
METAL-PLATE-CONNECTED WOOD TRUSSES: 2019 CBC

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Division of the State Architect (DSA) documents referenced within this publication are available on the [DSA Forms](#) or [DSA Publications](#) webpages.

PURPOSE

This Interpretation of Regulations (IR) clarifies the criteria and process under which DSA will evaluate, accept for use, and establish requirements for inspection of manufactured wood trusses on construction projects under DSA jurisdiction.

SCOPE

This IR is applicable to the design, manufacture, and installation of metal-plate-connected (MPC) wood trusses. MPC wood trusses are defined as having connections between wood members with metal connector plates using either integral teeth (known as gang-nail connectors) embedded into the wood or separately applied driven fasteners such as nails. This document does not address wood-chord-metal-web trusses, which are covered in *IR 23-8: Manufactured Wood-Chord-Metal-Web Trusses*.

BACKGROUND

California Building Code (CBC) Section 2303.4 defines minimum standards and quality for wood trusses. CBC Section 1705A.5 defines special inspection requirements for MPC wood trusses. American National Standards Institute/Truss Plate Institute (ANSI/TPI) 1 also defines design, manufacture and quality assurance requirements applicable to MPC wood trusses. Frequently used terms are defined in the Glossary below.

1. ACCEPTANCE CRITERIA

- 1.1 MPC wood trusses shall be designed and manufactured in accordance with ANSI/TPI 1.
- 1.2 Manufacture of MPC wood trusses shall comply with ANSI/TPI 1 Chapter 3. Manufacturers shall maintain a quality control program with periodic audits performed by an accredited auditing agency per ANSI/TPI 1. ←
- 1.3 The metal connector plates shall have a valid evaluation report issued by ICC-ES or another qualified evaluation organization per *IR A-5: Acceptance of Products, Materials and Evaluation Reports*. The evaluation report must indicate conformance with ANSI/TPI 1.
- 1.4 The manufacturing of metal connector plates shall comply with ANSI/TPI 1 Chapter 4 and the applicable evaluation report including any quality control requirements contained therein. ←
- 1.5 The manufacturing of trusses shall be inspected per Section 5 below.
- 1.6 When an MPC wood truss is used as a drag or collector element in the structure's seismic force resisting system, the plate's design strength derived from or based on static test shall be reduced by 20 percent. Refer to IR A-5 Section 4.2.

2. APPROVAL PROCESS

The approval of manufactured wood trusses for use on a specific project is a four-phase process. The process outlined in this IR is a deferred submittal process in compliance with the California Administrative Code (CAC) Section 4-317(g). As an alternate option, the truss

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submittal package described in Section 4 below may be included with the construction documents in the first phase described in Section 3 below. In this case, the review and approval of construction documents and truss submittal package will be combined.

There are specific requirements and responsibilities for the truss manufacturer and the architect or structural engineer in general responsible charge (project design professional) in each phase. The four phases and the key players involved are as follows:

2.1 Review and Approval of Construction Documents (Section 3 below): Project Design Professional and DSA.

2.2 Review and Approval of Truss Submittal Package (Section 4 below): Project Design Professional, Manufacturer, and DSA.

2.3 Manufacturing and Special Inspection (Section 5 below): Manufacturer and Fabrication Special Inspector.

2.4 Field Installation (Section 6 below): Project Inspector.

3. REVIEW AND APPROVAL OF CONSTRUCTION DOCUMENTS

This phase occurs before a project construction contract is awarded to a qualified wood truss manufacturer. The steps and requirements for this phase are as follows:

3.1 Project design professional prepares construction documents (plans and specifications) for the project. In addition to the requirements in CBC Section 2303.4.3.1 Item 1, the portion of the construction documents pertaining to wood trusses shall also include the following:

3.1.1 Structural framing plan, including layout of wood trusses, depths and all supporting elements.

3.1.2 Loading diagrams for all wood trusses.

3.1.3 Detailed requirements for the transfer of loads and anchorage of each truss to the supporting structure per CBC Section 2303.4.4.

3.1.4 Detailed requirements for truss top chord dimensions, orientation and ability to receive plywood diaphragm nailing.

3.1.5 Definition of the size and location of any building system components (e.g., ducts) occurring within the truss envelope and requiring coordination with the truss design. Illustrating such obstructions on the loading diagrams is recommended.

3.1.6 Project specifications shall require that wood truss manufacturer complies with Section 1 above. The project design professional should closely coordinate wood truss design (including all connections, non-standard products and details) with a qualified manufacturer prior to the submittal of contract documents for DSA review.

3.1.7 Project specifications and the form *DSA-103: List of Required Structural Tests and Special Inspections* per CBC Sections 1704A.2.3 and 1704A.3 shall include inspection requirements for wood trusses per Section 5 below.

3.2 Project design professional submits an application and construction documents to DSA for review. Refer to *PR 17-03 Project Submittal Appointment Process* and *PR 18-04 Electronic Plan Review for Design Professionals of Record*, Sections 1 and 2.

3.3 After the plan review process is completed (refer to PR 18-04 Sections 3 and 4), the DSA-approved construction documents will bear the DSA identification stamp.

METAL-PLATE-CONNECTED WOOD TRUSSES: 2019 CBC**4. REVIEW AND APPROVAL OF TRUSS SUBMITTAL PACKAGE**

This phase may occur after the project has been bid and the contract for the fabrication of the wood trusses has been awarded to a qualified manufacturer as defined in Section 1 above. As such, this phase constitutes a deferred submittal in accordance with CAC Section 4-317(g). Refer to PR 18-04 Section 5. The steps and requirements for this phase are as follows:

4.1 Manufacturer, working in a fully coordinated effort with the project design professional, prepares the truss submittal package for DSA approval, in accordance with the requirements of CBC Section 2303.4.3 and the DSA-approved project construction documents.

4.1.1 If changes to the DSA-approved construction documents (see Section 3 above) are required during the preparation of the truss submittal package, the project design professional shall prepare and submit a construction change document (CCD) to DSA for review in accordance with *IR A-6: Construction Change Document Submittal and Approval Process*. These changes may include, but are not limited to, truss depths, layout, framing plans, loads, truss anchorage, etc. Depending on the nature and extent of changes, DSA may require the revised documents to be submitted and processed as a Revision. When a CCD or Revision is required, it must be approved prior to or concurrent with approval of the truss submittal package.

4.1.2 In accordance with PR 18-04 Section 5, the truss submittal package shall be organized into two separate electronic files. The primary electronic file contains the approval documents including the truss design drawings and truss placement diagrams. The second electronic file contains all supporting documents including the truss calculations and any other supporting documents not included in the primary file the manufacturer may choose to submit to demonstrate the adequacy of the truss design.

4.2 The manufacturer's truss submittal package shall include truss design drawings, calculations, and truss placement diagrams per CBC Sections 2303.4.1.1, 2303.4.1.2, 2303.4.2, and 2303.4.3. The truss design drawings shall be prepared by and each individual sheet shall be signed and stamped by the manufacturer's California registered professional engineer per CBC Section 2303.4.1.4.1 and CAC Section 4-316(c).

4.2.1 Truss Design Drawings: In addition to the items in Section 4.2 above, the truss design drawings shall include the following:

4.2.1.1 Truss profile with overall dimensions, roof slopes, member size, panel point dimensions, size of connection plate, locations of bracing point, and hangers where used on the project.

4.2.1.2 Material specifications for members, plates, listing of current evaluation report for metal side plates, and hangers where used on the project.

4.2.1.3 Typical plate connection details defining alignment of plate and locating dimensions relative to the centerline of the joint. The centerline of joint is the intersection of the inside edge of the chord member with the centerline of the web member(s).

4.2.1.4 Details shall specify treatment of plates where knots occur within the joint.

4.2.1.5 Manufacturer's truss blocking panels where required by the design.

4.2.1.6 Gable end trusses where used over walls.

4.2.1.7 Where the loading diagrams per Section 3.1.2 above specify concentrated loads applied at locations that do not align with truss panel points, drawings shall demonstrate the load path between the location of the applied load and the truss panel point.

4.2.1.8 Details and locations of bottom chord bracing when required by code compliant design.

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4.2.2 Truss Calculations: In addition to the items in Section 4.2 above, the truss calculations shall include the following:

4.2.2.1 Summary of load combinations analyzed.

4.2.2.2 Summary of maximum member loads and reactions based upon controlling load combination. Controlling load combination shall be identified for each member and reaction.

4.2.2.3 Member design, including but not limited to maximum forces and demand-to-capacity stress ratio.

4.2.2.4 Required bearing areas and dimensions.

4.2.2.5 Metal side plate sizes based upon the defined plate manufacturer.

4.2.2.6 Metal side plate evaluation report.

4.2.2.7 Calculation of plate size, actual area required at each member of eccentric joints, heel joint reduction factor (when applicable per ANSI/TPI 1 Section 8.3.2.2), etc. for the maximum member loads summarized above.

4.2.2.8 If calculations were performed by the use of a computer program, user manual shall be available to DSA upon request. DSA may, at its discretion, request verification of the program's output results by other independent means, such as hand calculations.

4.3 The manufacturer submits the truss submittal package to the project design professional for review and approval. This step may take multiple exchanges between the project design professional and the manufacturer to finalize the submittal package for submittal to DSA.

4.4 When the project design professional(s) approves the truss submittal package, they shall prepare and affix a signed Statement of General Conformance and Signature Block per *IR A-18: Use of Construction Documents Prepared by Other Professionals*. The design professional shall submit the truss submittal package to DSA for review and approval in accordance with CAC Section 4-317(g).

4.5 When DSA determines the truss submittal package is in conformance, DSA will affix its approval stamp to the truss design drawings. This review may involve a back-check meeting if the submittal package was not approved as originally submitted. The project design professional shall coordinate with the manufacturer to resolve DSA plan review comments as noted on the marked-up submittal package and schedule a back-check appointment with DSA.

5. MANUFACTURE AND SPECIAL INSPECTION

The manufacture of wood trusses shall not occur prior to DSA approval of the truss submittal package (see Section 4 above). The steps and requirements for this phase are as follows:

5.1 Manufacturer prepares shop drawings from DSA-approved construction documents and truss design drawings. Changes to the DSA-approved construction documents or DSA-approved truss design drawings must be reviewed and approved by DSA prior to truss fabrication in accordance with Section 7 below.

5.2 Manufacturer notifies the project design professional, who will notify the project inspector and fabrication special inspector of the fabrication schedule. Fabrication may not start without the presence of the fabrication special inspector. Notification of the project design professional by the manufacturer may occur through the general contractor.

5.3 Fabrication Special Inspection: A fabrication special inspector must provide continuous inspection during wood truss fabrication in accordance with CBC Section 1704A.2.5 and CAC Section 4-335(f). This inspection is in addition to and independent of the quality control procedures and inspections provided by the manufacturer.

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5.3.1 Qualifications: The fabrication special inspector must be approved by DSA for each project prior to fabrication. Qualifications include compliance with all the following:

5.3.1.1 Possess knowledge of the special inspection and reporting requirements of CAC Section 4-335, MPC wood truss special inspection requirements of CBC, and all applicable reference standards.

5.3.1.2 Meet the minimum age and experience requirements specified in CAC Section 4-335(f). Applicable experience includes construction work or special inspection work similar to wood truss fabrication. Experience as either a manufacturer's quality control manager or as an inspector employed by an accredited quality control auditing agency of MPC wood truss manufacturers is preferred but not required.

5.3.2 Responsibilities:

5.3.2.1 Qualification of Manufacturer: Verify manufacturer complies with Section 1.2 above.

5.3.2.2 Inspection: Each truss shall be continuously inspected by the fabrication special inspector during all stages of fabrication. Material grades, dimensions, joint details and all other aspects of truss fabrication shall be thoroughly inspected.

5.3.2.3 Marking: Each inspected truss shall be stamped with an identification mark by the special inspector. At a minimum the "identification mark" shall include the special inspector's initials and date.

5.3.2.4 Reporting: Each special inspector shall provide detailed daily inspection reports that clearly describe the work inspected in accordance with *IR 17-12: Special Inspection Reporting Requirements* and CAC 4-335(f)4 to the project inspector and others identified to receive such reports. A special inspection report template (form *DSA 250: Special Inspection Report*) is available on the DSA website. Any rejected work shall be brought to the immediate attention of the contractor and project inspector.

5.3.2.5 Verified Report: A verified report shall be provided to the project design professional and DSA in accordance with CAC Section 4-335(e) or 4-335(f) and CBC Section 1705A.5.3.

5.3.2.6 Failure to Perform: Failure to inspect the work in a professional and competent manner, report defective work, file all required reports in a truthful and timely manner, or fulfill any other duties defined by the code may result in withdrawal of the fabrication special inspector's DSA acceptance and/or withdrawal of the laboratory of record's DSA acceptance. Refer to CAC 4-335.1(c). This includes but is not limited to the withdrawal of acceptance or approval to work on any current or future projects under DSA jurisdiction.

6. FIELD INSTALLATION

During this phase, the wood trusses are installed at the construction site. The steps and requirements for this phase are as follows:

6.1 Working from the DSA-approved construction documents, the DSA-approved truss submittal package, and any DSA-approved CCD, the project inspector shall verify truss size, fabrication special inspector's identification mark, placement in the field, and all truss installation details including bridging, bracing, connections, etc.

6.2 Where a truss clear span is 60 feet or greater, the project inspector shall verify that the temporary installation restraints/bracing and the permanent individual truss member restraint bracing are installed in accordance with the approved truss submittal package.

6.2.1 Note: Refer to [California Building Standards Commission \(CBSC\) Information Bulletin \(IB\) 20-02](#) regarding a misprint in CBC Section 1705A.5.2.

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7. REVISIONS

If changes to DSA-approved construction documents and/or the truss submittal package are necessary, the manufacturer and the project design professional, working together, shall prepare and submit a CCD to DSA for review in accordance with IR A-6. Depending on the nature and extent of changes, DSA may require the revised documents to be submitted and processed as a Revision. DSA approval of all changes is required prior to the fabrication or construction of the changes.

REFERENCES

2019 California Code of Regulations (CCR), Title 24

Part 1: California Administrative Code (CAC), Sections 4-316, 4-317 and 4-335

Part 2: California Building Code (CBC), Chapters 17A and 23

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.

This IR is subject to revision at any time. Please check DSA's website for currently effective IRs. Only IRs listed on the webpage at <https://www.dgs.ca.gov/dsa/publications> at the time of project application submittal to DSA are considered applicable.

METAL-PLATE-CONNECTED WOOD TRUSSES: 2019 CBC**GLOSSARY****Centerline of Joint**

The centerline of joint is the intersection of the inside edge of the chord member with the centerline of the web member(s). Where two web members intersect at a common joint, the edges of the web members are typically cut and shaped so the web member center lines meet at a common joint.

Construction Change Documents

Any changes to the DSA-approved construction documents, and/or the DSA-approved truss submittal package. Refer to IR A-6.

Construction Documents

Project documents pertaining to the construction of the project and submitted to DSA for review prior to construction. These documents may include drawings and specifications for site, architectural, structural, mechanical, electrical, plumbing, fire and life safety, accessibility and energy features.

Fabrication Special Inspector

Special inspector who provides continuous inspection during the fabrication of wood trusses, and is employed by the school district or by a DSA-accepted laboratory and approved by DSA for the project per CAC Section 4-335(f).

Project Design Professional

The architect or structural engineer in “general responsible charge” of a project per CAC Section 4-316(a).

Project Inspector

A DSA-certified inspector responsible for inspection for the project who is employed by the school district and approved by DSA for the project per CAC Section 4-333(b).

Truss Design Drawings

Truss design drawings are prepared, stamped, and signed by the manufacturer’s California registered engineer. The truss design drawings shall include as a minimum all the items listed in CBC Sections 2303.4.1.1 and 2303.4.1.2. The truss design drawings are part of the Truss Submittal Package.

Truss Placement Diagram

Per CBC Section 2303.4.2, the truss placement diagram identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram shall be provided as part of the truss submittal package, and with the shipment of trusses delivered to the jobsite. Truss placement diagrams that serve only as a guide for installation and do not deviate from the DSA-approved construction drawings shall not be required to bear the seal or signature of the truss designer.

Truss Submittal Package

A package prepared by the truss manufacturer and submitted to DSA for review through the project design professional. The package shall include all the items prescribed in CBC Section 2303.4.3.