 3—HILTI FASTENER LOCATION IN $1^1/_2$-INCH-DEEP COMPOSITE FLOOR DECK PANEL, INVERTED DECK PANEL PROFILE ORIENTATION

ICC-ES Evaluation Report

ESR-1663 Supplement

Reissued March 1, 2011
This report is subject to renewal in two years.

www.icc-es.org | (800) 423-6587 | (562) 699-0543 *A Subsidiary of the International Code Council®*

DIVISION: 03 00 00—CONCRETE
Section: 03 15 00—Concrete Accessories
Section: 03 16 00—Concrete Anchors

DIVISION: 04 00 00—MASONRY
Section: 04 05 19.16—Masonry Anchors

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Fastenings

DIVISION: 06 00 00—WOOD, PLASTICS AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

DIVISION: 09 00 00—FINISHES
Section: 09 22 16.23—Fasteners

REPORT HOLDER:

HILTI, INC.
5400 SOUTH 122ND EAST AVENUE
TULSA, OKLAHOMA 74146
(800) 879-8000
www.us.hilti.com
HNATechnicalServices@hilti.com

EVALUATION SUBJECT:

HILTI LOW-VELOCITY POWER-DRIVEN FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2007 *Florida Building Code—Building*
- 2007 *Florida Building Code—Residential*

Property evaluated:

Structural

2.0 PURPOSE OF THIS SUPPLEMENT

This supplement is issued to indicate that the Hilti EDS, DS, X-AL-H, X-C, X-C20 THP, X-C22 P8TH, X-CR, W6, and W10 power driven fasteners described in Sections 2.0 through 7.0 and in Tables 1 through 5 of the master report comply with the 2007 *Florida Building Code—Building*, and the 2007 *Florida Building Code—Residential*, when designed and installed in accordance with the master evaluation report, under the following condition: The use of Hilti EDS, DS, X-AL-H, X-C, X-C20 THP, X-C22 P8TH, X-CR, W6, and W10 power driven fasteners as a means of attachment for wood blocking, as defined in the 2007 *Florida Building Code*—Building Section 2330.1.1, in a roof assembly in the High-Velocity Hurricane Zone is prohibited. Attachment of wood structural panel diaphragms to supporting steel framing members as recognized in the master report is acceptable.

For products falling under Florida Rule 9N-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 master evaluation report issued on March 1, 2011.