

**ICC-ES Evaluation Report****ESR-3592**

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**DIVISION: 05 00 00—METALS**  
**Section: 05 05 23—Metal Fastenings**  
**Section: 05 31 00—Steel Decking**

**REPORT HOLDER:**

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**EVALUATION SUBJECT:****STEEL DECK DIAPHRAGMS ATTACHED WITH HILTI  
X-HSN 24 POWDER-DRIVEN FRAME FASTENERS****1.0 EVALUATION SCOPE****Compliance with the following codes:**2012, 2009 and 2006 *International Building Code*® (IBC)**Properties evaluated:**

Structural

**2.0 USES**

The Hilti X-HSN 24 powder-driven frame fasteners are used as equivalent alternatives to Hilti's X-EDNK22 THQ12 and X-EDN19 THQ12 frame fasteners for the attachment of steel deck roof and floor panels to supporting steel framing.

**3.0 DESCRIPTION**

The X-HSN 24 fasteners are manufactured from hardened carbon steel with an electroplated zinc coating complying with ASTM B633, SC 1, Type III. The fasteners are 0.960 inch (24.4 mm) long, with a 0.157-inch-diameter (4.0 mm), fully knurled tip and tapered shank. The X-HSN 24 fasteners have a dome-style head and a premounted 0.472-inch-diameter (12 mm) steel top hat washer with red plastic collation strip. Table 1 provides a depiction of the Hilti X-HSN 24 powder-driven fastener and the corresponding base steel material application limits.

**4.0 DESIGN AND INSTALLATION**

Allowable diaphragm shear values and stiffness values (calculated or tabulated) for steel deck roof and floor diaphragms using Hilti's X-EDNK22 THQ12 or X-EDN19 THQ12 frame fasteners are provided in ICC-ES AC43 evaluation reports for steel deck roof and floor diaphragms issued to Hilti, Inc., and other ICC-ES evaluation report holders. The allowable diaphragm shear values and

stiffness values found in these reports for Hilti's X-EDNK22 THQ12 or X-EDN19 THQ12 frame fasteners may be used for the X-HSN 24 frame fasteners provided all other components of the steel deck roof and floor diaphragm system remain the same as described in the applicable ICC-ES AC43 evaluation report. Installation details for the X-HSN 24 frame fastener are provided in Table 1.

Allowable tension pullout and pullover capacities for the X-HSN 24 fastener are provided in Tables 2 and 3, respectively, and may be used in place of the pullout and pullover capacities listed for the X-EDNK22 THQ12 or X-EDN19 THQ12 in the applicable ICC-ES evaluation report, for the purpose of determining uplift resistance for bare roof deck.

**5.0 CONDITIONS OF USE**

Steel deck diaphragms comprised of steel deck panels attached to steel supports with Hilti X-HSN 24 powder-driven fasteners, as described in this report, comply with those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1** The conditions of use stated in other ICC-ES evaluation reports specifying Hilti's X-EDNK22 THQ12 or X-EDN19 THQ12 fasteners must be adhered to, as applicable.
- 5.2** The X-HSN 24 fasteners are manufactured, identified, and installed in accordance with this report, the manufacturer's installation instructions and approved plans. If there is a conflict, this report governs.
- 5.3** Calculations demonstrating compliance with 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 to be constructed.
- 5.4** Hilti fasteners may be used for attachment of steel deck roof systems temporarily exposed to the exterior during construction prior to application of built-up roof covering systems. The fasteners on permanently exposed steel deck roof coverings must be covered with a corrosion-resistant paint or sealant that is subject to the approval of the building official.

**6.0 EVIDENCE SUBMITTED**


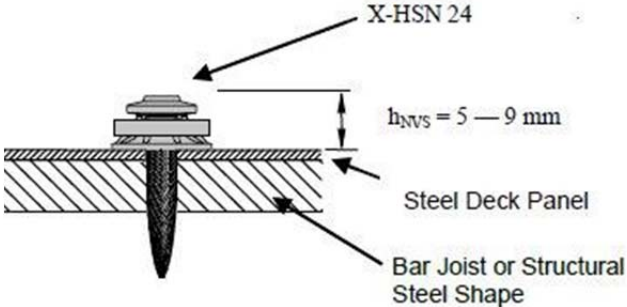
- 6.1** Data in accordance with the ICC-ES Acceptance Criteria for Steel Deck Roof and Floor Systems (AC43), dated October 2010 (editorially revised September 2013).

- 6.2 Data in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements (AC70), dated February 2013.
- 6.3 Data on side-by-side comparison testing between the X-HSN 24 fastener and the X-EDNK22 THQ12 and X-EDN19 THQ12 fasteners.

**7.0 IDENTIFICATION**

The Hilti X-HSN 24 powder-driven fastener described in this report is identified by an “H” stamped on the fastener head and by a red plastic collation strip. All fasteners are packaged in containers noting the product designation, the company name of Hilti and the evaluation report number (ESR-3592).

**TABLE 1—X-HSN 24 FRAME FASTENER INSTALLATION GUIDE**

STEEL SUPPORT FRAMING THICKNESS ( $t_f$ ) <sup>1,2</sup>	FASTENER TYPE	NAIL HEAD STANDOFF ( $h_{NVS}$ )
Bar Joist or Structural Steel Shape with $\frac{1}{8}$ inch $\leq t_f \leq \frac{3}{8}$ inch	 X-HSN 24	 $h_{NVS} = 5 - 9$ mm Steel Deck Panel Bar Joist or Structural Steel Shape

For SI: 1 inch = 25.4 mm, 1 ksi = 6.89 Mpa

<sup>1</sup>Steel support framing tensile strength ( $f_u$ ) must be less than 91 ksi for base steel thicknesses ( $t_f$ ) of  $\frac{5}{16}$  inch or less. Steel support framing tensile strength ( $f_u$ ) must be less than 75 ksi for base steel thicknesses ( $t_f$ ) greater than  $\frac{5}{16}$  inch.

<sup>2</sup>Steel support framing must be manufactured from code-compliant steel meeting the minimum strength requirements of ASTM A36, ASTM A572 Grade 50, or ASTM A992.

**TABLE 2—ALLOWABLE (ASD) TENSION PULLOUT LOADS TO RESIST UPLIFT LOADS FOR STEEL DECKS ATTACHED WITH X-HSN 24 FASTENERS (lbf)<sup>1</sup>**

FASTENER	STEEL SUPPORT FRAMING THICKNESS <sup>2</sup> (inch)				
	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$
X-HSN 24	ASTM A36, ASTM A572 Grade 50 or ASTM A992				
	435	635	750	750	750

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N

<sup>1</sup>Tabulated allowable (ASD) values based upon a  $\Omega$  safety factor of 5.0. To obtain LRFD pullout capacities, multiply tabulated values by 1.6.

<sup>2</sup>Steel support framing must be as described in Table 1.

**TABLE 3—ALLOWABLE (ASD) TENSION PULLOVER LOADS TO RESIST UPLIFT LOADS FOR STEEL DECKS ATTACHED WITH X-HSN 24 FASTENERS (lbf)<sup>1</sup>**

FASTENER	STEEL SUPPORT FRAMING THICKNESS <sup>2</sup> (inch)	DECK PANEL DESIGN THICKNESS <sup>3</sup> (gage/inch)			
		22 (0.0295)	20 (0.0358)	18 (0.0474)	16 (0.0598)
X-HSN 24	$\geq \frac{1}{8}$ $\leq \frac{3}{8}$	500	560	725	865

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N

<sup>1</sup>Tabulated allowable (ASD) values are based upon a  $\Omega$  safety factor of 3.0. To obtain LRFD pullout capacities, multiply tabulated values by 1.6.

<sup>2</sup>Steel support framing must be as described in Table 1.

<sup>3</sup>Steel decks must have minimum yield strength of 33 ksi.