
PREFABRICATED WOOD I-JOIST: 2022 CBC

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PURPOSE

This Interpretation of Regulations (IR) clarifies design, detailing, quality control, and quality assurance requirements for the 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 bonded together with exterior-type adhesives, forming an “I” cross-sectional shape. In this IR, wood I-joists are commonly referred to simply as joists. 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, American Wood Council (AWC) National Design Specification (NDS) Chapter 7 defines design requirements for prefabricated wood I-joists.

1. ACCEPTANCE CRITERIA

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

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

1.2.1 2021 International Building Code (IBC).

1.2.2 American Society for Testing and Materials (ASTM) D5055: Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

1.2.3 International Code Council Evaluation Service (ICC-ES) AC14: Acceptance Criteria for Wood I-Joist.

1.3 The acceptable evaluation report will also require the joist manufacture maintain quality control and quality assurance programs complying with the requirements of ICC-ES AC14 and ASTM D5055. See Section 4 below for additional information.

2. DESIGN REQUIREMENTS

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

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

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2.3 Design for flexure, shear, and bearing shall be based on capacities determined in accordance with ASTM D5055 procedures and as listed in the evaluation report.

2.4 Deflection shall be computed per the evaluation report and shall comply with CBC Table 1604A.3, the evaluation report, and any applicable recommendations published by the joist manufacturer.

2.4.1 NDS Section C7.4.5 notes the typically recommended deflection limit of span divided by 480 for floor joist under live load.

2.4.2 As discussed in NDS Section C7.4.5, when long-term loads (i.e., dead load plus sustained live loads) stress the member beyond 50 percent of the design moment capacity, the design shall account for long-term deflection, including the effects of creep, in accordance with NDS Section 3.5.2 with the following deflection limits:

2.4.2.1 Floor members and roof members in bays susceptible to ponding as defined in American Society of Civil Engineers Standard 7: Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7), Section 8.4: Span divided by 240.

2.4.2.2 Roof members in bays not susceptible to ponding: Span divided by 180.

2.4.3 Regardless of the proportion of long-term loads, in flat-roof applications that are susceptible to ponding, the design shall comply with the deflection limits of Section 2.4.2 above. While these limits minimize the potential for creating flat spots where water can collect on the roof, they do not ensure ponding will not occur. Additional investigation per CBC Section 1611A may still be required.

2.5 Joist blocking panels may be used for shear transfer if allowed by the evaluation report. Shear transfer capacity shall be limited to the allowable value specified in the evaluation report. Shear transfer nailing (i.e., size and spacing) shall be determined by calculations and shall comply with the joist manufacturer's requirements.

2.6 Lateral support of the joist bottom flange may be required when it is in compression (e.g., due to wind uplift loads, at cantilevers, etc.).

3. DETAILING REQUIREMENTS

3.1 Construction details shall comply with the joist manufacturer's detailing and construction requirements.

3.2 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.

3.2.1 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 ICC-ES AC13.

3.2.2 Hangers specifically designed to support only prefabricated wood I-joists are exempt from torsional testing per ICC-ES AC13 Section 3.4.1; therefore, such hangers shall not be considered effective for preventing joist rotation.

3.3 Bridging shall be provided in accordance with the joist manufacturer's requirements and the product evaluation report. Additional bridging may be required per Section 2.6 above.

3.4 Connection details shall be designed to minimize the potential for splitting of joists and other wood members. In the event of splitting, a repair procedure shall be submitted to DSA for review and approval on a project-specific basis. The following are typical conditions where splitting is prone to occur:

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- 3.4.1** Solid sawn lumber joist flange connections at bearing locations (e.g., wall top plates).
- 3.4.2** Fasteners of tie straps or other connector hardware.
- 3.4.3** Web stiffeners.
- 3.4.4** Joist flange or web filler that is a part of a wall anchorage system.
- 3.4.5** Joist flange receiving diaphragm nailing.
- 3.4.6** Shear transfer nailing at joist blocking panels.
- 3.5** End distance, edge distance, and spacing of nails in tie straps or other connector hardware shall comply with the joist manufacturer's requirements.
- 3.6** Material and size of web stiffeners shall comply with the joist manufacturer's requirements.
- 3.7** 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.
- 3.8** When receiving diaphragm nailing, the minimum thickness and width of the joist flange shall meet applicable CBC and AWC Special Design Provisions for Wind and Seismic (SDPWS) requirements. Flange dimensions shall be coordinated with fastener edge distance, spacing, and penetration requirements. Refer to SDPWS Table 4.2A, 4.2B, or 4.2C as applicable.
- 3.9** Premanufactured framing clips used for shear transfer shall not be fastened into the side face of joist flanges fabricated of laminated veneer lumber.

4. QUALITY CONTROL AND QUALITY ASSURANCE

- 4.1** Continuous special inspection of joist fabrication is not required.
- 4.2** Joists shall be fabricated in mills that comply with the following:
 - 4.2.1** ASTM D5055 Sections 8, 9, and 10.
 - 4.2.2** ICC-ES AC14 Section 3.0 and Appendix A.
 - 4.2.3** One of the following quality assurance standards:
 - 4.2.3.1** ICC-ES AC14 Appendix B, Quality Assurance Guidelines for Prefabricated Wood I-joists, promulgated by the Wood I-joists Manufacturers Association.
 - 4.2.3.2** American Plywood Association (APA) QA Policy, Performance Rated I-Joists.
 - 4.2.3.3** ICC-ES approved equivalent.
- 4.3** 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 shall be maintained by the joist manufacturer and made available to DSA upon request.

REFERENCES:

2022 California Code of Regulations (CCR) Title 24
Part 2: California Building Code (CBC), Table 1604A.3 and Sections 1611A, 2303.1.2, 2303.5

This IR is intended for use by DSA staff and by design professionals to promote statewide consistency for review and approval of plans and specifications as well as construction oversight of projects within the jurisdiction of DSA, which includes State of California public schools (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.

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