

Prefabricated Wood I-Joist**AC 23-1**

Reference: 2001 California Building Code,
Sections 1605A.4, 2316A., and 1633A.2.8

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Discipline: Structural

This Acceptance Criteria (AC) document clarifies requirements for the specified building material or component for use in projects under DSA jurisdiction, in accordance with referenced provisions of Title 24. The purpose of this AC document is to promote statewide consistency in the application and enforcement of Title 24 by project design professionals and DSA staff for projects under DSA jurisdiction.

DSA may consider alternate criteria, provided the project design professional submits valid data demonstrating that the alternate criteria are at least equivalent to the criteria set forth in this document, and otherwise demonstrate compliance with Title 24.

This AC document is subject to review on a regular basis by DSA, and may be revised at any time. Currently effective AC documents are posted on the DSA website at <http://www.dsa.dgs.ca.gov/Publications/default.htm>.

Purpose: This Acceptance Criteria (AC) document clarifies qualification and ongoing quality control requirements for acceptance of prefabricated wood I-joists for use in projects under the jurisdiction of Division of the State Architect (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.

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.

1. ACCEPTED I-JOISTS:

Manufacturers of accepted I-joists are listed below, along with the DSA Product Acceptance (PA) report number. For additional information, refer to the DSA PA report, which may be obtained from the manufacturer.

Manufacturer	PA #	Contact Person	Phone	e-mail
Trus Joist, A Weyerhaeuser Business	PA-048	Dave Rice	(208) 429-3715	riced@trusjoist.com
Roseburg Forest Products	PA-131	Dave Anderson	(888) 510-3001	davea@rfpco.com
Standard Structures, Inc.	PA-038	Steven R. Calletti	(707) 836-8191	steve@standardstructures.com
Jager Building Systems	PA-128	John Scarlett	(403) 203-6783	jscarlett@jagerbuildingsys.com
Boise Cascade Corp.	PA-113	Dan Cheney	(800) 232-0788	danchanel@boisebuilding.com
Louisiana Pacific Corp.	PA-035	Taylor Blake	(910)762-9878	taylor.blake@lpcorp.com

The OSB web material of I-joists approved for use on DSA projects shall be stamped with the brand name, grade, thickness, mill location and mill number. Alternatively the OSB web material shall be traceable to the original web supplier by documentation upon request. Accepted OSB web suppliers for each I-joist manufacturer are listed on their respective DSA PA report.

A manufacturer seeking a DSA Product Acceptance report must follow the procedure and meet the requirements in Appendix A.

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 Repetitive stress increases shall not be allowed.
- 2.3 Loads applied within the depth of the member from a support shall be included in the total shear force on the section.
- 2.4 Lateral support shall be provided at all bearing locations. Lateral support may be provided by joist hangers complying with ICC AC13, Section 3.3.
- 2.5 Bridging shall be provided in accordance with manufacturer’s requirements and the product listing. Additional bridging may be required to provide lateral support for the bottom chord when it is in compression (i.e. wind uplift, large cantilevers, etc.).
- 2.6 Flexure, shear and bearing shall meet the allowable stresses determined through ASTM D5055 procedures, and deflection shall meet the design criteria provided below. For I-joists with oriented strand board webs, the deflection limitations of CBC Table 16A-D shall be replaced with the following performance criteria during the design process. The criteria includes long-term and live load deflection which shall meet the following load definitions:

Δ_{LL} = Live-Load Deflection due to 1.0 x Live Load (LL)

Δ_{LT} = Long-Term Deflection due to Ω x [Dead Load (DL) + 0.33 x Live Load (LL)]

Ω = 1.5, the Creep Factor applied to long-term loads

	(Δ_{LL})	(Δ_{LT})
For Roof Members Supporting Plaster ¹ or Floor Members	L/480	L/480
For Roof Member without Plaster ¹	L/360	L/360

¹ Plaster refers to Portland Cement plaster, typically 7/8 inch thickness

- 2.7 I-Joist blocking panels may be used for shear transfer, if allowed by the referenced listing. Shear transfer capacity is limited to the allowable resistive shear capacity recognized in the referenced listing, for the joist series used as the blocking panel. Shear transfer nailing shall be established by design.

3. DETAILING CONSIDERATIONS: Follow the manufacturer’s detailing and construction requirements. Connection details shall be designed to minimize the potential for splitting of wood members and I-Joists. The following are typical conditions where splitting may occur:

- 3.1 Solid sawn lumber flange connections at bearing locations (e.g. wall top plates).
- 3.2 Tie strap or other connector hardware (end distance and spacing of nails).
- 3.3 Web stiffeners material and size (comply with the manufacturer’s requirements).
- 3.4 I-joist chord or web filler that is a part of a wall anchorage system (attachment must be made to material of minimum 2-1/2 inches thickness per CBC Section 1633A.2.8).
- 3.5 I-Joist flange receiving diaphragm sheathing nails (the minimum thickness and width of the flange shall meet applicable CBC code requirements, i.e. edge distance, minimum nail penetration). Refer to DSA Circular 23-3, “Minimum Fastener Penetration in Framing – Wood Diaphragms.”

Note: In the event of splitting, a repair procedure shall be submitted to the appropriate DSA Regional Office for review and approval on a project specific basis.

4. **I-JOIST QUALITY CONTROL CRITERIA:** Only mills that qualify under an approved QA/QC program shall provide materials. Continuous independent inspection of wood I-joist fabrication is not required. Ongoing quality control (QC) testing shall meet the requirements of ICC AC14, which includes the minimum requirements of ASTM D5055, Sections 8, 9 and 10. All quality control audits in compliance with Appendix B of ICC-ES AC14, resulting from unannounced audits by a third party auditor of a qualified third party inspection agency must be maintained by the manufacturers and made available to DSA upon request.

Appendix A: Procedure to obtain a DSA Product Acceptance Report for I-Joists

A1. SUBMITTAL REQUIREMENTS: Manufacturers must file a DSA Product Acceptance application and submit an initial application fee of \$1500 to DSA Headquarters. The total fee will be determined on the basis of actual review time. Along with the application and initial fee, manufacturers must submit the following information:

- A1.1** Submit current ICC ES Report showing compliance with ICC AC-014.
- A1.2** Submit calculations to show that the moment capacity qualification of ASTM D5055, Section 6.3, shall be determined using the Analytic Method of Section 6.3.1 and the confirmation tests of Section 6.3.2.
- A1.3** For I-joist with OSB web, submit a summary report of test results to show compliance with the performance standard for tests specified in Section A2 of this AC. Summary reports must be dated and signed by qualified testing laboratories.
- A1.4** For I-joist with composite lumber flanges, submit current DSA Acceptance Report number or ICC ES report.
- A1.5** Submit QA/QC manual for review. OSB web performance specification in Section A2 of this AC must be included in the QA/QC manual.

A2. PERFORMANCE STANDARDS FOR OSB WEB: In addition to ICC AC-014 compliance, qualification of the OSB web material shall include benchmark testing per the performance standard for the following tests, using a minimum of 15 full-size (4 feet x 8 feet) panels randomly selected from representative production of the web material:

- A2.1** Internal Bond Test per ASTM D1037. Minimum required panel (or sample) stress is 45 psi. The panel IB stress is the average of the five specimens taken from the panel per ASTM D1037. The minimum specimen stress is 25 psi.
- A2.2** Edge Thickness Swell Test per ASTM D1037. Limit maximum swell to 15% based on mean and 18% for individual specimen. Measurements shall be in accordance with APA Test Method P-7. Specimen shall be prepared in as-manufactured conditions, and the moisture content of the specimen shall not exceed 3%.
- A2.3** Panel Stiffness (EI) per ASTM D1037, parallel and perpendicular to strength axis. Samples may be prepared per APA Test Method S-14. Parallel samples shall achieve an average EI of 50,000 lb-in²/ft for 3/8 inch webs and 70,000 lb-in²/ft for 7/16 inch or 1/2 inch webs. Perpendicular samples shall achieve an average EI of 20,000 lb-in²/ft for 3/8 inch webs and 30,000 lb-in²/ft for 7/16 inch or 1/2 inch webs. Qualifying averages for 5/8 & 3/4 inch webs are 180,000 lb-in²/ft for parallel strength and 70,000 lb-in²/ft for perpendicular strength.
- A2.4** Durability Tests: Either edgewise shear (A2.4.1) or small sample bending (A2.4.2) test method described below will be acceptable. The average single-cycle benchmark test results must be equal to or greater than 75% of the average benchmark dry control test results.
 - A2.4.1 Edgewise Shear Test** per ASTM D1037 with side-by-side comparisons made from a dry control sample and the APA Test Method D-4, "Moisture Cycle for Quality Assurance (Single Cycle Test)". Required minimum stress for dry control is 1600 psi. An equal number of specimens shall be cut and tested with the face grain parallel to the length of the sample and perpendicular to length of sample.
 - A2.4.2 Small Sample Bending Test** per APA Test Method S-14 with side-by-side comparisons made from a dry control sample and the APA Test Method D-4, "Moisture Cycle for Quality Assurance (Single Cycle Test)," and D-5 "Moisture Cycle For Delamination and Strength Retention (Six-Cycle Test)" samples. Acceptable bending stresses for the control and D-4 test samples shall average 1500 psi and 1200 psi for the D-5 test sample.