

## Standard Responsibilities in the Design and Application of Metal Plate Connected Wood Trusses

Approved February 2008

### PREAMBLE

ANSI/TPI 1 *National Design Standard for Metal Plate Connected Wood Truss Construction* is the industry's consensus standard and is referenced by the IBC and IRC. The following text is a compilation of the requirements provided in ANSI/TPI 1-2007, Chapter 2, with permission from the publisher, the Truss Plate Institute (TPI), [www.tpinst.org](http://www.tpinst.org). The requirements are specifically categorized into two distinct areas – when the legal requirements mandate a Registered Design Professional (RDP) is used and when they do not. Terms that are capitalized are in ANSI/TPI 1 and in BCSI, *Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses*.

### 1.0 GENERAL PURPOSES

The purpose of ANSI/TPI 1, Chapter 2, is to define and draw attention to the responsibilities of the Owner, Registered Design Professional for the Building or Building Designer, Contractor, Truss Design Engineer or Truss Designer, and Truss Manufacturer, with respect to the application of Trusses in the construction of a Building.

### 2.0 REQUIREMENTS OF THE OWNER

**2.1 Building Permit.** Where required by Legal Requirements, including the Building Code, the Owner shall obtain a Building Permit.

If special inspections or structural observations related to Trusses are required as part of the Construction Documents and/or permitting process, these requirements shall be communicated in writing to the Contractor or Truss Manufacturer as appropriate.

**2.2 Engagement with the RDP/Building Designer.**

The Owner shall engage a RDP/Building Designer to prepare the Construction Documents.

In the absence of a mandate to use an independent RDP/Building Designer, the Owner shall assume the role of Building Designer.

**2.3 Engagement with the Contractor.** The Owner shall engage a Contractor to store, handle and install the Trusses for the Building, in compliance with any and all Legal Requirements.

**2.4 Review and Coordinate Submittal Packages.** The Owner or Owner's representative shall be responsible for ensuring that the requirements of Section 5.2 are accomplished.

**2.5 Long Span Truss Requirements.**

**2.5.1 Restraint/Bracing Design.** In all cases where a Truss clear span is 60 ft. (18 m) or greater, the Owner shall contract with any RDP for the design of the Temporary Installation Restraint/Bracing and the Permanent Individual Truss Member Restraint and Diagonal Bracing.

**2.5.2 Special Inspection.** In all cases where a Truss clear span is 60 ft. (18 m) or greater, the Owner shall contract with any RDP to provide special inspections to assure that the Temporary Installation Restraint/Bracing and the Permanent Individual Truss Member Restraint and Diagonal Bracing are installed properly.

**2.6 Responsibility Exemptions.** The Owner is responsible for items listed in Section 2.0, and is not responsible for the requirements of other parties specified outside of Section 2.0.

### 3.0 REQUIREMENTS OF THE RDP/ BUILDING DESIGNER

**3.1 Construction Documents.** The Construction Documents shall be prepared by a RDP/Building Designer and shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in detail that such documents conform to the Legal Requirements, including the Building Code.

**3.2 Deferred Submittals.** The RDP/Building Designer shall list the Deferred Submittals on the Construction Documents. The RDP/Building Designer shall review Deferred Submittals in accordance with Section 3.3.

**3.3 Review Submittal Packages.** The RDP/Building Designer shall review the Truss Submittal Package for compatibility with the Building design. All such submittals shall include a notation indicating that they have been reviewed and whether or not they have been found to be in general conformance with the design of the Building for final approval prior to truss fabrication.

**3.4 Required Information in the Construction Documents.** The RDP/Building Designer, through the Construction Documents, shall provide information sufficiently accurate and reliable to be used for facilitating the supply of the Structural Elements and other information for developing the design of the Trusses for the Building, and shall provide the following:

- (a) All Truss and Structural Element orientations and locations.
- (b) Information to fully determine all Truss profiles.
- (c) All Structural Element and Truss support

locations and bearing conditions (including the allowable bearing stress).

- (d) The location, direction, and magnitude of all dead, live, and lateral loads applicable to each Truss including, but not limited to, loads attributable to: roof, floor, partition, mechanical, fire sprinkler, attic storage, rain and ponding, wind, snow (including snow drift and unbalanced snow), seismic; and any other loads on the Truss.
- (e) All anchorage designs required to resist uplift, gravity, and lateral loads,
- (f) Adequate Truss-to-Structural Element connections, but not Truss-to-Truss connections.
- (g) Permanent Building Stability Bracing; including Truss anchorage connections to the Permanent Building Stability Bracing.
- (h) Criteria related to serviceability issues including:
  - (1) Allowable vertical, horizontal or other required deflection criteria.
  - (2) Any dead load, live load, and in-service creep deflection criteria for flat roofs subject to ponding loads.
  - (3) Any Truss camber requirements.
  - (4) Any differential deflection criteria from Truss-to-Truss or Truss-to- adjacent Structural Element.
  - (5) Any deflection and vibration criteria for floor Trusses including:
    - (a) Any strongback bridging requirements.
    - (b) Any dead load, live load, and in-service creep deflection criteria for floor trusses supporting stone or ceramic tile finishes.
  - (6) Moisture, temperature, corrosive chemicals and gases expected to result in:
    - (a) Wood moisture content exceeding 19 percent,
    - (b) Sustained temperatures exceeding 150°F, and/or
    - (c) Corrosion potential from wood preservatives or other sources that may be detrimental to Trusses.

**3.5 Responsibility Exemptions.** The RDP/Building Designer is responsible for items listed in Section 3.0, and is not responsible for the requirements of other parties specified outside of Section 3.0.

#### **4.0 REQUIREMENTS FOR THE PERMANENT MEMBER RESTRAINT/ BRACING OF TRUSS SYSTEMS**

**4.1 Method of Restraint.** The method of Permanent Individual Truss Member Restraint/Bracing and the method of anchoring or restraining to prevent lateral movement of all Truss members acting together as a system shall be accomplished by:

**4.1.1 Standard Industry Details.** Standard industry Lateral Restraint and Diagonal Bracing details in accordance with BCSI-B3: *Permanent Restraint/Bracing of Chords and Web Members* and/or BCSI-B7:

*Temporary & Permanent Restraint/Bracing for Parallel Chord Trusses.*

**4.1.2 Substitution with Reinforcement.** Permanent Individual Truss Member Restraint shall be permitted to be replaced with reinforcement designed to prevent buckling (e.g., buckling reinforcement by T-reinforcement or L-reinforcement, proprietary reinforcement, etc.).

**4.1.3 Project Specific Design.** A project specific Truss member permanent lateral restraint/bracing design for the roof or floor Framing Structural System shall be permitted to be specified by any RDP/Building Designer.

**4.2 Method Specified by any RDP/Building Designer.** The method of Permanent Individual Truss Member Restraint and Diagonal Bracing for the Truss Top Chord, Bottom Chord, and Web members shall be permitted to be specified by any RDP/Building Designer.

**4.3 Absence of Truss Restraint/Bracing Method or Details.** If a specific Truss member permanent bracing design for the roof or floor Framing Structural System is not provided by the Owner or any RDP/Building Designer, the method of Permanent Individual Truss Member Restraint and Diagonal Bracing for the Truss Top Chord, Bottom Chord, and Web members shall be in accordance with BCSI-B3 or BCSI-B7.

**4.4 Trusses Spanning 60 Feet (18 m) or Greater.** For Trusses with clear spans 60 ft. (18 m) or greater, see Section 2.5.

#### **5.0 REQUIREMENTS OF THE CONTRACTOR**

**5.1 Information Provided to the Truss Manufacturer.** The Contractor shall provide to the Truss Manufacturer a copy of all Construction Documents pertinent to the Framing Structural System and the design of the Trusses (i.e., framing plans, specifications, details, structural notes), and the name of the RDP/Building Designer if not noted on the Construction Documents. Amended Construction Documents upon approval through the plan review/permitting process shall be immediately communicated to the Truss Manufacturer.

**5.2 Information Provided to the RDP/Building Designer.** The Contractor, after reviewing and/or approving the Truss Submittal Package, shall forward the Truss Submittal Package to the RDP/Building Designer for review.

**5.3 Shop Drawing Review.** The Contractor shall not proceed with the Truss installation until the Truss Submittal Package has been reviewed by the RDP/ Building Designer.

**5.4 Means and Methods.** The Contractor is responsible for the construction means, methods, techniques, sequences, procedures, programs, and safety in connection with the receipt, storage, handling, installation, restraining, and bracing of the Trusses.

**5.5 Truss Installation.** The Contractor shall ensure that the Building support conditions are of sufficient strength and stability to accommodate the loads applied during the Truss installation process. Truss installation shall comply with installation tolerances shown in BCSI-B1. Temporary Installation Restraint/

Bracing for the Truss system and the permanent Truss system Lateral Restraint and Diagonal Bracing for the completed Building and any other construction work related directly or indirectly to the trusses shall be installed by the Contactor in accordance with:

- (a) The Construction Documents, and/or
- (b) The Truss Submittal Package.

For Trusses clear spanning 60 ft. (18 m) or greater, see Section 2.5.

**5.6 Pre- and Post-Installation Check.** The Contractor shall examine the Trusses delivered to the job site and examine the Trusses after they are erected and installed for:

- (a) Dislodged or missing connectors,
- (b) Cracked, dislodged or broken members, or
- (c) Any other damage that may impair the structural integrity of the Truss.

**5.7 Truss Damage Discovery.** In the event that damage to a Truss is discovered that would likely impair the structural integrity of the Truss, the Contractor shall:

- (a) Ensure that the Truss not be erected, or
- (b) That any area within the Building supported by any such Truss already erected shall be appropriately shored or supported to prevent further damage from occurring and shall remain clear and free of any load imposed by people, plumbing, electrical, mechanical, bridging, bracing, etc. until field repairs have been properly completed per Section 5.8.

**5.8 Truss Damage Responsibilities.** In the event of damage, the Contractor shall:

- (a) Contact the Truss Manufacturer and RDP/ Building Designer for the Building to determine an adequate field repair and
- (b) Construct the field repair in accordance with the written instructions and details provided by any Registered Design Professional.

**5.9 Responsibility Exemptions.** The Contractor is responsible for items listed in Section 5.0, and is not responsible for the requirements of other parties specified outside of Section 5.0.

## **6.0 REQUIREMENTS OF THE TRUSS DESIGN ENGINEER/TRUSS DESIGNER**

**6.1 Preparation of Truss Design Drawings.** The Truss Design Engineer shall supervise the preparation of the Truss Design Drawings or the Truss Designer is responsible for the preparation of the Truss Design Drawings based on the Truss design criteria and requirements set forth in the Construction Documents or as otherwise set forth in writing by the RDP/Building Designer. The Truss Design Drawings shall be supplied to the Truss Designer by the Truss Manufacturer.

**6.2 Single Truss Component Design.** The Truss Design Engineer or Truss Designer shall be responsible for the single Truss component design depicted on the Truss Design Drawing.

**6.3 Truss Design Drawing Seal and Signature.** When the Legal Requirements mandate a RDP design

the Building, each individual Truss Design Drawing shall bear the seal and signature of the Truss Design Engineer.

**Exception:** When a Cover/Truss Index Sheet is used, it is the only document required to be signed and sealed by the Truss Design Engineer.

**6.4 Truss Placement Diagram.** When the Truss Placement Diagram serves only as a guide for Truss installation, it does not require the seal of the Truss Design Engineer.

**6.5 Information on Truss Design Drawings.** Truss Design Drawings shall include, at a minimum, the information specified below:

- (a) Building Code used for design, unless specified on Cover/Truss Index Sheet.
- (b) Slope or depth, span and spacing.
- (c) Location of all joints and support locations.
- (d) Number of plies if greater than one.
- (e) Required bearing widths.
- (f) Design loads as applicable, including:
  - (1) Top Chord live load (for roof Trusses, this shall be the controlling case of live load or snow load);
  - (2) Top Chord dead load;
  - (3) Bottom Chord live load;
  - (4) Bottom Chord dead load;
  - (5) Additional loads and locations;
  - (6) Environmental load design criteria (wind speed, snow, seismic, and all applicable factors as required to calculate the Truss loads); and
  - (7) Other lateral loads, including drag strut loads.
- (g) Adjustments to Wood Member and Metal Connector Plate design values for conditions of use.
- (h) Maximum reaction force and direction, including maximum uplift reaction forces where applicable.
- (i) Metal Connector Plate type, manufacturer, size, and thickness or gauge, and the dimensioned location of each Metal Connector Plate except where symmetrically located relative to the joint interface.
- (j) Size, species and grade for each Wood Member.
- (k) Truss-to-Truss connection and Truss field assembly requirements.
- (l) Calculated span to deflection ratio and/or maximum vertical and horizontal deflection for live and total load and  $K_{CR}$  as applicable.
- (m) Maximum axial tension and compression forces in the Truss members.
- (n) Fabrication tolerance.
- (o) Required Permanent Individual Truss Member Restraint location and the method of Restraint/Bracing to be used per Section 4.0.

**6.6 Responsibility Exemptions.** The Truss Designer is responsible for items listed in Section 6.0, and is not responsible for the requirements of other parties specified outside of Section 6.0.

## **7.0 REQUIREMENTS OF THE TRUSS MANUFACTURER**

- 7.1 Truss Design Criteria and Requirements.** The Truss Manufacturer shall obtain the Truss design criteria and requirements from the Construction Documents.
- 7.2 Communication to Truss Designer.** The Truss Manufacturer shall communicate the Truss design criteria and requirements to the Truss Designer.
- 7.3 Alternate Truss Designs.** If an alternative or partial set of Truss design(s) is proposed by the Truss Manufacturer, Truss Design Engineer or Truss Designer, such alternative set of design(s) shall be sent to and reviewed by the RDP/Building Designer prior to manufacturing. These alternative set of design(s) do not require the seal of the Truss Design Engineer until accepted by the RDP for the Building.
- 7.4 Truss Placement Diagram.** Where required by the Construction Documents or Contract, the Truss Manufacturer shall prepare the Truss Placement Diagram that identifies the assumed location for each individually designated Truss and references the corresponding Truss Design Drawing. The Truss Placement Diagram shall be permitted to include identifying marks for other products including Structural Elements, so that they may be more easily identified by the Contractor during field erection. When the Truss Placement Diagram serves only as a guide for Truss installation and requires no engineering input, it does not require the seal of any Truss Design Engineer or RDP.
- 7.5 Required Documents.** The Truss Manufacturer shall supply to the Contractor the Truss Submittal Package, including the Truss Design Drawings, a Truss Placement Diagram, if required by the Construction Documents or Contract, and the required Permanent Individual Truss Member Restraint and the method to be used per Section 4.0.
- 7.6 Special Application Conditions.** The Truss Manufacturer shall be allowed to provide detail drawings to the Contractor to document special application conditions.
- 7.7 Truss Submittal Packages.** Where required by the Construction Documents or Contract, Legal Requirements or the Building Official, the Truss Manufacturer shall provide the appropriate Truss Submittal Package to one or more of the following: Building Official; RDP/Building Designer and/or Contractor for review and/or approval per Section 5.2.
- 7.8 Reliance on Construction Documents.** The Truss Manufacturer shall be permitted to rely on the accuracy and completeness of information furnished in the Construction Documents or otherwise furnished in writing by the RDP/Building Designer and/or Contractor.
- 7.9 Fabrication Tolerance.** The Truss Manufacturer shall

determine the value for the Fabrication Tolerance to be used in the design of the Trusses.

- 7.10 Manufacturer Quality Criteria.** The Truss Manufacturer shall manufacture the Trusses in accordance with the final Truss Design Drawings, using the quality criteria required by ANSI/TPI 1 unless more stringent quality criteria is provided by the Owner in writing or through the Construction Documents.
- 7.11 In-Plant Truss Inspections.** Truss inspections, as required by the Jurisdiction, shall be performed at the manufacturer's facility using the manufacturer's In-Plant Quality Assurance Program monitored by an inspection agency approved by the Jurisdiction, and shall satisfy any quality control/quality assurance requirements for the Trusses, and shall satisfy any designated in-plant special inspection requirements for the Trusses.
- 7.12 Responsibility Exemptions.** The Truss Manufacturer is responsible for items listed in Section 7.0, and is not responsible for the requirements of other parties specified outside of Section 7.0.

## 8.0 CONTRACTS

- 8.1 Defer to Construction Documents.** ANSI/TPI 1, Chapter 2, is not intended to take precedence over the Construction Documents, where a Contract between parties incorporates by reference the Construction Documents, and therefore the Construction Documents shall apply as between the parties to the Contract.
- 8.2 Defer to Contract.** ANSI/TPI 1, Chapter 2, is not intended to take precedence over a Contract as a Contract shall be permitted to contain provisions that take precedence over ANSI/TPI 1, Chapter 2, and/or the Construction Documents. A party shall not exclude in a Contract a responsibility established by ANSI/TPI 1, Chapter 2, or the Construction Documents unless that responsibility is assigned to a qualified party and that party agrees to that assignment.
- Any changes made to the Construction Documents by contract shall be submitted, reviewed and approved by the Building Official.
- 8.3 Incorporation into Contract.** A Contract shall be permitted to incorporate ANSI/TPI 1, Chapter 2, to establish the responsibilities of the parties to such Contract.

**DEFINITIONS OF TERMS ARE AVAILABLE IN ANSI/TPI 1 AND BCSI.**

These recommendations should not be interpreted as superior to the project Architect's or Engineer's design specification for handling, installing, restraining and bracing metal plate connected wood trusses for a particular roof or floor.

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