

DATE: _____ PROJECT: _____

TO: _____ FROM: _____

SUBJECT: HILTI X-CW CEILING WIRE FASTENER SUBSTITUTION REQUEST

SPECIFICATION TITLE: _____

SECTION: _____ PAGE: _____ ARTICLE/PARAGRAPH: _____

DESCRIPTION: _____

DESIGN DETAIL NO.: _____

PROPOSED SUBSTITUTION: Use HILTI X-CW Ceiling Wire for Suspended Ceiling Systems

PRODUCT DESCRIPTION: The Hilti X-CW Ceiling Wire Fastening Assembly consists of a pre-mounted powder-actuated fastener, either X-U or X-C type, with a pre-mounted 0.06 in. (1.5 mm) thick steel clamping washer and a 12 gauge (0.106in/2.7 mm) diameter galvanized, soft annealed mild carbon steel wire for supporting direct and indirect suspended lay-in panel ceilings.

**Approvals**ICC-ES (International Code Council)
ESR-2892

SUBMITTED BY: _____

SUPPORTING DATA ATTACHED:

- ☐ 2009 SUPPLEMENT TO HILTI PRODUCT TECHNICAL GUIDE, 2008
- ☐ ICC EVALUATION SERVICE REPORT ESR-2892
- ☐ FASTENER LOAD COMPARISONS
- ☐ SAMPLES
- ☐ PRICING INFORMATION

A/E REVIEW AND ACTION:

- ☐ SUBSTITUTION APPROVED
- ☐ SUBSTITUTION APPROVED AS NOTED
- ☐ SUBSTITUTION REJECTED

COMMENTS: _____

SIGNED BY: _____

DATE: _____



October 23, 2009

Subject: IBC / IRC Compliance of Hilti X-CW Ceiling Wire Assemblies (ICC-ES ESR-2892)

To Whom It May Concern:

This memorandum addresses the 2006 IBC (International Building Code) and IRC (International Residential Code) compliance of Hilti X-CW Ceiling Wire Assemblies.

Hilti X-CW Ceiling Wire Assemblies consist of a pre-mounted Hilti powder-actuated fastener, X-U (ICC-ES ESR-2269) or X-C (ICC-ES ESR-1663) type, with a pre-mounted clamping washer and a 12 gauge soft annealed mild carbon steel wire for supporting direct and indirect hung suspended lay-in panel ceilings.

Hilti X-CW Ceiling Wire Assemblies have been tested and evaluated by ICC-ES in accordance with AC70-07, Acceptance Criteria for Fasteners Power-Driven into Concrete, Steel, and Masonry Elements in order to provide recognition under 2006 IBC and IRC. Hilti X-CW Ceiling Wire Assemblies are recognized in evaluation service report ESR-2892 issued by ICC-ES, and meet the OSHPD and DSA requirements for fastening of acoustical lay-in panel suspended ceiling systems, subject to the conditions of OSHPD CAN 2-1912A.1 and DSA IR 25-2.

X-CW Ceiling Wire Assemblies are an alternative method of fastening for acoustical suspended ceiling systems as referenced in ASTM C635, which is referenced in Section 809.3 of 2006 IBC, and may be substituted for Hilti X-CC type Ceiling Clips (ICC-ES ESR-2184) if allowable service load requirements are satisfied.

For additional information or inquiries, please contact Hilti Technical Services at hnatechnicalservices@hilti.com or call 1-800-749-6337.

Regards,

A handwritten signature in black ink, appearing to read "William G. Gould".

William G. Gould, P.E.
Director, Codes and Approvals
Hilti, Inc.
(800) 879-6000 x-7804
william.gould@hilti.com

Ref. ICC-ES AC70 Acceptance Criteria for Concrete, Steel and Masonry Elements, 1-1-07
OSHPD CAN 2-1912A.1 Qualification, Design and Use of Anchors Installed in Concrete, 7-1-08
DSA IR 25-2 Metal Suspension Systems for Lay-In Panel Ceilings, 7-21-05

Hilti, Inc.
5400 South 122nd East Avenue
Tulsa, OK 74146

1-800-879-8000
www.hilti.com

ICC-ES Evaluation Report**ESR-2892**

Issued October 1, 2009

This report is subject to re-examination in one year.www.icc-es.org | (800) 423-6587 | (562) 699-0543*A Subsidiary of the International Code Council®***DIVISION: 03—CONCRETE**
Section: 03151—Concrete Anchoring**DIVISION: 09—FINISHES**
Section: 09051—Fasteners**REPORT HOLDER:****HILTI, INC.**
5400 SOUTH 122ND EAST AVENUE
TULSA, OKLAHOMA 74146
(800) 879-8000
www.us.hilti.com**EVALUATION SUBJECT****HILTI X-CW CEILING WIRE ASSEMBLIES****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2006 *International Building Code*® (IBC)
- 2006 *International Residential Code*® (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 metal deck for the purpose of hanging suspended ceiling systems complying with IBC Section 803.9. The fasteners 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 assemblies are the Hilti X-C and X-U fasteners, recognized in [ESR-1663](#) and [ESR-2269](#), respectively.

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 [0.106 inch (2.7 mm)] diameter, zinc-coated carbon steel wire complying with ASTM A 641, soft temper, with a Class 1 zinc coating designation.

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 metal deck 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 described in Section 1605.3 of the IBC are not allowed for wind loads acting alone or when combined with vertical loads. No increase is allowed for vertical loads acting alone. Use of fasteners 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.

4.2.2 Fastening to Concrete: Fasteners must be driven into the concrete after the concrete attains the specified concrete compressive strength. 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: Installation in structural sand-lightweight concrete filled steel deck must comply with Figure 3. Minimum distance from fastener centerline to rolled deck 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 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 45-degree values are as noted in Tables 2 and 3. The stress increases and load reductions described in Section 1605.3.2 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 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. 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 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:

- 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)

8.1 Uses:

See Section 2.0. 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 Description:

See Section 3.0.

8.3 Design and Installation:

8.3.1 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 fasteners to resist earthquake loads is outside the scope of this report.

8.3.2 Installation: See Section 4.2.

8.4 Conditions of use:

See Section 5.0.

8.5 Evidence Submitted:

See Section 6.0.

8.6 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, Lightweight concrete over metal deck	$\frac{7}{8}$
X-CW X-C 32	0.138	1.260		$1\frac{1}{8}$
X-CW X-U 22	0.157	0.866		$\frac{3}{4}$
X-CW X-U 27	0.157	1.063		$\frac{7}{8}$

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	$\frac{7}{8}$	210	210	---	---
X-CW X-C 32	$1\frac{1}{8}$	210	210	---	---
X-CW X-U 22	$\frac{3}{4}$	---	---	100	90
X-CW X-U 27	$\frac{7}{8}$	210	210	130	150

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

¹Allowable values are for fasteners installed in concrete having the designated compressive strength at the time of installation.

²Concrete 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 (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	$\frac{7}{8}$	110	210	100	145
X-CW X-C 32	$1\frac{1}{8}$	150	210	100	145
X-CW X-U 27	$\frac{7}{8}$	170	210	150	160

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

¹Allowable values are for fasteners installed in concrete having the designated compressive strength at the time of installation.

²The composite floor deck must have a minimum thickness of 20 gage (0.0358 inch) and a minimum yield strength (F_y) of 38 ksi. Figure 3 shows nominal flute dimensions, fastener locations and load orientations for the deck profile. Structural sand-lightweight concrete fill above top of steel deck must be a minimum of $\frac{3}{4}$ inches thick.

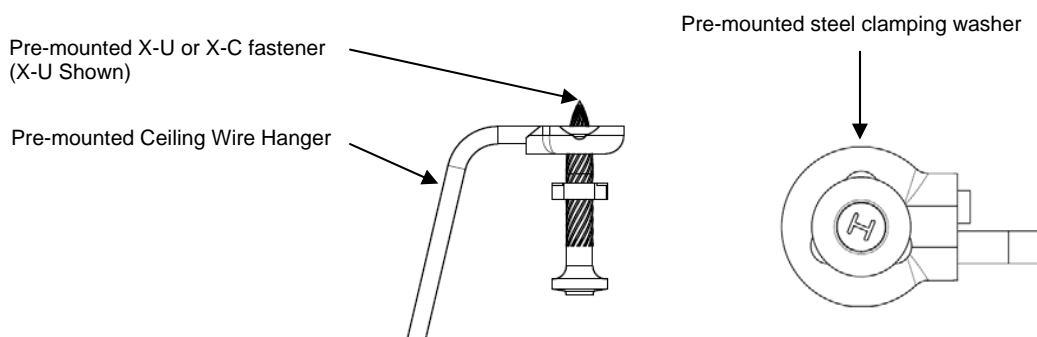
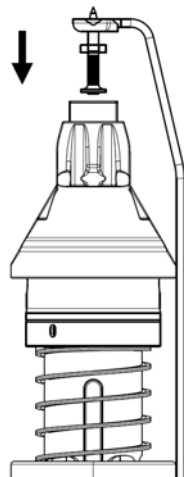
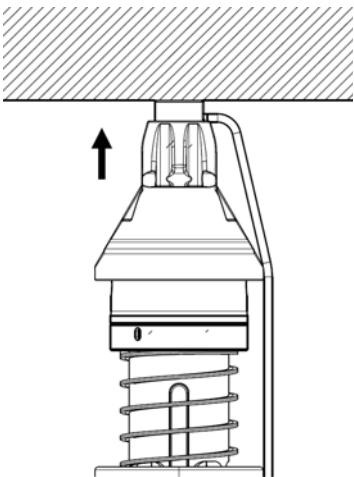


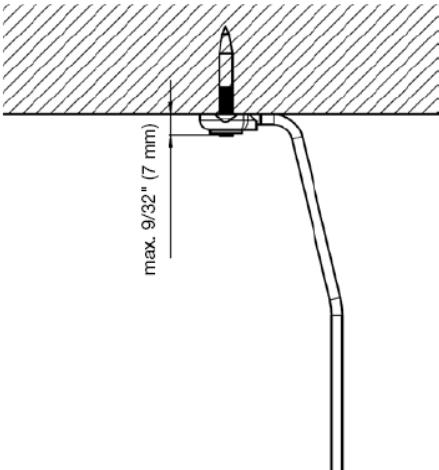
FIGURE 1—X-CW CEILING WIRE ASSEMBLY IDENTIFICATION



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

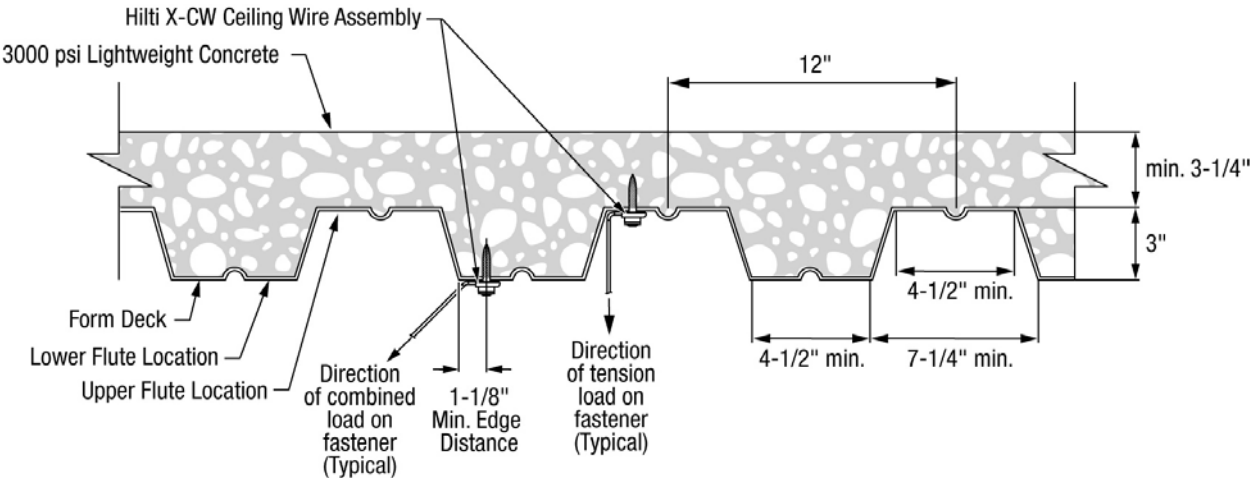


FIGURE 3—HILTI X-CW CEILING HANGER ASSEMBLY LOCATION IN
3-INCH-DEEP COMPOSITE FLOOR DECK, NORMAL DECK PROFILE ORIENTATION



**X-CW
Ceiling Wire
Fastening
Assemblies**

**2009 Supplement to
Hilti North American
Product Technical Guide,
2008 Edition**

2009 Edition

Hilti X-CW Ceiling Wire Assembly

1.1 Product Description

The Hilti X-CW Ceiling Wire Fastening Assembly consists of a pre-mounted powder-actuated fastener, either X-U or X-C type, with a pre-mounted 0.06 in. (1.5 mm) thick steel clamping washer

and a 12 gauge (0.106 in./2.7 mm) diameter galvanized, soft annealed mild carbon steel wire for supporting direct and indirect hung suspended lay-in panel ceilings.

1.1	Product Description
1.2	Material Specifications
1.3	Technical Data
1.4	Installation Instructions
1.5	Ordering Information

1.2 Material Specifications

Fastener Designation	Powder-Actuated Fastener Material	Powder-Actuated Fastener Plating	Steel Clamping Washer Material	Steel Clamping Washer Plating	Ceiling Wire Material	Ceiling Wire Plating
X-CW	Carbon Steel	5 µm Zinc ¹	Carbon Steel	16 µm Zinc ²	Carbon Steel	6 µm Zinc ³

1 ASTM B 633, SC 1, Type III

2 ASTM A 653/A 653M, Z120

3 ASTM A 641/A 641M, Class 1

1.3 Technical Data

Allowable Loads for Hilti X-CW Ceiling Wire Assemblies Installed in Normal Weight Concrete^{1,2,3,4}

Ceiling Wire Type	Concrete Compressive Strength			
	4000 psi		6000 psi	
	Tension	45-Degree	Tension	45 Degree
X-CW C27	210	210	–	–
X-CW C32	210	210	–	–
X-CW U22	–	–	100	90
X-CW U27	210	210	130	150

- The tabulated allowable loads apply to the X-CW ceiling wire assembly using a minimum safety factor of 5.0 in accordance with ICC-ES AC70 if controlled by the powder-actuated fastener pullout or a minimum of 2.0 in accordance with ICC-ES AC308 if controlled by the wire yielding and fracture.
- Allowable values are for fasteners installed in concrete having the designated compressive strength at the time of installation.
- Concrete thickness at the point of penetration must be a minimum of the fastener embedment depth plus 1-1/2".
- Multiple fasteners must be used for suspended ceiling applications.

Allowable Loads for Hilti X-CW Ceiling Wire Assemblies Installed in Structural Lightweight Concrete over Composite Floor Deck^{1,2,3,4}

Ceiling Wire Type	3000 psi Concrete Compressive Strength			
	Upper Flute		Lower Flute	
	Tension	45-Degree	Tension	45 Degree
X-CW C27	110	210	100	145
X-CW C32	150	210	100	145
X-CW U27	170	210	150	160

- The tabulated allowable loads apply to the X-CW ceiling wire assembly using a minimum safety factor of 5.0 in accordance with ICC-ES AC70 if controlled by the powder-actuated fastener pullout or a minimum of 2.0 in accordance with ICC-ES AC308 if controlled by the wire yielding and fracture.
- Allowable values are for fasteners installed in concrete having the designated compressive strength at the time of installation.
- Testing completed in composite floor deck having a minimum thickness of 20 gauge (0.0358") and a minimum yield strength (Fy) of 38 ksi. Figures 2 – 4 show nominal flute dimensions, fastener locations and load orientations for the deck profile. Concrete thickness at the point of penetration must be a minimum of the fastener embedment depth plus 1-1/2".
- Multiple fasteners must be used for suspended ceiling applications.



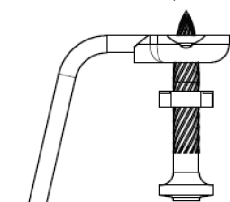
Approvals

ICC-ES (International Code Council)
ESR-2892

COLA (City of Los Angeles)
Pending

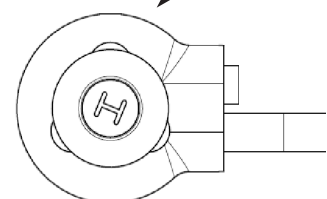


Pre-mounted X-U or X-C fastener (X-U Shown)



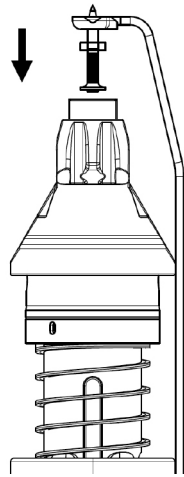
Pre-mounted Ceiling Wire Hanger

Pre-mounted steel clamping washer

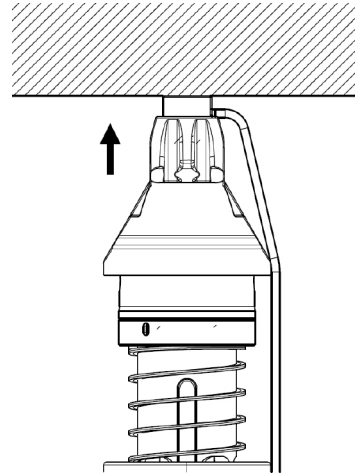


Hilti X-CW Ceiling Wire Assembly

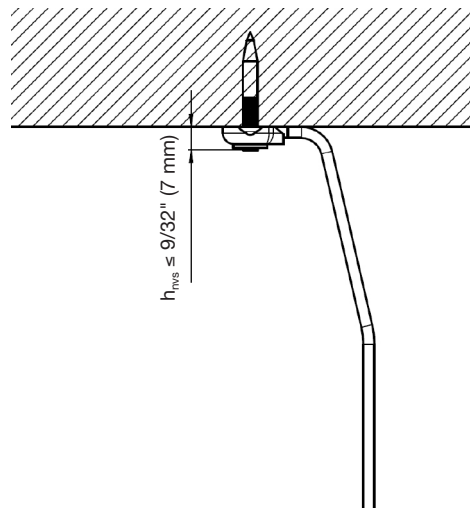
1.4 X-CW Installation Instructions



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



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



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

Figure 1 - X-CW Ceiling Wire Assembly Installation Instructions

Hilti X-CW Ceiling Wire Assembly

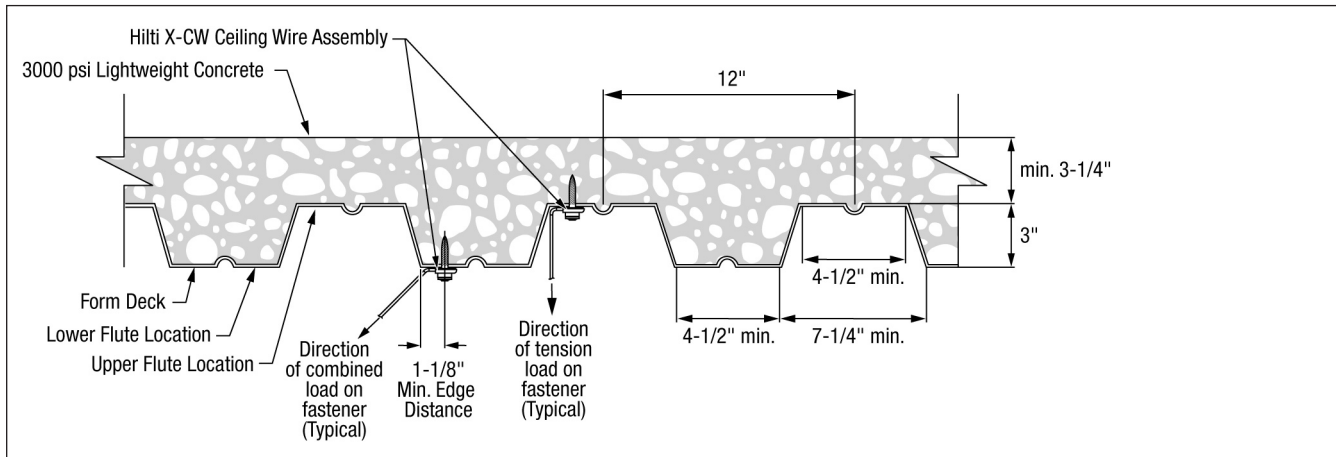


Figure 2 – Hilti X-CW Ceiling Hanger Assembly Location in 3-in.-Deep Composite Floor Deck, Normal Deck Profile Orientation

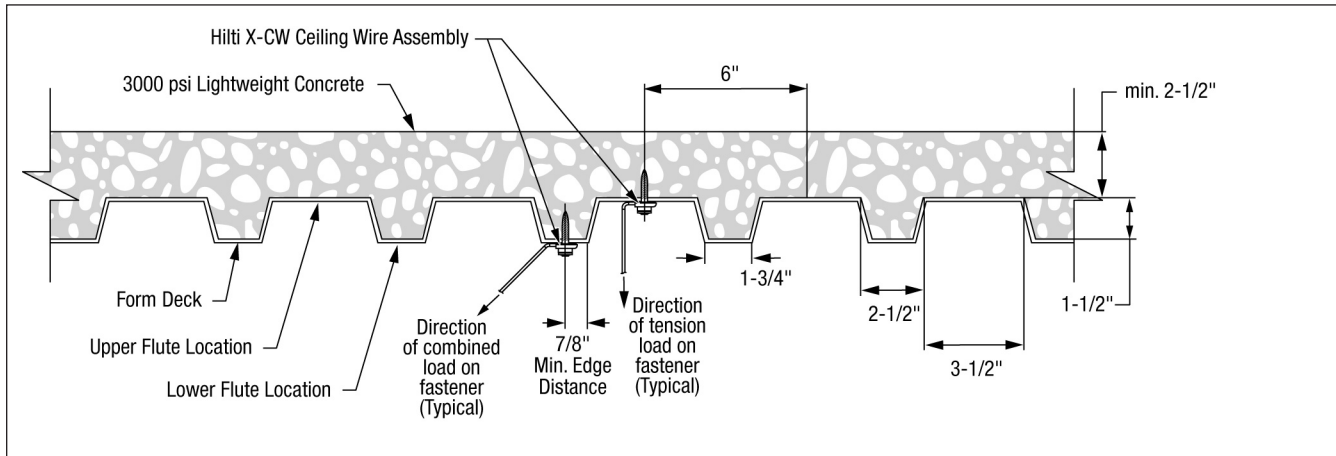


Figure 3 – Hilti X-CW Ceiling Wire Assembly Location in 1-1/2-in.-Deep Composite Floor Deck, Normal Deck Profile Orientation

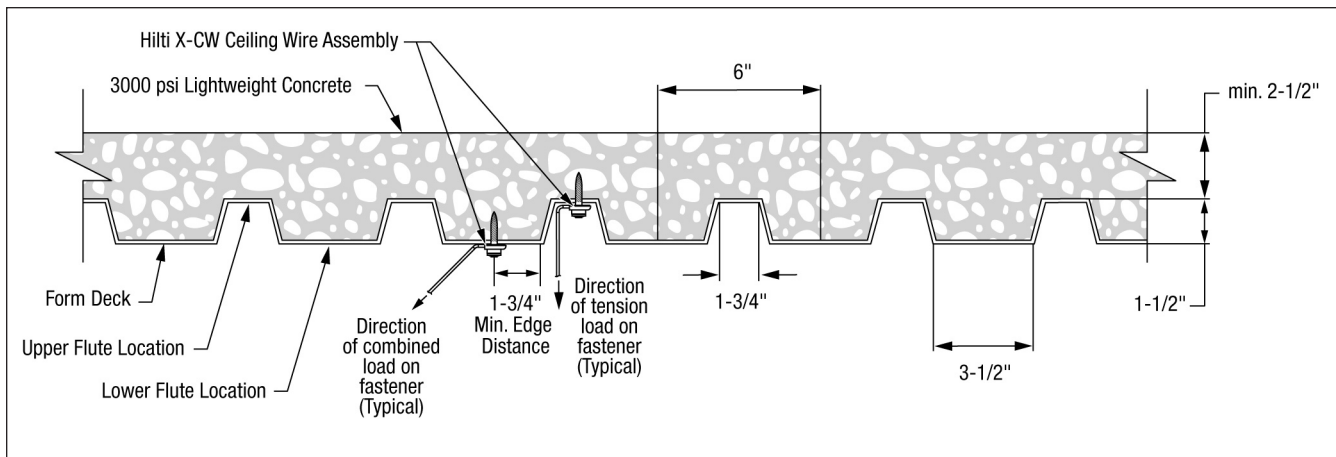


Figure 4 – Hilti X-CW Ceiling Wire Assembly Location in 1-1/2-in.-Deep Composite Floor Deck, Inverted Deck Profile Orientation

Hilti X-CW Ceiling Wire Assembly

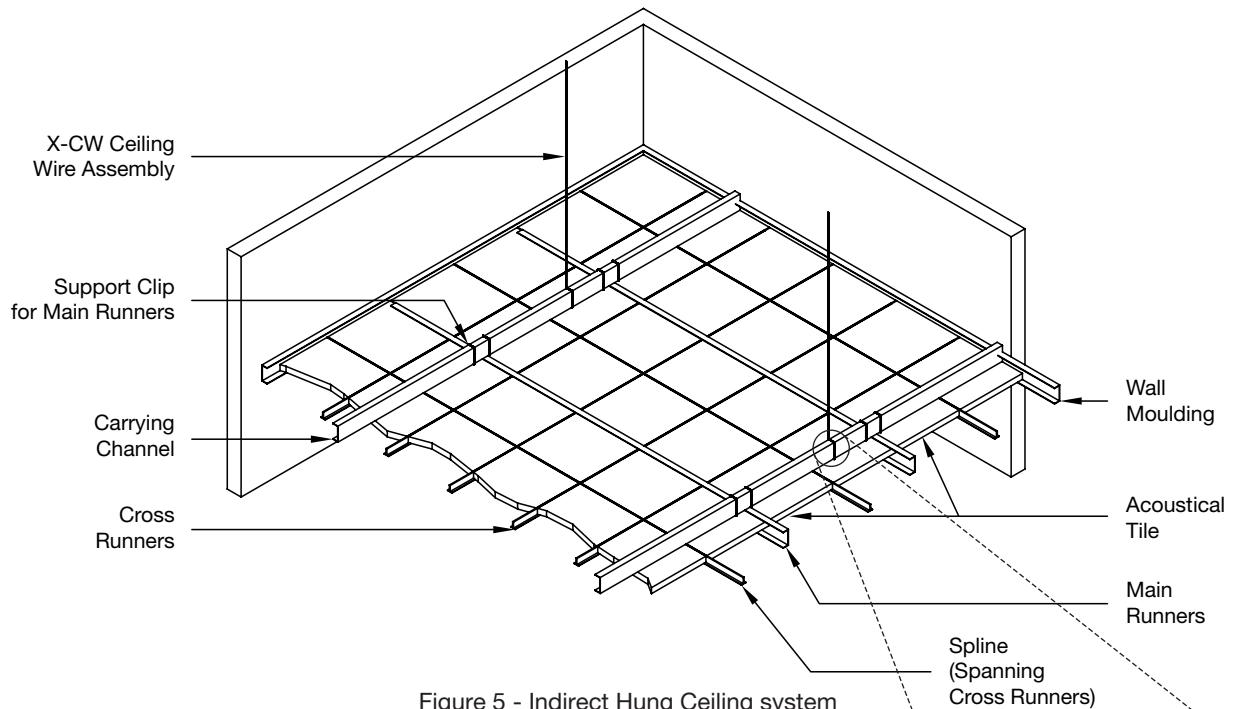


Figure 5 - Indirect Hung Ceiling system
(reference ASTM C635)

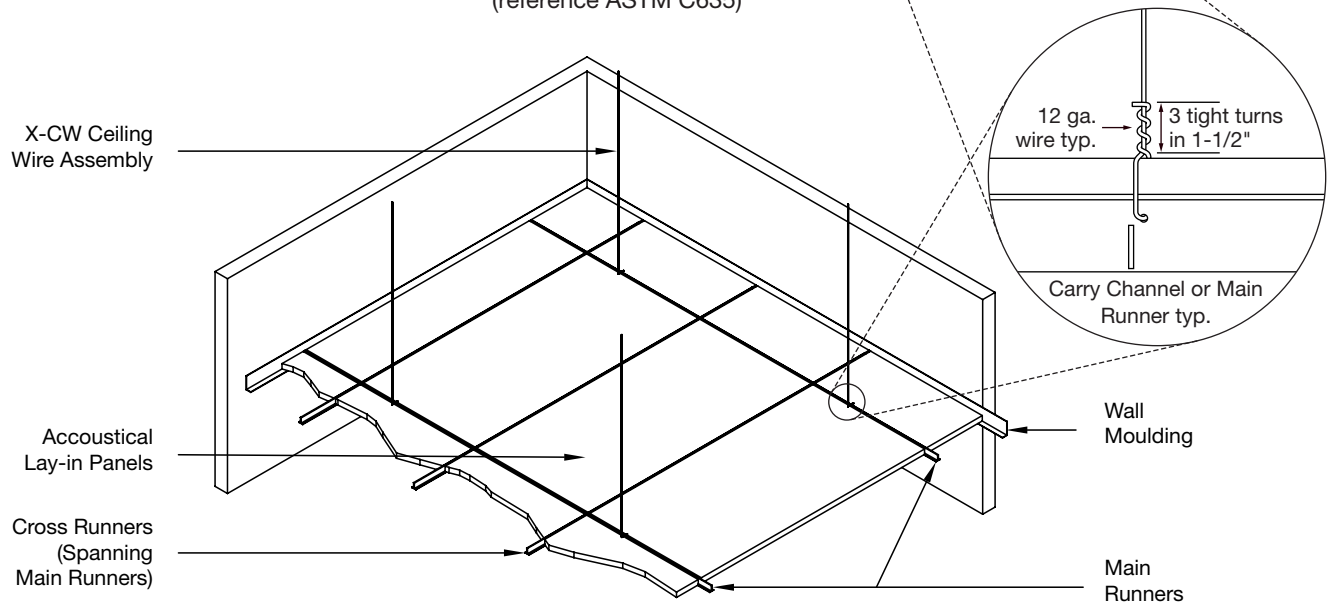


Figure 6 - Direct Hung Ceiling System
(reference ASTM C635)

The X-CW Ceiling Wire Hanger is a state-of-the-art ceiling wire fastening system with an integrated steel wire clamping washer pre-mounted on a Hilti X-U or X-C powder-actuated fastener. This innovative ceiling hanger system has been tested in accordance with the ICC-ES Acceptance Criteria for Fasteners Power-Driven Into Concrete, Steel and Masonry Elements (AC70), January 2007 edition (ESR-2892).

The pre-mounted steel clamping washer has been specifically designed to prevent wire slippage, therefore no wire wraps

are required on the fastener end. Yielding of the 12 gauge steel hanger wire controls the performance of this ceiling fastening system when installed with pre-mounted X-U and X-C powder-actuated fasteners in 4000 psi normal weight concrete base materials. Requirements for wire wraps on the suspended ceiling component end must still be satisfied. Anchorage of seismic bracing channels and compression struts should be done with ICC-ES AC193 qualified post-installed anchors, such as Hilti KB-TZ.

Hilti X-CW Ceiling Wire Assembly






1.5 Ordering Information

X-CW Ceiling Wire Fastening Assemblies

Fastener Description	Shank Ø in. (mm)	Fastener Length in. (mm)	Packaging Quantity ¹
Standard Fastener			
X-CW C27 12GA	0.138 (3.5)	1 (27)	1000
X-CW C32 12GA	0.138 (3.5)	1-1/4 (32)	1000
Premium Fastener			
X-CW U22 12GA	0.157 (4.0)	7/8 (22)	1000
X-CW U27 12GA	0.157 (4.0)	1 (27)	1000

¹Ceiling Wire Assemblies can be assembled with pre-tied wire 4', 6', 8', 10', and 12' lengths

Powder-actuated tool DX 351-CT and Accessories

Item No.	Description		
00373103	Powder-actuated tool DX 351-CT	①	① 
00387439	Grip section X-PT CT - 351	②	② 
00387440	Extension tube X-PT CT-351 3FT	③	③ 
00387441	Extension tube X-PT CT-351 1FT	④	④ 
00388152	Soft pouch X-PT CT	⑤	⑤ 
03442190	Powder-actuated tool DX 351-CT Combo Std (Includes Items 1, 2 and 3)		
03442191	Powder-actuated tool DX 351-CT Combo Plus (Includes items 1 - 5)		

Hilti. Outperform. Outlast.

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The data contained in this literature was current as of the date of publication. Updates and changes may be made based on later testing. If verification is needed that the data is still current, please contact the Hilti Technical Support Specialists at 1-800-879-8000. All published load values contained in this literature represent the results of testing by Hilti or test organizations. Local base materials were used. Because of variations in materials, on-site testing is necessary to determine performance at any specific site. Printed in the United States

Certified Quality and
Environmental Systems



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