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ICC-ES Evaluation Report

ESR-2892*

Issued October 1, 2009

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DIVISION: 03—CONCRETE
Section: 03151—Concrete Anchoring

DIVISION: 09—FINISHES
Section: 09051—Fasteners

REPORT HOLDER:

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EVALUATION SUBJECT:

HILTI X-CW CEILING WIRE ASSEMBLIES

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

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

Property evaluated

Structural

2.0 USES

Hilti X-CW ceiling wire assemblies are used to fasten steel wire to normal-weight concrete and structural sand-lightweight concrete-filled steel deck panels for the purpose of hanging suspended ceiling systems complying with IBC Section 808.1. The ceiling wire assemblies may be used where an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 General:

The Hilti X-CW Ceiling Wire Assembly consists of a steel wire clamped to a powder-actuated fastener with a premounted clamping washer, as shown in Figure 1. See Table 1 for assembly types and fastener dimensions.

3.2 Powder-actuated Fastener:

The powder-actuated fasteners used in the X-CW X-C 27 and X-C 32 ceiling wire assemblies are the Hilti X-C 27 and X-C 32, respectively, recognized in ESR-1663. The powder-actuated fasteners used in the X-CW X-U 22 and X-U 27 ceiling wire assemblies are the Hilti X-U 22 and X-U 27 fasteners, respectively, recognized in ESR-2269.

3.3 Clamping Washer:

The premounted clamping washer is formed from steel complying with ASTM A 653M SS, Grade 255, with a Z120 coating designation. The steel has a base-metal thickness of 0.06 inch (1.5 mm).

3.4 Wire:

The ceiling wire is No. 12 gage diameter [0.106 inch (2.7 mm)], zinc-coated carbon steel wire complying with ASTM A 641, soft temper, with a Class 1 zinc coating designation.

3.5 Normal-weight Concrete:

Normal-weight concrete must be stone-aggregate and comply with IBC Section 1905 or IRC Section 402.2, as applicable. The minimum concrete compressive strength at the time of fastener installation is noted in Table 2.

3.6 Structural Lightweight Concrete:

Structural lightweight concrete must be sand-lightweight complying with IBC Section 1905. The minimum concrete compressive strength at the time of fastener installation is noted in Table 3.

3.7 Steel Deck Panels:

Steel deck panels must have a minimum 0.0358-inch (0.909 mm) base-metal thickness and conform to the applicable material standard, with a minimum yield strength of 38 ksi (262 MPa). See Figure 3 for panel configuration requirements.

4.0 DESIGN AND INSTALLATION

4.1 Design:

The allowable tension and 45-degree-angle loads for X-CW ceiling wire assemblies installed into normal-weight concrete are provided in Table 2. The allowable tension

and 45-degree-angle loads for X-CW ceiling wire assemblies installed through steel deck panels into structural sand-lightweight concrete are provided in Table 3. For installation at angles between 45 degrees and 90 degrees to the supporting slab, the allowable load is the lesser of the allowable tension and 45-degree-angle loads.

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. Use of wire assemblies to resist earthquake loads is outside the scope of this report.

4.2 Installation:

4.2.1 General: The X-CW ceiling wire assemblies must be installed in accordance with this report and the manufacturer's published installation instructions, including those shown in Figure 2. 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. Fastener standoff distance must be as noted in the footnotes to the tables and as shown in Figure 2. Installers must be certified by Hilti, and have a current, Hilti-issued, operator's license.

4.2.2 Fastening to Concrete: Fasteners must be driven into the normal-weight or structural sand-lightweight concrete after the concrete attains the specified concrete compressive strength. Unless otherwise noted, minimum spacing between fasteners must be 4 inches (102 mm) and minimum edge distance must be 3 inches (76 mm). Unless otherwise noted in this report, concrete thickness must be a minimum of three times the embedment depth of the fastener.

4.2.3 Fastening to Structural Sand-lightweight Concrete-filled Steel Deck Panels: Installation in structural sand-lightweight concrete-filled steel deck panels must comply with Figure 3. Minimum distance from fastener centerline to rolled deck panel flute edges must be as depicted in Figure 3.

5.0 CONDITIONS OF USE

The Hilti X-CW ceiling wire assemblies 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 ceiling wire assemblies are manufactured and identified in accordance with this report.

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

5.3 Allowable tension and 45-degree-angle loads are in accordance with Section 4.1. 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.

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 Use of ceiling wire assemblies to resist earthquake loads is outside the scope of this report.

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

5.7 Use of ceiling wire assemblies is limited to dry, interior locations.

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

6.0 EVIDENCE SUBMITTED

6.1 Data in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-driven into Concrete, Steel and Masonry Elements (AC70), dated October 2006.

6.2 Report of testing of hanger wire connection to fastener, in accordance with the ICC-ES Acceptance Criteria for Suspended Ceiling Framing Systems (AC368), dated February 2007.

7.0 IDENTIFICATION

The fasteners are imprinted with an "H" on the head. All assemblies are identified on the packaging with the Hilti, Inc., name, the fastener type and size, and the evaluation report number (ESR-2892).

8.0 OTHER CODES

8.1 Evaluation Scope:

In addition to the codes referenced in Section 1.0, the products 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)
- 1997 *Uniform Building Code*™ (UBC)

8.2 Uses:

Hilti X-CW ceiling wire assemblies are used to fasten steel wire to normal-weight concrete and structural sand-lightweight concrete-filled steel deck panels for the purpose of hanging suspended ceiling systems complying with 2006 and 2003 IBC Section 803.9 and 2000 IBC Section 803.8, as applicable.The Hilti X-CW ceiling wire assemblies may be used where an engineered design is submitted in accordance with 2006 or 2003 IRC Section R301.1.3 or 2000 IRC Section R301.1.2, as applicable.

8.3 Description:

See Section 3.0 and the following:

8.3.1 Normal-weight Concrete: See Section 3.2.2. Under the UBC, normal-weight concrete must be stone-aggregate and comply with UBC Section 1903.

8.3.2 Structural Sand-lightweight Concrete: See Section 3.2.3. Under the UBC, sand-lightweight concrete must comply with UBC Section 1903.

8.4 Design and Installation:

8.4.1 Design: See Section 4.1 and the following:

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. Use of ceiling wire assemblies to resist earthquake loads is outside the scope of this report.

8.4.2 Installation: See Section 4.2.

8.5 Conditions of use:

See Section 5.0 and the following:

Allowable tension and 45-degree-angle loads are as noted in Section 4.1. The stress increases and load reductions described in Section 1605.3 of the 2006, 2003 and 2000 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.

8.6 Evidence Submitted:

See Section 6.0.

8.7 Identification:

See Section 7.0.

TABLE 1—X-CW CEILING WIRE ASSEMBLY TYPES

CEILING WIRE ASSEMBLY TYPE	FASTENER DIAMETER (inch)	FASTENER SHANK LENGTH (inches)	RELEVANT BASE MATERIAL	MINIMUM EMBEDMENT OF FASTENER (inches)
X-CW X-C 27	0.138	1.063	Normal-weight concrete, structural sand-lightweight concrete over steel deck panel	$^{7}/_{8}$
X-CW X-C 32	0.138	1.260		$1^{1}/_{8}$
X-CW X-U 22	0.157	0.866		$^{3}/_{4}$
X-CW X-U 27	0.157	1.063		$^{7}/_{8}$

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

TABLE 2—ALLOWABLE LOADS FOR HILTI X-CW CEILING WIRE ASSEMBLIES INSTALLED IN NORMAL-WEIGHT CONCRETE (pounds)[1,2]

CEILING WIRE ASSEMBLY TYPE	MINIMUM EMBEDMENT (inches)	CONCRETE COMPRESSIVE STRENGTH			
		4000 psi		6000 psi	
		Tension	45-Degree	Tension	45-Degree
X-CW X-C 27	$^{7}/_{8}$	210	210	---	---
X-CW X-C 32	$1^{1}/_{8}$	210	210	---	---
X-CW X-U 22	$^{3}/_{4}$	---	---	100	90
X-CW X-U 27	$^{7}/_{8}$	210	210	130	150

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

[1]Allowable values are for ceiling wire assemblies installed in concrete having the designated compressive strength at the time of installation.
[2]Concrete thickness at the point of penetration must be a minimum of three times the fastener embedment depth.

TABLE 3—ALLOWABLE LOADS FOR HILTI X-CW CEILING WIRE ASSEMBLIES INSTALLED IN STRUCTURAL SAND-LIGHTWEIGHT CONCRETE FILLED COMPOSITE STEEL DECK PANEL (pounds)[1,2]

CEILING WIRE ASSEMBLY TYPE	MINIMUM EMBEDMENT (inches)	3000 psi CONCRETE COMPRESSIVE STRENGTH			
		Upper Flute		Lower Flute	
		Tension	45-Degree	Tension	45-Degree
X-CW X-C 27	$^{7}/_{8}$	110	210	100	145
X-CW X-C 32	$1^{1}/_{8}$	150	210	100	145
X-CW X-U 27	$^{7}/_{8}$	170	210	150	160

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

[1]Allowable values are for ceiling wire assemblies installed in concrete having the designated compressive strength at the time of installation.
[2]The composite floor deck panel must have a minimum base-metal thickness of 0.0358 inch and conform to the applicable material standard, with a minimum yield strength (F_y) of 38 ksi. Figure 3 shows nominal flute dimensions, ceiling wire assembly locations and load orientations for the deck panel profile. Structural sand-lightweight concrete fill above top of steel deck panel must be a minimum of $3^{1}/_{4}$ inches thick.

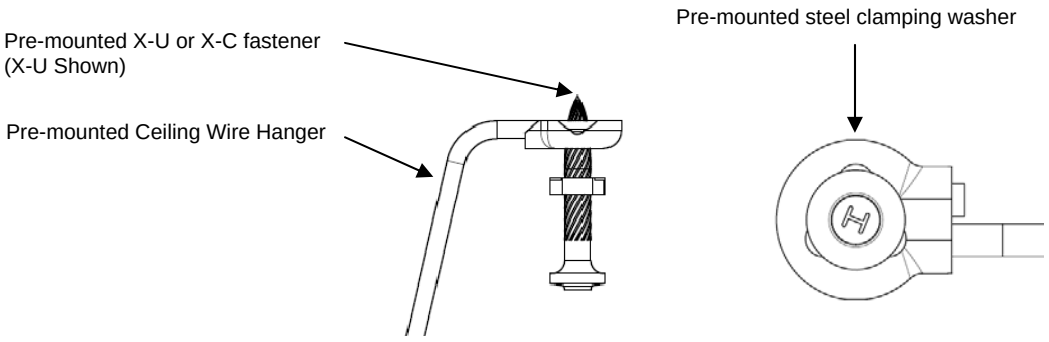
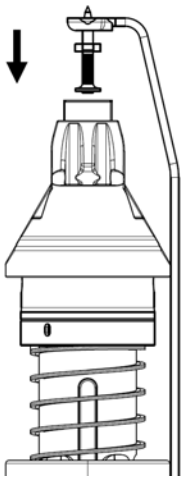
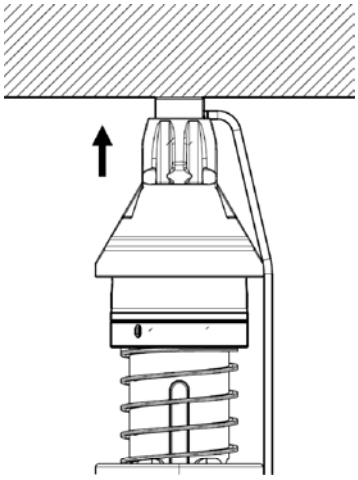


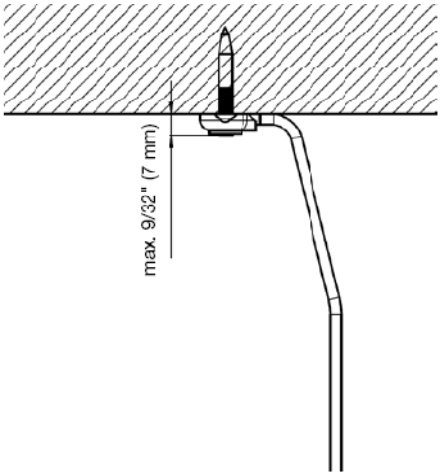
FIGURE 1—X-CW CEILING WIRE ASSEMBLY IDENTIFICATION



Insert X-CW Ceiling Wire Assembly
Into the Hilti Powder Actuated Tool

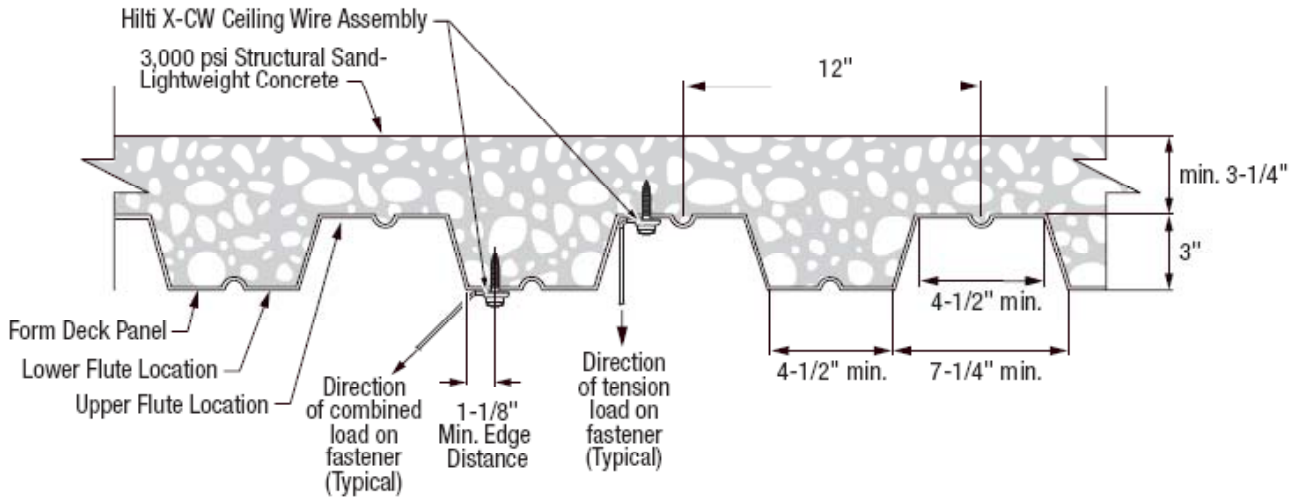


Locate the Fastening, Compress
the Hilti Powder-Actuated Tool
and Install Fastener



Check Nail Standoff and Adjust
the X-CW Ceiling Wire Position as Needed

FIGURE 2—X-CW CEILING WIRE ASSEMBLY INSTALLATION INSTRUCTIONS



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

FIGURE 3—HILTI X-CW CEILING WIRE HANGER ASSEMBLY LOCATION IN 3-INCH-DEEP COMPOSITE FLOOR DECK PANEL, NORMAL DECK PANEL PROFILE ORIENTATION

ICC-ES Evaluation Report

ESR-2892 Supplement

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EVALUATION SUBJECT:

HILTI X-CW CEILING WIRE ASSEMBLIES

1.0 EV ALUATION 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 X-CW Ceiling Wire Assemblies described in Sections 2.0 through 7.0 and in T ables 1 thr ough 3 of th e master re port comply with th e 2 007 *Florida Building Code—Building*, and the 2007 *Florida Building Code—Residential*, when designed and installed in accordance with the master evaluation report.

For products falling under Florida Rule 9B-72, verification that the report holder's quality assurance program is audited by a quality assurance entit y a pproved b y th e F lorida Bui lding Co mmission for the t ype of inspections being con ducted i s the responsibility of an approv ed validation entity (or the co de official when the report ho lder does not p ossess an ap proval b y the Commission).

This supplement expires concurrently with the master evaluation report issued on October 1, 2009.