
PREFABRICATED WOOD I-JOIST: 2019 CBC

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PURPOSE

This Interpretation of Regulations (IR) clarifies qualification and quality control/assurance requirements for acceptance of prefabricated wood I-joists for use in construction projects under DSA jurisdiction.

SCOPE

This IR is applicable to the design, detailing, fabrication, and inspection of wood I-joists. A prefabricated wood I-joist is a structural member manufactured with sawn or structural composite lumber flanges and structural panel webs composed of either plywood or oriented strand board (OSB) bonded together with exterior-type adhesives, forming an “I” cross-sectional shape. This IR does not apply to open web trusses, which are addressed by *IR 23-8: Manufactured Wood-Chord-Metal-Web Trusses*.

BACKGROUND

California Building Code (CBC) Section 2303.1.2 defines minimum standards and quality requirements for prefabricated wood I-joists. Additionally, Americal Wood Council (AWC) National Design Specification for Wood Construction (NDS) Chapter 7 defines design requirements for prefabricated wood I-joists.

1. ACCEPTANCE CRITERIA

1.1 I-joists must have a valid evaluation report issued by a qualified independent evaluation agency prescribed in *IR A-5: Acceptance of Products, Materials, and Evaluation Reports*.

1.2 The evaluation report shall indicate compliance with all the following building codes and standards:

1.2.1 2018 edition International Building Code (IBC).

1.2.2 Americal Society for Testing and Materials (ASTM) D5055.

1.2.3 International Code Council Evaluation Service (ICC-ES) AC14.

1.3 The evaluation report shall also require a quality control/assurance program complying with the requirements of ICC-ES AC14 and ASTM D5055. See Section 4 below.

2. DESIGN REQUIREMENTS

2.1 Joists shall only be used for dry conditions of use and must be protected from weather exposure during construction.

2.2 Joists shall be designed in accordance with NDS Chapter 7 and the appropriate evaluation report.

2.3 Lateral and rotational supports shall be provided at points of bearing per NDS Section 7.3.5 and shall be located no more than 1 foot from bearing point at supports using joist hangers.

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2.3.1 Lateral and rotational support is permitted to be provided by joist hangers that have been tested for torsional moment capacity per CBC Section 2303.5 and ASTM D7147 and are in compliance with acceptance criteria per ICC-ES AC13.

2.3.2 Note: Hangers specifically designed to support only prefabricated wood I-joists are exempt from torsional testing per ICC-ES AC13 Section 3.4.1. As a result, such hangers shall not be considered effective for preventing joist rotation.

2.4 Bridging shall be provided in accordance with manufacturer's requirements and the product's evaluation report. Additional bridging may be required to provide lateral support for the bottom flange when it is in compression (e.g. wind uplift, cantilevers, etc.).

2.5 Design for flexure, shear, and bearing shall be determined through ASTM D5055 procedures and as listed in the evaluation report.

2.6 Deflection shall be computed per the evaluation report and shall not exceed limits defined in CBC Table 1604A.3, the evaluation report, or the manufacturer's recommendation, whichever is more restrictive.

2.6.1 NDS Section C7.4.5 recommends a deflection limit of the joist span divided by 480 for floor joist under live load.

2.6.2 NDS Section C7.4.5 recommends the consideration of long-term deflection, including the effects of creep, for cases with heavy dead loads. In particular, this should be considered when the long-term loading (i.e., dead load plus sustained live loads) will stress the member to 50% or more of the design moment capacity. This is especially important for members in flat-roof applications that may be susceptible to ponding. A commonly used, DSA accepted approach for evaluating long-term deflection can be found in NDS Section 3.5.2 with the following deflection limits:

2.6.2.1 Floor members and roof members in bays susceptible to ponding as defined in American Society of Civil Engineers (ASCE) 7 Section 8.4: Joist span divided by 240.

2.6.2.2 Roof members in bays not susceptible to ponding: Joist span divided by 180.

2.6.3 While the deflection limits of Section 2.6.2 above help minimize the potential for creating flat spots where water can collect on the roof, they do not ensure against ponding and may still require additional investigation per CBC Section 1611A.

2.7 I-joist blocking panels may be used for shear transfer if allowed by the evaluation report. Shear transfer capacity is limited to the allowable shear capacity specified in the evaluation report. Shear transfer nailing (size and spacing) shall be determined by calculations and must conform to manufacturer's requirements.

3. DETAILING REQUIREMENTS

3.1 Follow the manufacturer's detailing and construction requirements.

3.2 Connection details shall be designed to minimize the potential for splitting of wood members and I-joists. In the event of splitting, a repair procedure shall be submitted to DSA for review and approval on a project-specific basis.

3.3 The following are typical conditions where splitting is prone to occur:

3.3.1 Solid sawn lumber flange connections at bearing locations (e.g., wall top plates).

3.3.2 Tie strap or other connector hardware.

3.3.3 Web stiffeners.

3.3.4 I-joist flange, or web filler, that is a part of a wall anchorage system.

3.3.5 I-joist flange receiving diaphragm sheathing nails.

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3.3.6 Shear transfer nailing at I-joist blocking panels.

3.4 End distance, edge distance, and spacing of nails in tie straps or other connector hardware shall comply with the manufacturer's requirements.

3.5 Material and size of web stiffeners shall comply with the manufacturer's requirements.

3.6 Connection details that are part of the anchorage system and load path resisting out-of-plane seismic wall forces shall meet the requirements of ASCE 7 Section 12.11.2.

3.7 The minimum thickness and width of the flange shall meet applicable CBC requirements (i.e., edge distance, minimum nail penetration, etc.) per AWC Special Design Provisions for Wind & Seismic (SDPWS) Tables 4.2A, 4.2B, and 4.2C.

3.8 Premanufactured framing clips used for shear transfer shall not be fastened into the side face of I-joist flanges constructed of laminated veneer lumber.

4. QUALITY CONTROL/QUALITY ASSURANCE

4.1 Continuous independent inspection of wood I-joist fabrication is not required.

4.2 Only mills that qualify under an approved Quality Assurance/Quality Control (QA/QC) program shall provide I-joists. The quality assurance program shall meet the following requirements:

4.2.1 ASTM D5055 Sections 8, 9, and 10.

4.2.2 ICC-ES AC14 Appendix A.

4.2.3 ICC-ES AC14 Appendix B, Quality Assurance Guidelines for Prefabricated Wood I-joists, promulgated by the Wood I-joists Manufacturers Association, or ICC-ES approved equivalent such as American Plywood Association (APA) QA Policy, Performance Rated I-Joists.

4.2.4 Unannounced audits performed by a third party auditor of a qualified inspection agency shall be conducted in accordance with ICC-ES AC14. All quality control reports resulting from such audits must be maintained by the manufacturers and made available to DSA upon request.

REFERENCES:

- 2019 California Code of Regulations (CCR) Title 24
- Part 2: California Building Code (CBC), Sections 1604A.3, 2303.1.2, 2303.5

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