



PFS TECO Research Report 0109

Date of Acceptance: May 25, 2017
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Expiration Date: May 24, 2018

Revision Date: Original
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TYPE OF ACCEPTANCE: Product Material – Joist and Rafter Framing Anchors
CSI Division: 06 00 00 -- Wood, Plastics, and Composites
CSI Section: 06 05 23 – Wood, Plastic, and Composite Fastenings

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RESEARCH REPORT SUBJECT: Joist and Rafter Framing Anchors for Wood Construction
Installation on construction complying with IRC Dwelling and IBC Construction

DESCRIPTION OF BUILDING COMPONENTS:

This report covers galvanized steel framing connectors known as tie clips or hurricane clips. These connectors tie roof trusses, roof rafters, or joists to the top plate of a structural wall. They resist uplift loads, shear loads in the direction parallel to the length of the top plate, and shear loads in the direction perpendicular to the length of the top plate. See Figure 3 in this report.

1. Framing Anchors

- (a) **CH01 & CH02 Tie Clip:** The CH01 & CH02 Tie Clips are intended to anchor wood rafters, trusses, or joists to wood wall top plates. The CH01 & CH02 Tie Clips are formed from No.18 gauge galvanized steel. Nominal base metal thickness exclusive of coating material is 0.0456 inches.
- (b) **CH09 & CH11 Tie Clip:** The CH09 & CH11 Tie Clips are intended to anchor wood rafters, trusses, or joists to wood wall top plates. The CH09 & CH11 Tie clips are formed from No.16 gauge galvanized steel. Nominal base metal thickness exclusive of coating material is 0.0565 inches.
- (c) **Steel:** The connectors described in this report are fabricated from ASTM A 653 Grade 40 SS minimum galvanized steel with a minimum yield strength, F_y , of 40,000 psi and a minimum tensile strength, F_u , of 55,000 psi, with a minimum G90 zinc coating specification in accordance with ASTM A 653.
- (d) **Wood:** Supporting wood members to which these connectors are fastened must be sawn lumber, glued-laminated lumber, or engineered lumber [such as Laminated Veneer Lumber (LVL), Parallel Strand Lumber (PSL), and Laminated Strand Lumber (LSL)] having dimensions such that the connectors fit entirely on the wood surface. Unless otherwise noted, supporting wood members and supported members must have a minimum specific gravity of 0.55 (minimum equivalent specific gravity of 0.55 for engineered lumber). The lumber used with the connectors described in this report must have a maximum moisture content of 19 percent (16 percent for engineered lumber). Use of these connectors in contact with fire retardant treated wood or pressure preservative treated wood is outside the scope of this report.
- (e) **Fasteners:** Nails used for the connectors described in this report must comply with ASTM F 1667 and must be minimum 8d common nails which shall be 0.131 inch diameter, shall be minimum 1.5 inches long, and shall have a minimum bending yield strength (F_{yb}) of 100,000 psi. Wood screws, if used with these connectors, must comply with ANSI/ASME B18.6.1 and must be minimum #8 wood screws with a minimum root diameter of 0.129 inches and minimum thread length of 1.25 inches.

2. Design and Installation

- (a) **Design:** The tabulated allowable loads shown in this report in Tables 1, 2, and 3 are based on allowable stress design (ASD) and are reported with the load duration factor, C_D , corresponding with the applicable loads in accordance with the 2015 NDS, *National Design Specification for Wood Construction*.

Tabulated allowable loads apply to products connected to wood used under dry conditions and where sustained temperatures are 100°F or less. When products are installed to wood having a moisture content greater than 19 percent (16 percent for engineered wood products), or when wet service is expected, the allowable loads must be adjusted by the wet service factor, C_M , specified in the NDS. When connectors are installed in wood that will experience sustained exposure to temperatures exceeding 100°F, the allowable loads in this report must be adjusted by the temperature factor, C_t , specified in the NDS. Other adjustment factors may also apply. See Table 11.3.1, *Applicability of Adjustment Factors for Connections*, in the 2015 NDS.

- (b) **Installation:** Installation of the connectors must be in accordance with this evaluation report and the manufacturer's published installation instructions dated March 30, 2017. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.

APPLICABLE CODES:

- 2015 *International Building Code*® (IBC)
- 2012 *International Building Code*® (IBC)
- 2009 *International Building Code*® (IBC)
- 2015 *International Residential Code*® (IRC)
- 2012 *International Residential Code*® (IRC)
- 2009 *International Residential Code*® (IRC)

APPLICABLE CHARACTERISTICS REVIEWED:

1. Structural Performance:

- (a) CH01, CH02, CH09, and CH11 Tie Clips have been evaluated for load capacity in the F1, F2, and F3 directions as shown in Figure 3 in this report. Figure 1 in this report shows the CH01 Tie Clip including its dimensions. Figure 2 in this report shows the CH02 Tie Clip including its dimensions; it may be installed singly or in pairs as shown. Figure 4 in this report shows the CH09 Tie Clip installation including its dimensions. Figure 5 in this report shows the CH11 Tie Clip installation including its dimensions. The capacities shown in Tables 1, 2, and 3 in this report are for single clip installation. CH01, CH09, and CH11 Tie Clips may be installed in pairs with one clip diagonally opposite the other. Tabulated loads for all Clips may be doubled for installation in pairs. See Installation Instructions dated March 30, 2017, for further information.

APPLICABLE USES:

The CH Machine structural connectors described in this report are used for connecting wood framing members in accordance with the applicable paragraphs of Section 2304 of the IBC. They may also be used in structures regulated under the IRC when an engineered design is submitted in accordance with IRC Section R301.1.3.

LIMITATIONS OF ACCEPTANCE:

The CH Machine framing hardware described in the report comply with, or are suitable alternative to what is specified in, those codes listed in the Applicable Codes Section of this report, subject to the following conditions:

1. The connectors must be manufactured, identified and installed in accordance with this report and the manufacturer's published installation instructions identified in 2(b) of this report. A copy of the instructions must be available at the jobsite at all times during installation.
2. Calculations showing compliance with this report must be submitted to the code official. 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.
3. Adjustment factors noted in Section 2(a) of this report and the applicable codes must be considered, where applicable.
4. Connected wood members and fasteners must comply, respectively, with Sections 1(d) and 1(e) of this report.
5. Use of connectors with preservative- or fire-retardant-treated lumber is outside the scope of this report.
6. Connectors covered in this report are manufactured at the designated facilities under a quality control program with inspection by PFS Corporation.
7. Periodic special inspection is required for installation of connectors described in this report that are designated as components of the seismic-force-resisting system for structures in Seismic Design Categories C, D, E, or F in accordance with IBC Section 1704.2 and 1705.12.2 (2015 IBC).

8. Periodic special Inspection is required for components within the main wind-force resisting system where required in accordance with IBC Sections 1704.2 and 1705.11.3 (2015 IBC). Special inspections are not required for connectors used in structures regulated under the IRC.

9. Use of these connectors in contact with fire retardant treated wood or pressure preservative treated wood is outside the scope of this report

DOCUMENTATION SUBMITTED:

Submitted data was provided in accordance with PFS TECO 1601 (quality control manual, specifications, manufacturer’s installation instructions, test data, and description information).

PRODUCT IDENTIFICATION:

Each connector must be embossed during the stamping process with the product model number.

Table 1: CH01 TIE CLIP LOAD CAPACITIES^{1,2}

Load Direction	Load Duration Factors (C _D)		
	1.0	1.33	1.6
F1	205	272	328
F2	130	172	208
F3	453	602	725

¹ When attached with a minimum of ten #8 x 1.25 inch long wood screws or 8d common nails, five in each leg.

² Load per clip. May be installed singly or in pairs; see Installation Instructions dated March 30, 2017.

Table 2: CH02 TIE CLIP LOAD CAPACITIES^{3,4}

Load Direction	Load Duration Factors (C _D)		
	1.0	1.33	1.6
F1	174	231	278
F2	205	272	328
F3	269	358	430

³ When attached with a minimum of ten #8 x 1.25 inch long wood screws or 8d common nails, five in each leg.

⁴ Load per clip. May be installed singly or in pairs; see Installation Instructions dated March 30, 2017.

Table 3: CH09 & CH11 TIE CLIP LOAD CAPACITIES^{5,6}

Load Direction	Load Duration Factors (C _D)		
	1.0	1.33	1.6
F1	72	96	115
F2	78	104	125
F3	588	782	941

⁵ When attached with a minimum of twelve (six in each leg) #8 x 1.25 inch long wood screws or 8d common nails installed in holes of clip such that the fasteners are as far from the wood edges as possible.

⁶ Load per clip. May be installed singly or in pairs; see Installation Instructions dated March 30, 2017.

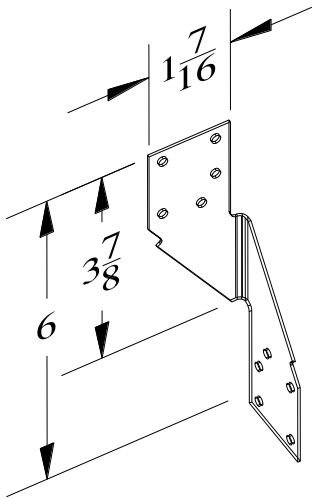


Figure 1: CH01 Dimensions. Install singly or in pairs.

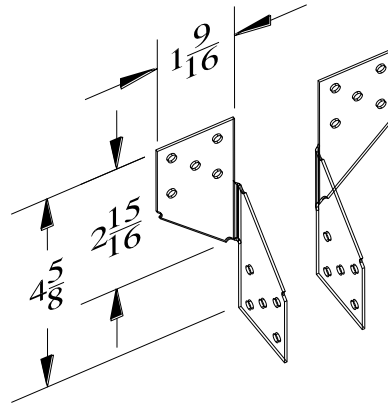


Figure 2: CH02 Dimensions. Install singly or in pairs.

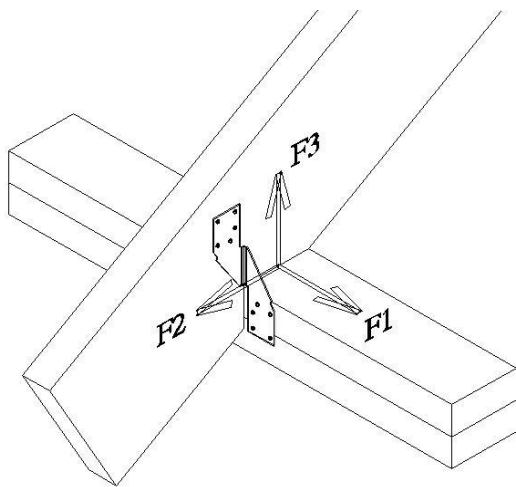


Figure 3: CH01 & CH02 Installation Diagram and Load Directions

- Load Directions:
- F1 Perpendicular to Joist
 - F2 Co-linear with Joist
 - F3 Uplift

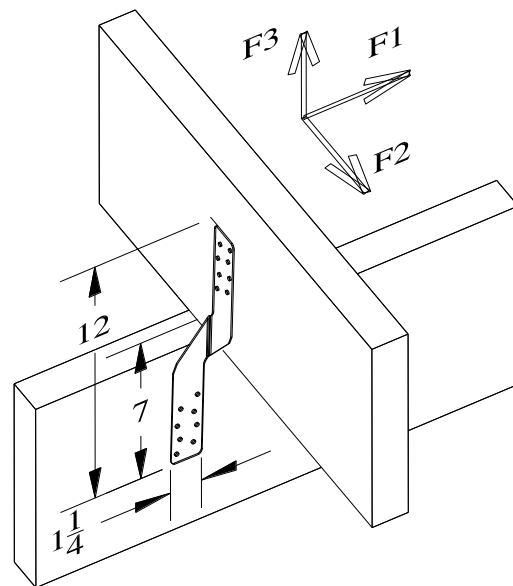


Figure 4: CH09 Dimension, Installation Diagram and Load Directions. Install singly or in pairs.

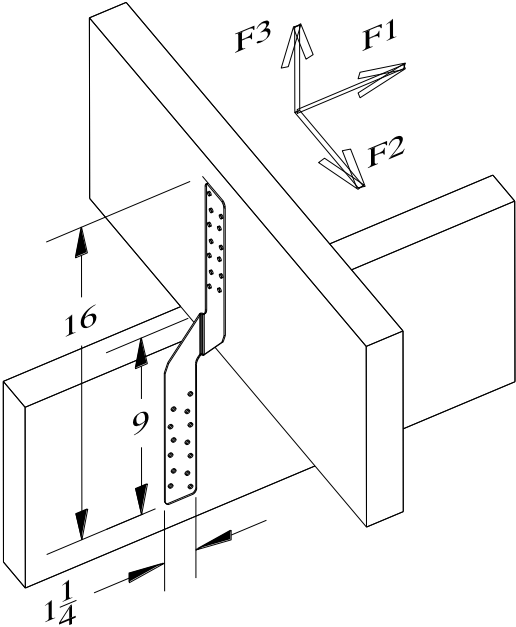


Figure 5: CH11 Dimensions, Installation Diagram and Load Directions. Install singly or in pairs.