

## PREFABRICATED WOOD CONSTRUCTION CONNECTORS

# IR 23-1

### References:

California Code of Regulations (CCR) Title 24, Part 2: California Building Code (CBC)  
2001 CBC, Sections 2304A.3, 2304A.4.2, 2316A.2, and 2318A.4  
2007 CBC, Sections 2304.9.3, 2306, 2307, 1715A.1  
2010 CBC, Sections 2304.9.3, 2306, 2307, 1716A.1  
DSA Interpretation of Regulations (IR) A-5  
ASTM D7147-05  
ICC ES AC-13

Revised 11-03-10  
Revised 11-01-07  
Revised 08-18-04  
Issued 09-01-99

Discipline: Structural

This Interpretation of Regulations (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which includes State of California public elementary and secondary schools (grades K-12), community colleges and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is reviewed on a regular basis and is subject to revision at any time. Please check the DSA web site for currently effective IRs. Only IRs listed in the document at <http://www.dgs.ca.gov/dsa/Resources/IRManual.aspx> at the time of plan submittal to DSA are considered applicable.

**Purpose:** This Interpretation of Regulations (IR) clarifies acceptable load capacities, design and installation requirements for prefabricated wood construction connectors used on projects under Division of the State Architect (DSA) jurisdiction, which includes State of California public elementary and secondary schools (grades K-12), community colleges, and state-owned or state-leased essential services buildings.

**Scope:** Prefabricated metal connectors are used to attach wood structural members to other wood structural members, or to structural steel, masonry, or concrete members (including foundations).

The application of Sections 1 through 6 of this IR is permitted for prefabricated concrete anchorage devices, including cast-in-place bolts and post-installed expansion or epoxy anchors used in conjunction with wood construction connectors. Post-installed anchor design and testing must also comply with Sections 1912A.1, 1916A.7 (Section 1916A.8 in the 2007 CBC or Section 1923A in the 2001 CBC) and DSA IR 19-1.

Requirements for metal plate connectors for wood trusses are addressed in Section 2303.4.6 (Section 2303.4.2 in the 2007 CBC, or Section 2318A.7 in the 2001 CBC) and DSA IR 23-4. Manufactured lateral-load resisting systems as defined in ASCE-7, Table 12.2.-1 (CBC Table 16A-N for projects submitted under 2001 CBC), e.g. shear walls, moment frames, are not included within the scope of this IR. DSA approval must be granted for these systems on a case by case basis.

**1. LISTING REQUIREMENTS:** Prefabricated connectors must be listed in a current and valid evaluation report issued by an evaluation agency recognized by DSA in accordance with DSA IR A-5. DSA Product Acceptance Reports are acceptable for projects submitted under the 2001 CBC only.

**2. ACCEPTABLE LOAD CAPACITIES:** In accordance with IR A-5, DSA allows 100% of listed gravity load capacities and 80% of listed wind and seismic load capacities for manufactured wood construction connectors. One hundred percent (100%) of the listed wind and seismic load capacities will be allowed if listed load capacities are based upon DSA-approved cyclic testing. Listed load capacities based on values listed in NDS-05, Section 2.3, *Adjustment of Reference Design Values*, may be used. For projects submitted

under the 2001 CBC, listed load capacities based on load duration factors allowed by Section 2316A may be used.

### **3. DESIGN REQUIREMENTS:**

- 3.1** Load duration factors, or "adjustment of reference design value", (e.g. 33% increase for short-term loading) shall be determined in accordance with NDS-05, Section 2.3 (Amendment 6 in 2001 CBC, Section 2316A.2), and the evaluation report.
- 3.2** Wood member properties such as minimum specific gravity and maximum moisture content, must comply with applicable provisions of the CBC and also all requirements of the connector manufacturer and the evaluation report.

### **4. INSTALLATION REQUIREMENTS:**

- 4.1** All connectors, including holdowns shall be installed in accordance with the applicable evaluation report and/or manufacturer's published information. Holdown connectors specified to be installed with clearance between the connector and the sill plate (e.g. one inch stand-off) may result in increased deflection of the holdown connection, which shall be considered in the design.
- 4.2** Fasteners must comply with all requirements (e.g. nail gauge and length, corrosion-resistant coatings) of the manufacturer and of the evaluation report. Fastener protective coatings or corrosion-resistant materials shall be compatible with preservative treatment chemicals in the wood, when in contact with them, and comply with manufacturers' recommendations.
- 4.3** Connectors shall not be field bent, except as specifically permitted by the evaluation report and/or the manufacturer's instructions.
- 4.4** Connection details shall be designed to minimize the potential for splitting of wood members. In the event of splitting, a DSA-approved repair procedure will be required.

**5. CONNECTOR FABRICATION:** Connector fabrication must meet the quality control requirements of ICC ES AC-13, *Acceptance Criteria for Joist Hangers and Similar Devices*, Section 6. Connectors must meet the following requirements:

- 5.1** Connector steel shall be corrosion-resistant material (e.g. stainless steel) or shall have a protective coating (e.g. G90 minimum, G185, or post-fabrication hot-dipped galvanized coating). Paint may be used as a protective coating in lieu of galvanization when the connector is not exposed to weather or to corrosive elements, such as pressure treated wood. Connectors shall show no fracturing in either the protective coating or the base metal. Connector protective coatings or corrosion-resistant materials shall be compatible with preservative treatment chemicals in the wood, when in contact with them, and comply with manufacturers' recommendations.
- 5.2** Each prefabricated connector must bear a stamp or adhered label showing the name of the manufacturer, model number, and evaluation report number.
- 5.3** Minimum thickness of steel shall comply with Section 5.0 of ICC ES AC-13.

**6. Testing Requirements for Joist Hangers:** For projects submitted under the 2010 CBC, joist hanger vertical capacities, torsional moment capacities and deflection characteristic shall be determined in accordance with CBC Section 1716A.1 (Section 1715A.1 in the 2007 CBC,) and ICC ES AC 13 or ASTM D7147-05