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**METAL-PLATE-CONNECTED WOOD TRUSSES: 2022 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 inspection requirements for 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 a qualified organization per *IR A-5: Acceptance of Products, Materials and Evaluation Reports*. An acceptable evaluation report will 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 6 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 MPC wood trusses for use on a specific project is typically a four-phase process. The phases outlined in this IR constitute a deferred submittal process in accordance with California Administrative Code (CAC), Section 4-317(g). As an alternate to the deferred

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submittal process and at the discretion of the project applicant, the information in the truss submittal package described in Section 4 below may be incorporated into the construction documents described in Section 3 below. In this option, the review and approval of construction documents includes the information typically contained in the truss submittal package.

There are specific requirements and responsibilities for the truss manufacturer, truss designer, project design professionals, inspectors, and DSA in each phase as follows:

### 2.1 Review and Approval of Construction Documents

The project design professionals work with DSA to submit and obtain approval of the construction documents in accordance with the electronic plan review procedure. Refer to Section 3 below and Procedure (PR) 18-04: *Electronic Plan Review for Design Professionals*, Sections 1, 2, 3 and 4.

### 2.2 Review and Approval of Truss Submittal Package

The truss manufacturer, truss designer, and project design professionals work with DSA to submit and obtain approval of the truss submittal package in accordance with Section 4 below and PR 18-04 Section 5.

### 2.3 Manufacture of Trusses

After DSA approval of the truss submittal package, the truss manufacturer may proceed with fabrication of the MPC wood trusses under the oversight of the fabrication special inspector. Any design change during manufacturing requires approval of a Construction Change Document (CCD). The process of submitting a CCD for review and obtaining DSA approval requires contributions from the truss designer and project design professionals in addition to the truss manufacturer. Refer to Sections 5 and 6 below.

### 2.4 Field Installation

After fabrication and delivery, MPC wood truss installation at the job site is subject to inspection by the project inspector. Refer to Section 6.4 below.

## 3. REVIEW AND APPROVAL OF CONSTRUCTION DOCUMENTS

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

### 3.1 Document Preparation

Project design professionals prepare construction documents for the project. In addition to the requirements in CBC Section 2303.4.3.1 Item 1 and ANSI/TPI 1 Section 2.3.2.4, the portion of the construction documents pertaining to MPC wood trusses shall also include the following:

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

**3.1.2** Depths and profiles of MPC wood trusses.

**3.1.3** Loading diagrams for each MPC wood truss with a unique profile (i.e., span, depth, geometry, etc.) or loading condition.

**3.1.4** Details of connections required for the transfer of loads and anchorage of each truss to the supporting structure per CBC Section 2303.4.4.

**3.1.5** Specified requirements for the truss top chord dimensions, orientation, and ability to receive plywood diaphragm nailing.

**3.1.6** 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

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and dimensioning such obstructions on truss elevations or the loading diagrams is recommended.

**3.1.7** Specifications requiring the MPC wood trusses and truss manufacturer to comply with the requirements of Section 1 above. The project design professionals should closely coordinate MPC wood truss design including all connections, non-standard products, and details with a qualified MPC truss manufacturer prior to the submission of construction documents to DSA.

**3.1.8** Specifications and form *DSA-103: List of Required Structural Tests and Special Inspections* defining inspection requirements for MPC wood trusses per Section 6 below. Refer to CBC Sections 1704A.2.3 and 1704A.3.

### **3.2 Submission, Review, and Approval**

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 Sections 1 and 2. After the plan review process is completed in accordance with PR 18-04 Sections 3 and 4, the DSA-approved construction documents will bear the DSA identification stamp.

## **4. REVIEW AND APPROVAL OF TRUSS SUBMITTAL PACKAGE**

This phase will commonly occur after the contract for the fabrication of the MPC 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 Truss Submittal Package Preparation**

Truss manufacturer, working in a fully coordinated effort with the project design professional, prepares the truss submittal package for DSA review and 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 as described in Section 3 above are required during the preparation of the truss submittal package, the project design professional shall prepare and submit a 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 approval document file and the supporting document file.

**4.1.2.1** The approval document file contains documents that require DSA approval. Truss design drawings (see Section 4.1.3 below) and truss placement diagram(s) shall be included in the approval document file.

**4.1.2.2** The supporting document file contains information that is not directly approved by DSA but is necessary to substantiate approval of the truss submittal package. The supporting document file shall include the truss calculations (see Section 4.1.6 below), applicable evaluation reports, and any other product data or information necessary to demonstrate the adequacy of the truss design.

**4.1.3** The truss submittal package shall include truss design drawings in accordance with CBC Sections 2303.4.1.1, 2303.4.1.2, and 2303.4.3. The truss design drawings shall be prepared by and each individual sheet shall be stamped and signed by the truss designer (see Glossary below) per CBC Section 2303.4.1.4.1. In addition to the items required by the CBC, the truss design drawings shall include the following:

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**4.1.3.1** Truss profile with overall dimensions, roof slopes, member sizes, panel point dimensions, sizes of connection plates, locations of bracing points, and hangers where used on the project.

**4.1.3.2** Listing of the valid evaluation report for metal side plates and hangers.

**4.1.3.3** Typical plate connection details defining alignment of plates and locating dimensions relative to the centerline of the joint (see Glossary below).

**4.1.3.4** Specification of treatment of plates where knots occur within the joint.

**4.1.3.5** Manufacturer's truss blocking panels where required.

**4.1.3.6** Gable end trusses where used over walls.

**4.1.3.7** Details and locations of bottom chord bracing when required.

**4.1.3.8** Temporary restraints and bracing for trusses with spans of 60-feet or more as required in accordance with CBC Section 1705A.5.2.

**4.1.4** Where the loading diagrams per Section 3.1.3 above specify concentrated loads applied at locations that do not align with truss panel points, the truss design drawings shall demonstrate the load path between the location of the applied load and the truss panel point.

**4.1.5** The truss submittal package shall include the truss placement diagram(s) in accordance with CBC Section 2303.4.2.

**4.1.6** The truss submittal package shall include truss calculations in accordance with CBC Section 2303.4.3.1, including but not limited to the following:

**4.1.6.1** Summary of load combinations analyzed.

**4.1.6.2** Summary of maximum member loads and reactions based upon the controlling load combination. The controlling load combination shall be identified for each member and reaction.

**4.1.6.3** Member design, including but not limited to the maximum forces and demand-to-capacity stress ratios.

**4.1.6.4** Required bearing areas and dimensions.

**4.1.6.5** Metal side plate sizes based upon the defined plate manufacturer and evaluation report.

**4.1.6.6** Metal side plate evaluation report.

**4.1.6.7** 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 described above.

**4.1.6.8** If calculations are performed by the use of a computer program, the software user manual shall be made available to DSA upon request. DSA may, at its discretion, require verification of the software output results by other independent means, such as hand calculations.

## **4.2 Review and Acceptance by Project Design Professionals**

The manufacturer submits the truss submittal package to the project design professionals for review and approval. This process may take multiple exchanges between the project design professionals and the truss manufacturer to finalize the submittal package for submission to DSA.

**4.2.1** The project design professionals and the truss manufacturer shall coordinate the documents with respect to the following:

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**4.2.1.1** Mechanical, electrical, and plumbing systems that include locations and sizes of roof mounted, floor mounted, and suspended equipment and distribution systems (e.g., ducts, pipes, conduits, etc.).

**4.2.1.2** Roof pitch or slope.

**4.2.2** When the project design professionals approve 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).

### **4.3 DSA Review and Approval**

The DSA review and approval process may require cycles of plan review comments and corrections to the truss submittal package if DSA determines the initial version to be incomplete or not code compliant. Each revised version of the package is subject to the actions required by Section 4.2 above prior to being resubmitted to DSA.

When DSA determines the truss submittal package is complete and code compliant, DSA will affix its approval stamp to the approval document as defined Section 4.1.2.1 above.

## **5. MANUFACTURE OF TRUSSES**

The manufacture of MPC 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 Fabrication Inspection**

**5.1.1** Manufacturer prepares shop drawings from the DSA-approved construction documents and truss design drawings. Changes to the approved truss design drawings shall be reviewed and approved by DSA prior to truss fabrication in accordance with Section 5.2 below.

**5.1.2** 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. Refer to Section 6 below. Notification of the project design professional by the manufacturer may occur through the general contractor.

### **5.2 Changes During Fabrication**

If changes to the DSA-approved construction documents or truss submittal package are necessary, the MPC truss manufacturer and the project design professionals, 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.

## **6. TESTING AND INSPECTION**

### **6.1 Fabrication Special Inspection**

A fabrication special inspector shall provide continuous inspection during MPC 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 program provided by the truss manufacturer.

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

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withdrawal of the laboratory of record's DSA acceptance. Refer to CAC 4-335.1. This includes but is not limited to the withdrawal of approval to work on any current or future projects under DSA jurisdiction.

**6.2 Fabrication Special Inspector Qualifications**

The fabrication special inspector shall be approved by DSA for each project prior to fabrication. Qualified fabrication special inspectors for MPC wood trusses comply with all of the following:

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

**6.2.2** 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 MPC wood truss fabrication. Experience as either a truss 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.

**6.3 Fabrication Special Inspector Responsibilities**

The fabrication special inspector is responsible to perform the following relative to the MPC wood trusses:

**6.3.1** Verify the truss manufacturer complies with Section 1.2 above.

**6.3.2** Continuous inspection of each truss during all stages of fabrication, including verification of material grades, dimensions, joint details, and all other aspects of truss fabrication.

**6.3.3** Mark each inspected truss with a stamped identification mark. At a minimum the identification mark shall include the special inspector's initials and date.

**6.3.4** 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 Forms webpage.

**6.3.5** Bring any rejected work to the immediate attention of the contractor and project inspector.

**6.3.6** Provide a verified report to the project design professional in general responsible charge and DSA in accordance with CAC Section 4-335(e) or 4-335(f) and CBC Section 1705A.5.3.

**6.4 Inspection of Field Installation**

The project inspector is responsible to perform the following during the installation of the MPC wood trusses at the project site:

**6.4.1** 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.

**6.4.2** Working from the DSA-approved truss submittal package, the project inspector shall verify the installation of permanent individual truss member restraints and permanent individual truss member diagonal bracing.

**6.4.3** Working from the DSA-approved truss submittal package, the project inspector shall verify installation of temporary restraints and bracing for trusses with spans of 60 feet or more in accordance with CBC Section 1705A.5.2.

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### REFERENCES

2022 California Code of Regulations (CCR), Title 24

Part 1: California Administrative Code (CAC), Sections 4-316, 4-317, 4-333, 4-335, and 4-335.1.

Part 2: California Building Code (CBC), Sections 1704A.2, 1704A.3, 1705A.5A, and 2303.4.

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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.

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**METAL-PLATE-CONNECTED WOOD TRUSSES: 2022 CBC****GLOSSARY****Centerline of Joint**

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 point.

**Construction Change Documents**

Partial drawings or specifications that document changes to the DSA-approved construction documents or the DSA-approved truss submittal package. Refer to IR A-6.

**Construction Documents**

Drawings and specifications prepared by the project design professionals for the construction of the project and submitted to DSA for review and approval 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 MPC wood trusses. The inspector may contract directly with the school district and be independently approved for the project by DSA, or the inspector may be employed by a DSA-accepted laboratory. Refer to CAC Section 4-335.

**Project Design Professional**

The architect or structural engineer in general responsible charge of a project in accordance CAC Section 4-316(a) and the structural engineer with delegated responsibility in accordance with CAC Section 4-316(b). These individuals are sometimes referred to as the architect of record and the structural engineer of record, and both are intended when this term is used in the plural form in this IR.

**Project Inspector**

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

**Truss Design Drawings**

As defined by CBC Section 2303.4.1.1 and ANSI/TPI 1 Section 2.2. Truss design drawings are prepared, stamped, and signed by the truss designer per CBC Section 2303.4.1.4.1. The truss design drawings shall include as a minimum all the items listed in CBC Sections 2303.4.1.1 and ANSI/TPI 1 Section 2.3.5.5. The truss design drawings are part of the truss submittal package.

**Truss Designer**

A California registered professional engineer retained by the MPC truss manufacturer who is responsible for the design of the MPC trusses per CBC Section 2303.4.1.4, CAC Section 4-316(c), and ANSI/TPI 1 Section 2.2 and who stamps and signs the truss design drawings in accordance with CBC Section 2303.4.1.4.1.

**Truss Placement Diagram**

As defined by CBC Section 2303.4.2 and ANSI/TPI 1 Section 2.2. The truss placement diagram identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram is part of the truss submittal package, and shall accompany the shipment of trusses to the jobsite. Truss placement diagrams that serve only as a guide for installation and do not deviate from the DSA-approved construction drawings are not required to be stamped and signed the truss designer.

**Truss Submittal Package**

As defined by CBC Section 2303.4.3. The truss submittal package is prepared by the truss manufacturer and submitted to DSA for review and approval through the project design professional as described in this IR.