

Where Should Truss-to-Truss Girder Connection Information be Included?

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Issue:

The connection between a truss and truss girder must be designed to provide adequate support to the truss connecting into the truss girder and to ensure the proper transfer of load from the truss into the truss girder. A clear depiction of these connections helps the installer understand all the connection requirements and how they are applied, thereby enabling him/her to properly implement these connections during installation.

Truss-to-truss girder connections are the responsibility of the Truss Designer and, as such, the requirements for these connections are included on the Truss Design Drawing (TDD). In an effort to provide more assistance to their customers, some Truss Manufacturers may also include these connection requirements on the Truss Placement Diagram (TPD). Inclusion of this information on the TPD has critical implications as to how the TPD is viewed from an engineering law perspective. This *Technical Note* examines these implications.

Key Definitions:¹

Truss: An individual metal plate connected wood element manufactured by the Truss Manufacturer, and supplied for the Building Structural System.

Truss Design Drawing: The written, graphic and pictorial depiction of an individual truss.

Truss Designer: The individual or organization responsible for the design of trusses.

Truss Manufacturer: An individual or organization engaged in the manufacturing of trusses.

Truss Placement Diagram: The illustration supplied by the truss manufacturer identifying the location assumed for each truss, which references each individually designated Truss Design Drawing.

Background:

A few building departments (e.g., City of Las Vegas, Nevada, and Manatee County, Florida) have periodically requested that the TPD(s) be sealed by a registered design professional. The underlying reason for the requests was that the truss-to-truss girder connections (i.e., hanger schedules) were included on TPDs and not on TDDs, and these building departments wanted to make sure that they had been specified and approved by the Truss Designer.

Analysis:

ANSI/TPI 1-2002 (TPI 1) has been adopted as a referenced standard in the 2003 and 2006 editions of the International Building Code (IBC) (*see Appendix A*) and the International Residential Code (IRC) (*see Appendix B*). An addendum to Chapters 2 and 6 of TPI 1 was revised on January 1, 2005. The definition of a TPD is included in Chapter 2 of TPI 1. From this definition it should be noted that the TPD is

¹ As defined in ANSI/TPI 1-2002 *National Design Standard for Metal Plate Connected Wood Truss Construction*.

intended as an installation guide provided by the Truss Manufacturer to assist the installer in identifying the assumed location for each Truss.

This is further confirmed by the IBC 2006 which defines the TPD as follows:

2303.4.1.3 Truss placement diagram. The truss manufacturer shall provide a truss placement diagram that 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 job site. Truss placement diagrams shall not be required to bear the seal or signature of the truss designer.

Exception: When the truss placement diagram is prepared under the direct supervision of a registered design professional, it is required to be signed and sealed.

The addendum to TPI 1 Chapter 6 (*see Appendix C*) specifies that truss-to-truss girder connections must be included on the TDD. Specifically Section 6.1.3 states in part:

6.1.3 Truss Design Information

For each Truss Design Drawing, the Truss Designer shall set forth, as a minimum, the following: ...

6.1.3.9 Connection requirements for: (a) truss to truss girder; (b) truss ply to ply; and (c) field assembly of trusses; ...

The IBC (*see Appendix A*) and IRC (*see Appendix B*) include the following requirements specific to this issue:

IBC 2303.4.1² Truss design drawings. These shall include, at a minimum: ...

15. Connection requirements for:

15.1 Truss to truss girder;

15.2 Truss ply to ply; and

15.3 Field splices; ...

IRC R502.11.4/ R802.10.1 Truss design drawings. These shall include, at a minimum: ...

9. Connection requirements for:

9.1 Truss to truss girder;

9.2 Truss ply to ply;

9.3 Field splices; ...

Based on this information it is evident that the TDD is the document required to contain the truss-to-truss girder connection information when applicable. In certain instances, a separate connector table referenced on the TDD may also be provided. The Truss Designer is responsible for preparing the TDD(s) and where applicable, the connector table. Where specified by legal requirements, the TDDs and any referenced table shall bear the seal and signature of the Truss Designer.

As an additional service, the Truss Manufacturer may decide to include the connection information from the TDDs on the TPD. As long as the connection information on the TPD is the same as the information on the TDDs, it should be assumed that the connection information on the TPD is supplemental and the TPD does not require a seal.

Conclusion:

TPI 1 and the 2003 and 2006 editions of the IBC and IRC require that any truss-to-truss girder connection information be included on the TDD(s). The Truss Designer is responsible for preparing the TDD(s) and, where applicable, the connector or equivalent information needed to select a connector that will satisfy the reaction and uplift requirements noted on the TDD.

² Section 2303.4.1.2 of 2006 IBC.

As defined in TPI 1 and the IBC 2006, the TPD is an installation guide prepared for showing the assumed location of the individual trusses. If there is connection information included on the TPD that is not on the TDD(s), it may be justifiable to consider that the TPD provides engineering information and is therefore subject to professional engineering rules and regulations. However, if the connection information on the TPD is the same as what is included on the TDDs, the TPD is strictly an installation guide and therefore does not need to be sealed.

Appendix A

The language in **RED** signifies sections of the code or law that have been used in the foregoing document to make it easier for the reader to see the language in context.

2003 International Building Code

Chapter 23 WOOD

SECTION 2303: MINIMUM STANDARDS AND QUALITY

2303.4 Trusses. **Metal-plate-connected wood trusses shall be manufactured as required by TPI 1.** Each manufacturer of trusses using metal plate connectors shall retain an approved agency to make unscheduled inspections of truss manufacturing and delivery operations. The inspection shall cover all phases of truss operations, including lumber storage, handling, cutting fixtures, passes or rollers, manufacturing, bundling and banding.

2303.4.1 Truss design drawings. Truss construction documents shall be prepared by a registered design professional and shall be provided to the building official and approved prior to installation. These construction documents **shall include, at a minimum, the information specified below.** Truss shop drawings shall be provided with the shipment of trusses delivered to the job site.

1. Slope or depth, span, and spacing;
2. Location of all joints;
3. Required bearing widths;
4. Design loads as applicable;
5. Top chord live load (including snow loads);
6. Top chord dead load;
7. Bottom chord live load;
8. Bottom chord dead load;
9. Concentrated loads and their points of application;
10. Controlling wind and earthquake loads;
11. Adjustments to lumber and joint connector design values for conditions of use;
12. Each reaction force and direction;
13. Metal connector plate type, size, thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
14. Lumber size, species and grade for each member;
15. **Connection requirements for:**
15.1 Truss-to-truss girder;
15.2 Truss ply-to-ply; and
15.3 Field splices.
16. Calculated deflection ratio and/or maximum description for live and total load;
17. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents; and
18. Required permanent truss member bracing location.

2006 International Building Code

Chapter 23 WOOD

SECTION 2303: MINIMUM STANDARDS AND QUALITY

2303.4 Trusses.

2303.4.1 Design. Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other approved framing devices.

2303.4.1.1 Truss designer. The individual or organization responsible for the design of trusses.

2303.4.1.2 Truss design drawings. The written, graphic and pictorial depiction of each individual truss shall be provided to the building official and approved prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. **Truss design drawings shall include, at a minimum, the information specified below:**

1. Slope or depth, span and spacing;
2. Location of joints;
3. Required bearing widths;
4. Design loads as applicable;
5. Top chord live load (including snow loads);
6. Top chord dead load;
7. Bottom chord live load;
8. Bottom chord dead load;
9. Concentrated loads and their points of application as applicable;
10. Controlling wind and earthquake loads as applicable;
11. Adjustments to lumber and metal connector plate design value for conditions of use;
12. Each reaction force and direction;
13. Metal connector plate type, size, thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
14. Lumber size, species and grade for each member;
15. **Connection requirements for:**
 - 15.1. Truss to truss;**
 - 15.2. Truss ply to ply; and**
 - 15.3. Field splices.**
16. Calculated deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
17. Maximum axial tensile and compression forces in the truss members; and
18. Required permanent individual truss member bracing and method per Section 2303.4.1.5, unless a specific truss member permanent bracing plan for the roof or floor structural system is provided by a registered design professional. Where required by one of the following, each individual truss design drawing shall bear the seal and signature of the truss designer:
 1. Registered design professional; or
 2. Building official; or
 3. Statutes of the jurisdiction in which the project is to be constructed.

Exceptions:

1. When a cover sheet/truss index sheet combined into a single cover sheet is attached to the set of truss design drawings for the project, the single sheet/truss index sheet is the only document that needs to be signed and sealed within the truss submittal package.
2. When a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings for the project, both the cover sheet and the truss index sheet are the only documents that need to be signed and sealed within the truss submittal package.

2303.4.1.3 Truss placement diagram. The truss manufacturer shall provide a truss placement diagram that 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 job site. **Truss placement diagrams shall not be required to bear the seal or signature of the truss designer.**

Exception: When the truss placement diagram is prepared under the direct supervision of a registered design professional, it is required to be signed and sealed.

2303.4.1.4 Truss submittal package. The truss submittal package shall consist of each individual truss design drawing, the truss placement diagram for the project, the truss member permanent bracing specification and, as applicable, the cover sheet/truss index sheet.

2303.4.1.5 Truss member permanent bracing. Where permanent bracing of truss members is required on the truss design drawings, it shall be accomplished by one of the following methods:

1. The trusses shall be designed so that the buckling of any individual truss member can be resisted internally by the structure (e.g. buckling member T-bracing, L-bracing, etc.) of the individual truss. The truss individual member buckling reinforcement shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement diagrams provided by the truss designer.
2. Permanent bracing shall be installed using standard industry bracing details that conform with generally accepted engineering practice. Individual truss member continuous lateral bracing location(s) shall be shown on the truss design drawing.

2303.4.1.6 Anchorage. All transfer of loads and anchorage of each truss to the supporting structure is the responsibility of the registered design professional.

2303.4.1.7 Alterations to trusses. Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without written concurrence and approval of a registered design professional. Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, water heater) shall not be permitted without verification that the truss is capable of supporting such additional loading.

2303.4.2 Metal-plate-connected trusses. In addition to Sections 2303.4.1 through 2303.4.1.7, the design, manufacture and quality assurance of metal-plate-connected wood trusses shall be in accordance with TPI 1. Manufactured trusses shall comply with Section 1704.6 as applicable.

International Building Code
Chapter 35 REFERENCED STANDARDS

TPI

Truss Plate Institute
583 D'Onofrio Drive, Suite 200
Madison, WI 53719

Standard reference number	Title	Referenced in code section number
TPI 1—2002	National Design Standards for Metal-Plate-Connected Wood Truss Construction	2303.4, 2306.1

Appendix B

International Residential Code Chapter 5 FLOORS SECTION R502: WOOD FLOOR FRAMING

R502.11 Wood trusses.

R502.11.1 Design. Wood trusses shall be designed in accordance with approved engineering practice. The design and manufacture of metal plate connected wood trusses shall comply with ANSI/TPI 1. The truss design drawings shall be prepared by a registered professional where required by the statutes of the jurisdiction in which the project is to be constructed in accordance with Section R106.1.

R502.11.4 Truss design drawings. Truss design drawings, prepared in compliance with Section R502.11.1, shall be provided to the building official and approved prior to installation. Truss design drawing shall be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span, and spacing.
 2. Location of all joints.
 3. Required bearing widths.
 4. Design loads as applicable.
 - 4.1 Top chord live load (including snow loads).
 - 4.2 Top chord dead load.
 - 4.3 Bottom chord live load.
 - 4.4 Bottom chord dead load.
 - 4.5 Concentrated loads and their points of application.
 - 4.6 Controlling wind and earthquake loads.
 5. Adjustments to lumber and joint connector design values for conditions of use.
 6. Each reaction force and direction.
 7. Joint connector type and description (e.g., size, thickness or gauge); and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
 8. Lumber size, species and grade for each member.
 - 9. Connection requirements for:**
 - 9.1 Truss-to-truss girder.**
 - 9.2 Truss ply-to-ply.**
 - 9.3 Field splices.**
 10. Calculated deflection ratio and/or maximum description for live and total load.
 11. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents.
 12. Required permanent truss member bracing location.
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International Residential Code Chapter 8 ROOF-CEILING CONSTRUCTION SECTION R802: WOOD ROOF FRAMING

R802.10 Wood trusses.

R802.10.1 Truss design drawings. Truss design drawings, prepared in conformance with Section R802.10.1, shall be provided to the building official and approved prior to installation. Truss design drawings shall include, at a minimum, the information specified below. Truss design drawing shall be provided with the shipment of trusses delivered to the job site.

1. Slope or depth, span, and spacing.
2. Location of all joints.

3. Required bearing widths.
4. Design loads as applicable.
 - 4.1 Top chord live load (including snow loads).
 - 4.2 Top chord dead load.
 - 4.3 Bottom chord live load.
 - 4.4 Bottom chord dead load.
 - 4.5 Concentrated loads and their points of application.
 - 4.6 Controlling wind and earthquake loads.
5. Adjustments to lumber and joint connector design values for conditions of use.
6. Each reaction force and direction.
7. Joint connector type and description (e.g., size, thickness or gauge); and the dimensioned location of each joint connector except where symmetrically located relative to the joint interface.
8. Lumber size, species and grade for each member.
- 9. Connection requirements for:**
 - 9.1 Truss-to-truss girder.**
 - 9.2 Truss ply-to-ply.**
 - 9.3 Field splices.**
10. Calculated deflection ratio and/or maximum description for live and total load.
11. Maximum axial compression forces in the truss members to enable the building designer to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss drawing or on supplemental documents.
12. Required permanent truss member bracing location.

R802.10.2 Design. Wood trusses shall be designed in accordance with accepted engineering practice. **The design and manufacture of metal plate connected wood trusses shall comply with ANSI/TPI 1.** The truss design drawings shall be prepared by a registered professional where required by the statutes of the jurisdiction in which the project is to be constructed in accordance with Section R106.1.

International Residential Code
Part IX Referenced Standards
Chapter 43

TPI	Truss Plate Institute 583 D'Onofrio Drive, Suite 200 Madison, WI 53719	
	Standard reference number	Referenced in code section number
TPI 1—2000	National Design Standard for Metal-plate-connected Wood Truss Construction	R502.11.1, R502.11.2, R802.10.2, R802.10.3, R802.11.1

Appendix C

ANSI/TPI 1-2002

National Design Standard for Metal Plate Connected Wood Truss Construction

Chapter 2 – Responsibilities in the Design Process Involving Metal Plate Connected Wood Trusses

2.3.19 *Truss Design Drawing*: The written, graphic and pictorial depiction of an individual truss.

2.3.22 *Truss Placement Diagram*: The illustration supplied by the truss manufacturer identifying the location assumed for each truss, which references each individually designated Truss design Drawing.

Chapter 6 – Materials and General Design Considerations

6.1 GENERAL

6.1.3 Truss Design Information

For each truss design drawing, the Truss Designer shall set forth, as a minimum, the following:

6.1.4.1 Slope or depth, span, and spacing;

6.1.4.2 Location of all joints;

6.1.4.3 Required bearing widths;

6.1.4.4 Design loads as applicable:

6.1.4.4.1 Top chord live load (including snow loads);

6.1.4.4.2 Top chord dead load;

6.1.4.4.3 Bottom chord live load;

6.1.4.4.4 Bottom chord dead load;

6.1.4.4.5 Concentrated loads and their points of application; and

6.1.4.4.6 Controlling wind and earthquake loads expressed in units of force per unit area or unit length;

6.1.4.5 Adjustments to lumber and metal connector plate design values for conditions of use;

6.1.4.6 Each reaction force and direction;

6.1.4.7 Metal connector plate type, size, thickness or gauge, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;

6.1.4.8 Lumber size, species or species group, and grade for each member;

6.1.4.9 Connection requirements for: (a) truss to truss girder; (b) truss ply to ply; and (c) field assembly of trusses;

6.1.4.10 Calculated deflection ratio or maximum deflection for live and total load;

6.1.4.11 Maximum axial compression forces in the truss members to enable the Building Designer to design the size, connections, and anchorage of the permanent continuous lateral bracing;

6.1.4.12 The approximate location for continuous lateral permanent bracing of truss members subject to buckling due to compression forces;

6.1.4.13 The quality control factor (C_q), per Section 6.4.11; and

6.1.4.14 Any specific joint inspection requirements

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