ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2300

DIVISION: 03—CONCRETE
Section: 03151—Concrete Anchoring

DIVISION: 04—MASONRY
Section: 04081—Masonry Anchoring

DIVISION: 05—METALS
Section: 05090—Metal Fastenings

DIVISION: 06—WOOD AND PLASTIC
Section: 06090—Wood and Plastic Fastenings

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 X-U AND X-U 15 UNIVERSAL POWDER DRIVEN FASTENERS

1.0 EVALUATION SCOPE

Compliance with 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)*
- 1997 *Uniform Building Code*™ (UBC)*

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

Property evaluated:

Structural

2.0 USES

2.1 General:

The Hilti X-U fasteners are used to attach wood, light gage steel, and other building elements to normal-weight and structural sand-lightweight concrete, steel decks with structural sand-lightweight concrete fill, concrete masonry and steel base materials. The Hilti X-U 15 fasteners are used to attach light gage steel and other building elements to steel. 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 ACI 530 (which is referenced in IBC Section 2107) for placement in grouted masonry; and the bolts used to attach materials to steel, described in IBC Section 2204.2. The fasteners may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

2.2 Horizontal Diaphragms:

The Hilti X-U fasteners may be used as alternates to 10d common nails for fastening wood structural panel diaphragms to structural steel members.

3.0 DESCRIPTION

3.1 Fasteners:

3.1.1 X-U: The X-U fasteners are powder driven fasteners made from hardened steel complying with the manufacturer's quality documentation, austempered to a Rockwell C nominal hardness of 58 and zinc-plated in accordance with ASTM B 633 SC 1, Type III. The fasteners have a shank diameter of 0.157 inch (4.0 mm), a head diameter of 0.32 inch (8.2 mm) and a knurled tip, and come in lengths ranging from 0.63 inch to 2.83 inches (16 to 72 mm). See Figure 1 for the fastener configuration.

3.1.2 X-U 15: The X-U 15 fasteners are powder driven fasteners made from hardened steel complying with the manufacturer's quality documentation, austempered to a Rockwell C nominal hardness of 59 and zinc plated in accordance with ASTM B 633 SC 1, Type III. The fasteners have a shank diameter of 0.145 inch (3.7 mm), a head diameter of 0.32 inch (8.2 mm) and a shank length of 0.63 inch (16 mm). See Figure 2 for the fastener configuration.

3.2 Concrete:

Normal-weight and structural sand-lightweight concrete must conform to IBC Section 1905 or IRC Section R402.2, as applicable. The minimum concrete compressive strength at the time of fastener installation is noted in the tables of this report.

3.3 Masonry:

Masonry must be comprised of normal-weight concrete masonry units (CMUs) complying with ASTM C 90 and Type S mortar complying with IBC Section 2103.8 or IRC Section R607, as applicable. The CMUs must have a minimum nominal width of 8 inches (203 mm). Where specified in Table 6 of this report, masonry construction must be fully grouted and must have minimum prism strength, f'_m, of 1,500 psi (10.3 MPa) at the time of fastener installation. Grout must comply with IBC Section 2103.12 or IRC Section R609.1.1, as applicable.

3.4 Steel Substrates:

Structural steel must comply with the minimum requirements of ASTM A 36 and have a thickness as shown in Table 2. Steel deck properties and configurations are to be as described in the footnotes to Table 5, and Figures 6 through 8, of this report.

3.5 Wood Structural Panel Horizontal Diaphragms:

3.5.1 Wood Structural Panel: Wood structural panels must have a minimum thickness of $^{15}/_{32}$ inch (11.9 mm) and must comply with the requirements of IBC Section 2305.2.4.

3.5.2 Structural Steel Supports: Structural steel framing members supporting the wood structural panel diaphragm must comply with the minimum requirements of ASTM A 36 and have a minimum thickness of $^{3}/_{16}$ inch (4.8 mm).

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: The allowable shear and tension service loads for the X-U and X-U 15 fasteners installed in steel, and the X-U fasteners installed in normal-weight concrete, structural sand-lightweight concrete, structural sand-lightweight concrete filled steel deck and masonry can be found in Tables 2 through 6 as summarized in Table 1. The stress increases and load reductions described in Section 1605.3 of the 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, and fasteners used as described in Sections 4.1.3 and 4.2.7, 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:

$$(P_s/P_t) + (V_s/V_t) \leq 1$$

where:

P_s = Applied service tension load, pounds (N).

P_t = Allowable service tension load, pounds (N).

V_s = Applied service shear load, pounds (N).

V_t = Allowable service shear load, pounds (N).

4.1.2 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 is allowed to be taken as the value noted in the NDS based on the fastener diameter.

4.1.3 Wood Structural Deck Diaphragms: When the X-U fastener is used to fasten wood structural panels to steel members, the fastener is recognized as equivalent to a 10d common nail. Diaphragm design, including fastener spacing, diaphragm capacity and diaphragm deflection, must comply with IBC Sections 2305.2 and 2306.3.

4.2 Installation:

4.2.1 General: The X-U and X-U 15 fasteners must be installed in accordance with this report and the manufacturer's published installation instructions. A copy of these instructions must be available on the jobsite at all times during installation. Installation must be limited to dry, interior locations.

Fastener placement requires the use of a low-velocity powder-actuated tool 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 installed in steel, minimum spacing between fasteners must be 1 inch (25.4 mm) 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. Minimum spacing between fasteners must be 4 inches (102 mm) and minimum edge distance must be 3 inches (76 mm). Unless noted otherwise in this report, concrete thickness must be a minimum of three times the penetration depth of the fastener.

4.2.4 DX-Kwik System: Installation of the X-U fastener into normal-weight concrete, using the Hilti DX-Kwik system as an alternate procedure, requires the drilling of a pilot hole using a drill bit (TX-C 5/23) supplied by Hilti, Inc., prior to the installation of the fastener with the powder-actuated tool. DX- Kwik installation procedures are shown in Figure 5.

4.2.5 Fastening to Structural Sand-lightweight Concrete Filled Steel Deck: Installation in structural sand-lightweight concrete filled steel deck must comply with Figures 6 through 8. Minimum distances from fastener centerline to rolled deck flute edges must be as depicted in Figures 6 through 8.

4.2.6 Fastening to Masonry: Fasteners must be driven into the masonry after the mortar and grout materials have attained the specified strength. Fasteners must be located in accordance with Table 6.

4.2.7 Wood Structural Panel Diaphragms: The wood structural panels must be fastened to the steel members at the spacing determined by the design. When used, the optional steel strap is placed on top of the panels and the fasteners are driven through the strap and panel into the supporting steel member. The minimum distance from the centerline of the fasteners to the edge of the panel is $^{3}/_{8}$ inch (9.5 mm). Fastener penetration and distance to the edge of the supporting steel member must be as described in Section 4.2.2. See Figure 10 for a typical installation detail showing one row of fasteners. Multiple rows of fasteners may be installed if required by the design. The remainder of the diaphragm must be constructed in accordance with the code.

5.0 CONDITIONS OF USE

The Hilti X-U and X-U 15 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 The fasteners are manufactured and identified in accordance with this report.

5.2 Fastener installation complies with this report and the Hilti, Inc., instructions. In the event of conflict between this report and Hilti, Inc., published instructions, this report governs.

5.3 Allowable tension and shear values are as noted in Tables 2 through 6. The stress increases and load reductions described in Section 1605.3 of the IBC 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 are to 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 , and fasteners used to fasten wood structural panel diaphragms to steel members as described in Sections 4.1.3 and 4.2.7, use of fasteners to resist earthquake loads is outside the scope of this report.

5.6 The use of fasteners is limited to installation in uncracked concrete or masonry. Cracking occurs when $f_t > f_r$ due to service loads or deformations.

5.7 Use of fasteners is limited to dry, interior locations.

5.8 Use of fasteners in contact with preservative-treated or fire-retardant-treated wood is not permitted.

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 into Concrete, Steel and Masonry Elements (AC70), dated October 2006.

7.0 IDENTIFICATION

Each package of fasteners is labeled with the fastener type, size, manufacturer's name (Hilti) and evaluation report number (ESR-2269). An "H", for Hilti, is imprinted on the head of the fastener as shown in Figures 1 and 2.

8.0 OTHER CODES

8.1 Scope:

In addition to the 2006 IBC and 2006 IRC, the products in this report were evaluated for compliance with the requirements of the following codes:

- 2003 *International Building Code*® (2003 IBC)
- 2003 *International Residential Code*® (2003 IRC)
- 2000 *International Building Code*® (2000 IBC)
- 2000 *International Residential Code*® (2000 IRC)
- 1997 *Uniform Building Code*™ (UBC)

8.2 Uses:

8.2.1 General: The Hilti X-U and X-U 15 fasteners are used to connect materials as described in Section 2.0. The fasteners are alternatives to the cast-in-place anchors described in 2003 and 2000 IBC Sections 1912 and 1913 and UBC Section 1923.1 for placement in concrete; the embedded anchors described in Section 2.1 of ACI 530 (which is referenced in 2003 and 2000 IBC Section 2107) and UBC Section 2107.1.5 for placement in grouted masonry; and the bolts used to attach materials to steel, described in 2003 IBC Section 2204.2, 2000 IBC Section 2209, and UBC Section 2205.11. The fasteners may be used where an engineered design is submitted in accordance with 2003 IRC Section R301.1.3 or 2000 IRC Section R301.1.2, as applicable.

8.2.2 Horizontal Diaphragms: See Section 2.2.

8.3 Description:

8.3.1 Fasteners: See Section 3.1.

8.3.2 Concrete: See Section 3.2. Under the UBC, concrete must conform to Section 1903.

8.3.3 Masonry: See Section 3.3. Under the 2003 and 2000 IBC, mortar and grout must comply with Sections 2103.7 and 2103.10, respectively. Under the UBC, mortar and grout must comply with Sections 2103.3 and 2104.3, respectively.

8.3.4 Steel Substrates: See Section 3.4.

8.3.5 Wood Structural Panel Diaphragms: See Section 3.5. Under the UBC, the wood structural panel must comply with Section 2315.3.3.

8.4 Design and Installation:

8.4.1 Design:

8.4.1.1 General: See Section 4.1.1. The stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. Except for fasteners used with architectural, electrical and mechanical components as described in 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), and fasteners used as described in Sections 4.1.3 and 4.2.7, use of fasteners to resist earthquake loads is outside the scope of this report.

8.4.1.2 Wood to Steel, Concrete, or Masonry: See Section 4.1.2. Reference lateral design values for fasteners determined in accordance with Part 11 of ANSI/AF&PA NDS (2003 IBC and IRC), Part 12 of ANSI/AF&PA NDS (2000 IBC and IRC), or Section 2318.3 of the UBC, as applicable, are applicable to Hilti fasteners of equal or greater diameters.

8.4.1.3 Wood Structural Deck Diaphragms: See Section 4.1.3. Under the UBC, diaphragm design must comply with UBC Section 2315.3.3 and Section 23.222 of UBC Standard 23-2, as applicable.

8.4.2 Installation: See Section 4.2.

8.5 Conditions of Use:

See Section 5.0, and the following:

8.5.1 Allowable tension and shear values are as noted in Tables 2 through 6. The stress increases and load reductions described in Section 1605.3 of the 2006 and 2003 IBC, and the stress increases described in Section 1612.3.2 of the UBC, are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

8.5.2 Except for fasteners used with architectural, electrical and mechanical components as described in 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), and fasteners used as described in Sections 4.1.3 and 4.2.7, use of fasteners to resist earthquake loads is outside the scope of this report.

8.6 Evidence Submitted:

See Section 6.0.

8.7 Identification:

See Section 7.0.

FIGURE 1—HILTI X-U FASTENER

FIGURE 2—HILTI X-U 15 FASTENER

TABLE 1—APPLICATION DESCRIPTIONS

BASE MATERIAL	POWDER-ACTUATED FASTENER	INSTALLATION METHOD	LOAD DATA
Steel	X-U and X-U 15 Fasteners	Standard	Table 2
Normal-Weight Concrete	X-U Fastener	Standard	Table 3
		DX KWIK	Table 4
Structural Sand-lightweight Concrete	X-U Fastener	Standard	Table 5
3-inch Deep Composite Floor Deck	X-U Fastener	Standard	
$1^1/_2$-inch Deep Composite Floor Deck	X-U Fastener	Standard	
Hollow Concrete Masonry Units	X-U Fastener	Standard	Table 6
Grout-Filled Concrete Masonry Units	X-U Fastener	Standard	

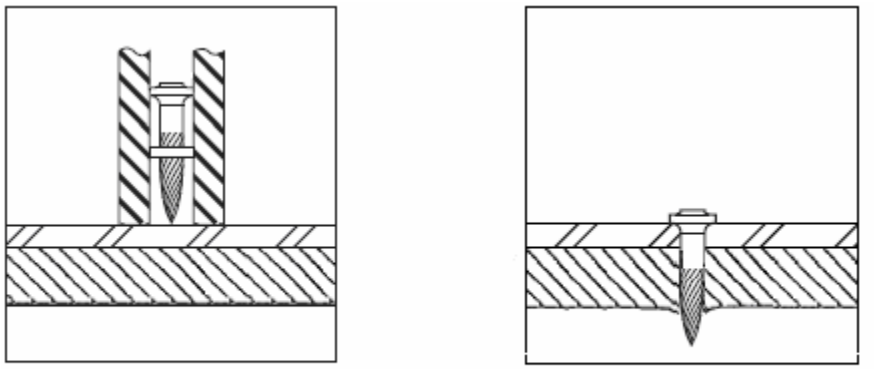
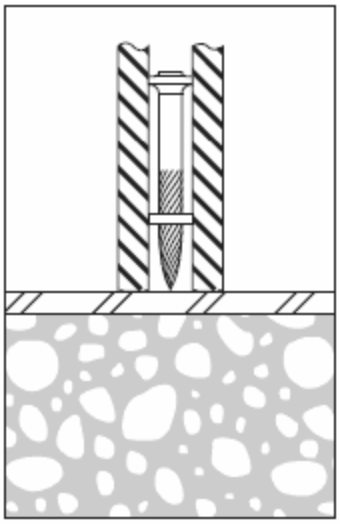
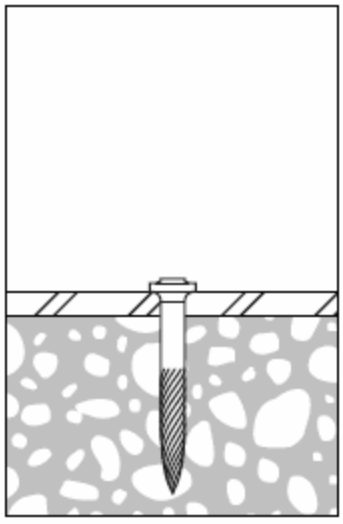


FIGURE 3—STANDARD INSTALLATION PROCEDURES FOR X-U AND X-U 15 FASTENERS IN STEEL



Press tip of fastener to material to be fastened and drive with Hilti powder-actuated tool



Properly installed X-U fastener.

FIGURE 4—STANDARD INSTALLATION PROCEDURES FOR X-U FASTENERS IN CONCRETE

TABLE 2—ALLOWABLE SERVICE LOADS FOR FASTENERS DRIVEN INTO STEEL[1, 2,6, 7] (lbf)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (in.)	STEEL THICKNESS (in.)									
			$^3/_{16}$		$^1/_4$		$^3/_8$		$^1/_2$		$\geq ^3/_4$	
			Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear	Tension	Shear
Universal Knurled Shank	X-U	0.157	535	720	775	720	935	720	900	720	350[4]	375[4]
											275[3]	350[3]
Universal Knurled Shank	X-U 15	0.145	155	400	230	395	420	450	365[5]	500[5]	365[5]	400[5]

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

[1]The tabulated allowable load values are for the fasteners only. Wood or steel members connected to the steel substrate must be investigated in accordance with accepted design criteria.
[2]The fasteners must be driven to where the point of the fastener penetrates through the steel base material, unless otherwise noted.
[3]Based upon minimum point penetration of $^3/_8$-inch.
[4]Based upon minimum point penetration of $^1/_2$-inch.
[5]Based upon minimum point penetration of $^{15}/_{32}$-inch.
[6]Earthquake load resistance is outside the scope of this report, except as noted in Sections 5.5 and 8.5.2 of this report.
[7]The stress increases and load reductions described in Section 1605.3 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

TABLE 3—ALLOWABLE SERVICE LOADS FOR FASTENERS DRIVEN INTO NORMAL-WEIGHT CONCRETE[1,2,3,4,5] (lbf)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (in.)	MINIMUM EMBEDMENT (in.)	CONCRETE COMPRESSIVE STRENGTH					
				2000 psi		4000 psi		6000 psi	
				Tension	Shear	Tension	Shear	Tension	Shear
Universal Knurled Shank	X-U	0.157	$^3/_4$	100	125	100	125	105	205
			1	165	190	170	225	110	280
			$1^1/_4$	240	310	280	310	180	425
			$1^1/_2$	275	420	325	420	–	–

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

[1]The tabulated allowable load values are for the fasteners only. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
[2]Earthquake load resistance is outside the scope of this report, except as noted in Sections 5.5 and 8.5.2 of this report.
[3]The stress increases and load reductions described in Section 1605.3 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.
[4]Fasteners must not be driven until the concrete has reached the designated minimum compressive strength.
[5]Concrete thickness must be a minimum of 3 times the embedment depth of the fastener.

TABLE 4—ALLOWABLE SERVICE LOADS FOR FASTENERS DRIVEN INTO NORMAL-WEIGHT CONCRETE USING DX-KWIK[1,2,3,4,5,6] (lbf)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (in.)	MINIMUM EMBEDMENT (in.)	CONCRETE COMPRESSIVE STRENGTH			
				4,000 psi		6,000 psi	
				Tension	Shear	Tension	Shear
Universal Knurled Shank	X-U 47 P8 w/ DX-Kwik	0.157	$1^1/_2$	395	405	360	570

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

[1]X-U Fastener is installed using the DX-Kwik drilled pilot hole installation procedure described in Section 4.3.4 and shown in Figure 4.
[2]The tabulated allowable load values are for the fasteners only. Wood or steel members connected to the concrete substrate must be investigated in accordance with accepted design criteria.
[3]Earthquake load resistance is outside the scope of this report, except as noted in Sections 5.5 and 8.5.2 of this report.
[4]The stress increases and load reductions described in Section 1605.3 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.
[5]Pilot holes must not be drilled until the concrete has reached the designated minimum compressive strength.
[6]Concrete thickness must be a minimum of 3 times the embedment depth of the fastener.

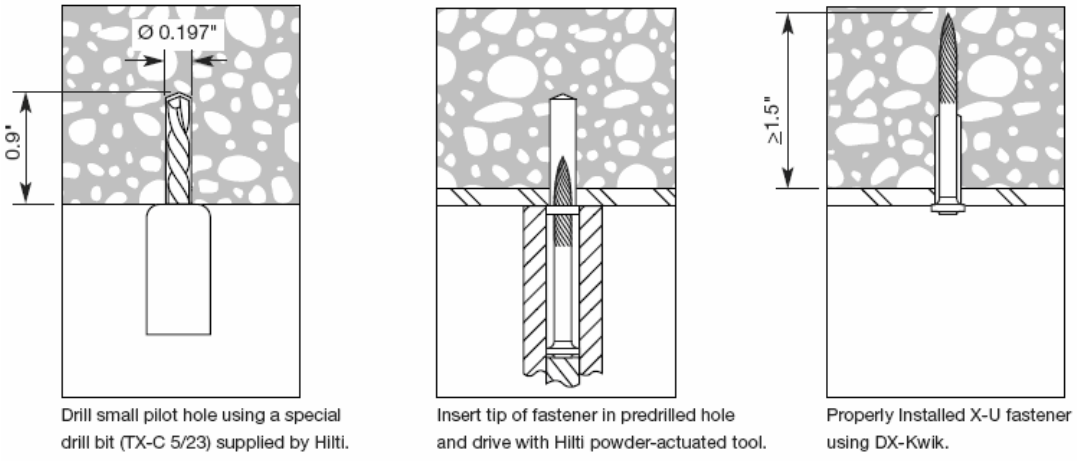


FIGURE 5—DX KWIK INSTALLATION PROCEDURES

TABLE 5—ALLOWABLE SERVICE LOADS FOR FASTENERS DRIVEN INTO MINIMUM f'_c = 3000 psi STRUCTURAL SAND-LIGHT WEIGHT CONCRETE[1,4,5,6] (lbf)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (in.)	MINIMUM EMBEDMENT (in.)	FASTENER LOCATION							
				Installed into Concrete[7]		Installed Through Metal Deck into Concrete[4, 8]					
						3-inch deep composite floor deck[1,2]			$1^1/_2$-inch deep composite floor deck[1,3]		
				Tension	Shear	Tension		Shear	Tension		Shear
						Upper Flute	Lower Flute		Upper Flute	Lower Flute	
Universal Knurled Shank	X-U	0.157	$^3/_4$	125	115	130	95	245	95	95	370
			1	205	260	215	120	330	125	125	415
			$1^1/_4$	315	435	295	120	375	–	–	–
			$1^1/_2$	425	475	400	260	430	–	–	–

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

[1]The tabulated allowable load values are for the fasteners only. Wood or steel members connected to the substrate must be investigated in accordance with accepted design criteria.
[2]The steel deck profile for the 3-inch deep composite floor deck has a minimum thickness of 0.0359 inch (0.91 mm) and a minimum F_y of 33 ksi. Lower and upper flute width must be a minimum of $4^1/_2$ inches. Figure 5 shows the nominal flute dimensions, fastener locations, and load orientations for the deck profile. Structural sand-lightweight concrete fill above top of steel deck must be minimum $3^1/_4$ inches thick.
[3]The steel deck profile for the $1^1/_2$-inch deep composite floor deck has a minimum thickness of 0.0359 inch (0.91 mm) and a minimum F_y of 33 ksi. Lower flute and upper flute widths must be a minimum of $1^3/_4$-inch and $3^1/_2$-inch, respectively. This deck may also be inverted as shown in Figure 7. Figures 6 and 7 show the nominal flute dimensions, fastener locations, and load orientations for the deck profile. Structural sand-lightweight concrete fill above top of steel deck must be minimum $2^1/_2$ inches thick.
[4]Earthquake load resistance is outside the scope of this report, except as noted in Sections 5.5 and 8.5.2 of this report.
[5]The stress increases and load reductions described in Section 1605.3.2 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.
[6]Fasteners must not be driven until the concrete has reached the designated minimum compressive strength.
[7]Concrete thickness must be a minimum of 3 times the embedment depth of the fastener.
[8]Minimum allowable spacing parallel to the deck flutes is 5.1 inches.

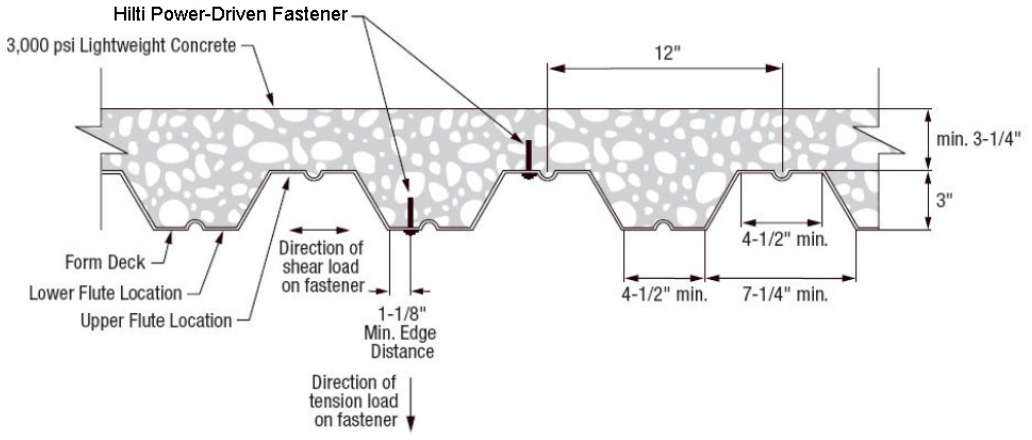


FIGURE 6—HILTI FASTENER LOCATION IN 3-INCH-DEEP COMPOSITE FLOOR DECK, NORMAL DECK PROFILE ORIENTATION

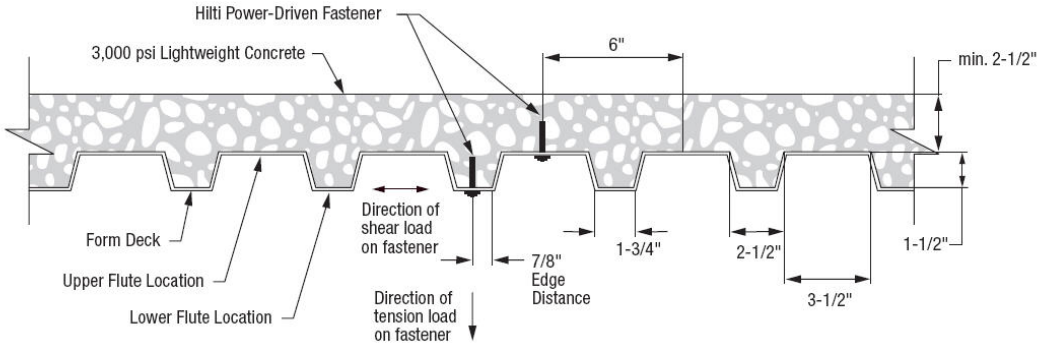


FIGURE 7—HILTI FASTENER LOCATION IN $1^1/_2$-INCH-DEEP COMPOSITE FLOOR DECK, NORMAL DECK PROFILE ORIENTATION

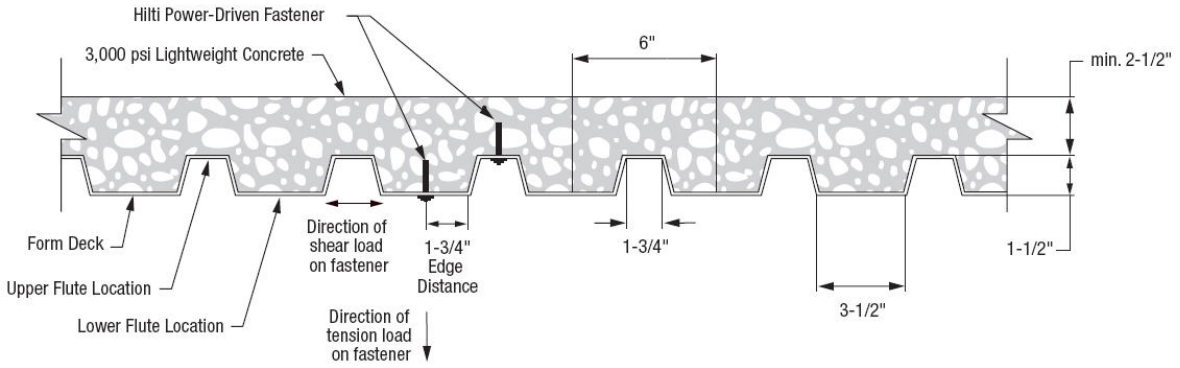


FIGURE 8—HILTI FASTENER LOCATION IN $1^1/_2$-INCH-DEEP COMPOSITE FLOOR DECK, INVERTED DECK PROFILE ORIENTATION

TABLE 6—ALLOWABLE SERVICE LOADS FOR FASTENERS DRIVEN INTO CONCRETE MASONRY UNITS [1,2,3,4,9,10] (pounds)

FASTENER DESCRIPTION	FASTENER	SHANK DIAMETER (in.)	MINIMUM EMBEDMENT (in.)	HOLLOW CMU				GROUT-FILLED CMU					
				Face Shell [4]		Mortar Joint[4,5]		Face Shell[4]		Mortar Joint[4,5]		Top of Grouted Cell[7]	
				Tension (lb)	Shear (lb)	Tension (lb)	Shear[6] (lb)	Tension (lb)	Shear (lb)	Tension (lb)	Shear[6] (lb)	Tension (lb)	Shear[8] (lb)
Universal Knurled Shank	X-U	0.157	1	70	85	25	70	225	220	150	190	165	240

[1]The tabulated allowable load values are for the fastener into concrete masonry units only. 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 fasteners installed in masonry conforming to the requirements of Section 3.3 of this report.
[3]No more than one low-velocity fastener may be installed in an individual concrete masonry unit cell. The fastener must be installed a minimum of 4 inches from the edge of the wall.
[4]Fastener can be located in the face shell or mortar joint as shown in Figure 8 of this report.
[5]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.
[6]Shear load direction can be horizontal or vertical (bed joint or T-Joint) along the CMU wall plane.
[7]Fastener located in center of grouted cell installed vertically.
[8]Shear load can be in any direction in top of grouted cell application.
[9]Earthquake load resistance is outside the scope of this report, except as noted in Sections 5.5 and 8.5.2 of this report.
[10]The stress increases and load reductions described in Section 1605.3.2 of the IBC and the stress increases described in Section 1612.3.2 of the UBC are not allowed for wind loads acting alone or when combined with gravity loads. No increase is allowed for vertical loads acting alone.

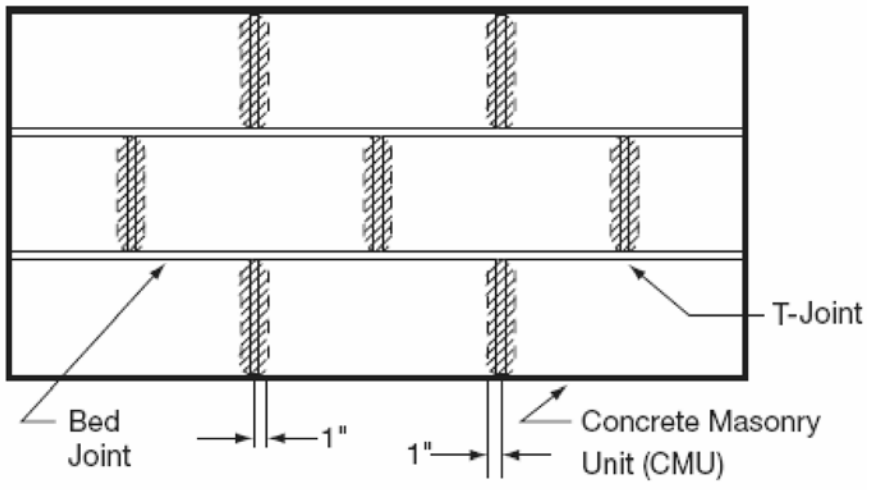


FIGURE 9—ACCEPTANCE LOCATIONS (NONSHADED AREAS) FOR HILTI FASTENERS IN CMU WALLS

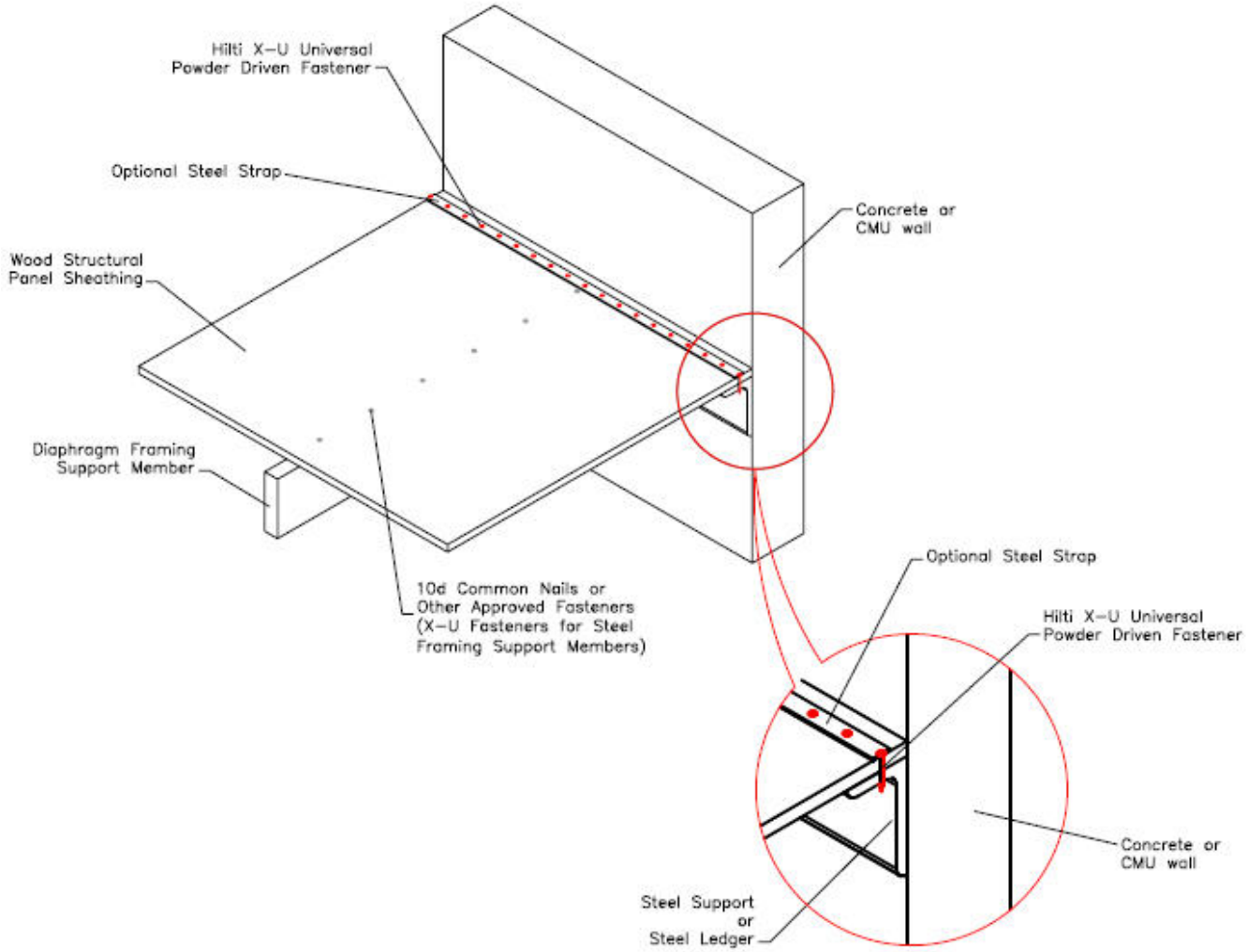


FIGURE 10—WOOD STRUCTURAL PANEL DECK ATTACHMENT TO STEEL LEDGER WITH HILTI X-U UNIVERSAL POWDER DRIVEN FASTENER