

Design Responsibilities for Residential Construction Projects in the State of Michigan

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Background:

WTCA has developed this *Technical Note* to clearly outline a component manufacturer's role and responsibility for residential construction in the context of the residential building code and professional engineering law applicable in the State of Michigan. This *Technical Note* is based on conversations with and questions from various Michigan local building officials and registered design professionals. The analysis is based on the current engineering laws of the state Michigan¹ and the 2003 Michigan Residential Code (MRC), which is based on the nationally recognized model building code the 2003 International Residential Code (IRC)².

Issue:

Questions frequently arise as to who is responsible for which portions of the design process in a residential construction project. Then people ask for guidance pertaining to their roles and responsibilities with respect to the building code and prevailing professional engineering laws.

Key Definitions:

BUILDING:

Any structure used or intended for supporting or sheltering any use or occupancy.

BUILDING STRUCTURAL SYSTEM:

The completed combination of structural elements, trusses, connections and systems, which serve to support the Building's self weight, the applicable live load(s), and all environmental loads.

CONSTRUCTION DOCUMENTS:

Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a permit and constructing a building. In the case of a building that uses metal plate connected wood trusses the Construction Documents will include the Truss Design Drawing and Truss Placement Diagram.

CONTRACTOR:

The Owner of the Building, or the individual or organization who contracts with the Owner, and is responsible for the construction of the Building in accordance with Construction Documents, complying with the statutes of the jurisdiction in which the project is to be constructed and all other Legal Requirements. The term "Contractor" shall include those subcontractors who have a direct contract with the Contractor to perform all or a portion of

¹ For the latest professional engineering law see the following website: www.michigan.gov/engineers

² R 408.30401 of the Michigan Administrative Code adopts by reference the 2003 International Building Code, as published by the International Code Council, Inc.



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the storage, handling, installation, and installation of the bracing (Temporary Installation Bracing, Permanent Individual Truss Member Restraint and Permanent Building Stability Bracing) of the trusses.

OWNER:

Any person, agent, firm or corporation having a legal or equitable interest in the property.³

PERMANENT BUILDING STABILITY BRACING:

Bracing that is to be considered part of the lateral force resisting system for the entire building. The Permanent Building Stability Bracing is bracing that transfers forces due to seismic, wind, collected structural member buckling or other external lateral forces into the shearwalls, foundation or other lateral force resisting systems that are provided for the building. The Permanent Building Stability Bracing also prevents rollover of the roof trusses. The design of the lateral force resisting system for the entire building is the responsibility of the Registered Design Professional or Owner when there is no contract with a Registered Design Professional for the design of the Building Structural System.

PERMANENT INDIVIDUAL TRUSS MEMBER RESTRAINT:

Restraint that is required to prevent local buckling of an individual truss chord or web member due to the compression forces in the individual truss member. The Permanent Individual Truss Member Restraint is the responsibility of the Truss Designer. In the absence of specific Permanent Individual Truss Member Restraint requirements, trusses shall be braced in accordance with the Building Component Safety Information (BCSI 1) *Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses*.

REGISTERED DESIGN PROFESSIONAL (RDP):

"Registered design professional" means an individual who is licensed under article 20, 1980 PA 299, MCL 339.2001.⁴ (see Appendix A)

STRUCTURAL BUILDING COMPONENTS:

Specialized structural building products designed, engineered and manufactured under controlled conditions for a specific application. They are incorporated into the overall Building Structural System by the Building Designer. Examples are wood or steel roof trusses, floor trusses, floor panels, wall panels, I-joists, or engineered beams and headers.

TEMPORARY INSTALLATION BRACING:

Bracing installed for the purpose of holding trusses true to line, dimension and plumb. In addition, temporary bracing holds trusses in a stable condition until permanent truss bracing and other permanent components that contribute to the overall rigidity of the roof or floor are in place. Temporary bracing may consist of ground bracing, continuous lateral sheets or ties, diagonals, crossbracing or similar items. In the absence of specific temporary bracing requirements, trusses shall be braced in accordance with the Building Component Safety Information (BCSI 1) *Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses*.

TRUSS DESIGN DRAWING (TDD):

A type of construction document that includes the written, graphic and pictorial depiction of each individual truss.⁵

TRUSS MANUFACTURER:

An individual or organization engaged in the manufacturing of trusses.⁶

³ As defined in the Section 202 of the 2003 Michigan Building Code (MBC)

⁴ As defined in the Section 202 of the 2003 MBC

⁵ Definitions taken from MBC 2003, ANSI/TPI 1-2002 Chapter 2, adopted by reference in MBC 2003 (See IBC 102.4, 2303.4, and Chapter 35), or the *Metal Plate Connected Wood Truss Handbook* published by WTCA

⁶ Definitions taken from MBC 2003, ANSI/TPI 1-2002 Chapter 2, adopted by reference in MBC 2003 (See IBC 102.4, 2303.4, and Chapter 35), or the *Metal Plate Connected Wood Truss Handbook* published by WTCA

Unique Definitions for Structures that require a RDP:

BUILDING DESIGNER:

The Owner of the Building contracts with a Registered Design Professional for the design of the Building Structural System and who is responsible for the Construction Documents.⁷

TRUSS DESIGN ENGINEER:

The individual or organization responsible for the design of trusses. Each individual Truss Design Drawing shall bear the seal and signature of the Truss Design Engineer.⁸

Unique Definitions for Structures that do not require a RDP:

BUILDING DESIGNER:

The Owner of the Building or the individual or organization that contracts with the Owner for the design of the Building Structural System and/or who produces the Construction Documents.⁹

TRUSS DESIGNER:

The individual or organization responsible for the design of trusses.¹⁰

Analysis:

Where a Registered Design Professional is Required

According to the Michigan Statutes-Act 299 of the 1980 Occupational Code (*see Appendix A*), a Registered Design Professional (also known as Licensed Design Professional or Licensed Engineer) is required on all projects except the following:

Article 20 339.2012 Persons exempted. ...

(b) A designer of a manufactured product, if the manufacturer of the product assumes responsibility for the quality of the product. ...

(d) A person not licensed under this article who is planning, designing, or directing the construction of a detached 1- and 2-family residence building not exceeding 3,500 square feet in calculated floor area. For purposes of this subdivision, detached 1- and 2-family residence building does not include an adult foster care home licensed under the adult foster care facility licensing act...

Building Designer

For residential construction projects in the State of Michigan, the “Building Designer” as used in this *Technical Note* is the Registered Design Professional who has responsibility for the overall Building design in accordance with the state’s statutes and regulations governing the professional registration and certification of Architects or Engineers. In residential construction, the Building Designer is often the building owner, builder, or contractor. According to Section R106.1 (*see Appendix B for complete text*) of the 2003 MRC, the Construction Documents shall be prepared as follows:

2003 MRC R106.1 Submittal documents. ...The construction documents shall be prepared by or under the direct supervision of a registered design professional when required by...the Michigan occupational code. ...

The Construction Documents should clearly define the scope of the project as follows:

2003 MRC R106.1.1 Information on construction documents. Construction documents shall be dimensioned and drawn upon suitable material... Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed...

⁷ Adapted from MRC 106.1

⁸ Adapted from MBC section 2303.4

⁹ Adapted from MBC 106.1

¹⁰ Adapted from MBC 2303.4

In preparing the Construction Documents, the Building Designer needs to provide the Truss Designer with the information necessary to properly design the Structural Building Components for the Building. According to ANSI/TPI 1-2002 (TPI 1) Chapter 2 (*see Appendix C for complete text*), which is adopted by reference in MRC Sections R102.4, R502.11.1, R802.10.2, and Part IX, Referenced Standards - Chapter 43 provisions (*see Appendix B*), the following information should be provided:

- ANSI/TPI 1-2002 Section 2.5.2** The Building Designer...shall provide the following:
- 2.5.2.1 All Structural Element and Truss orientations and locations;
 - 2.5.2.2 Information to fully determine all Truss profiles;
 - 2.5.2.3 All Structural Element and Truss bearing conditions;
 - 2.5.2.4 The location, direction, and magnitude of all dead and live loads applicable to each Structural Element and Truss...
 - 2.5.2.5 All Structural Element and Truss anchorage designs required to resist uplift, gravity, and lateral loads;
 - 2.5.2.6 Allowable vertical and horizontal deflection criteria and any specific criteria...
 - 2.5.2.7 Proper transfer of design loads affecting the Structural Elements and Trusses;
 - 2.5.2.8 Adequate connections between Trusses and between Structural Elements...but not Truss to Truss girder connections...
 - 2.5.2.9 Permanent bracing design for the Building...and permanent bracing for all Structural Elements and Trusses...
- 2.5.3 The Building Designer shall be responsible for the adequacy of the design of the Building Structural System [and]...shall evaluate the effect of the Trusses and the Structural Elements supplied, on the Building Structural System.

The Truss Manufacturer and Truss Designer must rely on the Building Designer to take the information provided by the Truss Design Drawing, the *Building Component Safety Information (BCSI)*, and the Building Designer's analysis of the flow of loads through the Building to design a Permanent Building Stability Bracing system that takes the resisted Truss member buckling loads (if any) and tie these loads off to the Building's load path system as follows (*see Appendix C*):

ANSI/TPI 1-2002 Section 2.6.6 ... The approximate location for, or the maximum spacing between, permanent lateral bracing of Truss members will be indicated on the Truss Design and it shall be the responsibility of the Owner to engage the Building Designer or others to specify how the permanent lateral bracing is to be anchored or restrained to prevent lateral movement of all Truss members together. ...

The Building Designer is the professional who is most intimately familiar with the flow of loads through the entire Building and is the one who can use this knowledge to ensure bracing load transfer and overall Building performance success. As mentioned previously, in most residential construction, there is no Building Designer so the responsibilities fall on the Owner by default. In most cases, the Owner delegates this responsibility to the Contractor.

Building Official

The Building Official is the person who examines the Construction Documents for compliance with the MRC, the specifics of which are listed in Sections R104.2 and R106.3 (*see Appendix B*).

2003 MRC R104.2 Application and permits. The building official shall receive applications, review construction documents and issue permits for the erection and alteration of buildings and structures, inspect the premises for which such permits have been issued and enforce compliance with the provisions of this code.

2003 MRC R106.3 Examination of documents. The building official shall examine or cause to be examined construction documents for code compliance.

On typical residential construction projects, plans for fire alarm systems, manufactured trusses and sprinkler systems may not be completed at the time that the Construction Documents are submitted for

approval. These become known as "phased approvals" and the Building Official is responsible for reviewing these for general code compliance. This process is defined in MRC Section R106.3.3 (*see Appendix B*).

2003 MRC R106.3.3 Phased approval. The building official is authorized to issue a permit for the construction of foundations or any other part of a building or structure before the construction documents for the whole building or structure have been submitted...

There are no requirements of either the MRC or Michigan law which would provide that for those products handled on a phased approval basis, the design responsibilities of the parties involved would in any way change.

Truss Designer

The Building Designer (Owner or Contractor) typically delegates the design of all the individual trusses to the Truss Designer. The Truss Designer's responsibility is to properly design the trusses according to the information provided in the Construction Documents. The Truss Designer is responsible for the final designed truss detailed in a Truss Design Drawing. Section R502.11.4 and R802.10.1 of the 2003 MRC (*see Appendix B*), outlines the exact information that needs to be on a Truss Design Drawing:

2003 MRC R502.11.4/ R802.10.1 Truss design drawings. These shall include, at a minimum:

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 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 girder;
 - 15.2 Truss ply to ply;
 - 15.3 Field splices;
16. Calculated deflection ratio or maximum description for live and total load;
17. Maximum axial compression forces in the truss members to design the size, connections and anchorage of the permanent continuous lateral bracing. Forces shall be shown on the truss construction documents or on supplemental documents; and
18. Required permanent truss member bracing location. (Note, this is also known as the "permanent individual truss member bracing.")

Note: The stability of each individual truss and how that is achieved is the responsibility of the Truss Designer, as the Truss Designer is most intimately familiar with the configuration and flow of loads through each individual Truss and is the one who can use this knowledge to ensure proper bracing locations and truss stability. To aid in the design of the Permanent Bracing of the roof or floor truss system, the Truss Design Drawing includes items 17 and 18 above.

As defined in Michigan law, the Building Designer is responsible for the overall design and flow of loads through the building. This includes what is called the "permanent building stability bracing" for the trusses. This bracing resists forces out of the plane of the individual truss and is generally part of the

seismic or wind or other external lateral force resisting system. To aid in the design of the “permanent building stability bracing” the TDD includes items #17 and #18 so that the RDP has the information needed to generate the appropriate engineering calculations.

In the 2006 IBC, clarification was made to help with the implementation of item 18 (*see Appendix D*) as follows:

2006 IBC 2303.4.1 Truss design drawings. These shall include, at a minimum: ...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.

2006 IBC 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.

The proposed 2009 International Residential Code language provides the following enhancement to the 2006 IBC language listed above:

Proposed 2009 IRC R502.10.4.2 / R802.10.4.3 Bracing. ...In the absence of specific bracing requirements, trusses shall be braced in accordance with the Building Component Safety Information (BCSI) *Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses*.

Basically, the Truss Designer needs to provide everything that is pertinent to the design of the individual component. The Building Designer, Contractor, or Owner needs to review the Truss Design Drawing submittals to verify that all the Structural Building Components and their placement comply with the Construction Documents.

In other words, the Truss Designer has undertaken truss design work based on the specific information provided in the Construction Documents. Since the design work that is contracted for is specific to the trusses, the scope of responsibility for the Truss Designer is limited to the Truss Design Drawings created from the information on the Construction Documents. In compliance with Michigan engineering law (*see Appendix A*), engineers are responsible for clearly noting the extent of their responsibility in an engineering project.

Article 20 339.2008 Sealing documents requiring governmental agency approval or record; projects involving overlapping of architecture and engineering professions; sealing documents not prepared by licensee prohibited. ... (3) A licensee shall not seal a plan, drawing, map, plat, report, specification, or other document not prepared by the licensee or under supervision of the licensee as the person in responsible charge.

Even though in most residential projects, the only Registered Design Professional is the Truss Designer, his or her engineering scope of work is limited to what is shown on the Truss Design Drawing. If permanent truss member restraint is required for the truss to withstand design loads and properly do its job, those axial loads will be found on the Truss Design Drawings per MRC R502.11.4(17) and R802.10.1(17) above as well as the truss members and brace locations will be shown per MRC R502.11.4(18) and R802.10.1(18).

Truss Manufacturer

The Truss Manufacturer's primary responsibility is to manufacture the trusses in conformance with TPI 1. TPI 1 provides manufacturing quality requirements to ensure the trusses perform as anticipated by the approved Truss Design Drawings. Many Truss Manufacturers also contract with an approved third party inspection agency to perform unannounced, periodic audits of the manufacturing facility to facilitate compliance with the building code framing inspection requirements as follows (*see Appendix B*):

2003 MRC R104.4 Inspections. The building official is authorized to make all of the required inspections, or the building official shall have the authority to accept reports of inspection by approved agencies or individuals. Reports of such inspections shall be in writing and be certified by a responsible officer of such approved agency or by the responsible individual. ...

2003 MRC R109.1 Types of inspections. For onsite construction, from time to time the building official, upon notification from the permit holder or his agent, shall make or cause to be made any necessary inspections and shall either approve that portion of the construction as completed or shall notify the permit holder or his or her agent wherein the same fails to comply with this code.

2003 MRC R109.1.4 Frame and masonry inspection. Inspection of framing and masonry construction shall be made after the roof, masonry, all framing, firestopping, draftstopping and bracing are in place and after the plumbing, mechanical and electrical rough inspections are approved.

2003 MRC R109.2 Inspection agencies. The building official is authorized to accept reports of approved inspection agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

For more information on a specific truss industry quality control program please visit:
www.sbcindustry.com/wtcaqc.php.

Many Truss Manufacturers include important safety information, such as BCSI 1, (www.sbcindustry.com/bcsi.php) in their jobsite packages as a guide to aid the Contractor in the proper handling, installing, and bracing of metal plate connected wood trusses.

Contractor

The contractor is responsible for the construction means, methods, techniques, sequences, procedures, programs and safety in connection with the handling, storing, installation and bracing of the trusses as defined in TPI 1 (*see Appendix C for complete text*) and adopted by reference in the IRC.

ANSI/TPI 1-2002 Section 2.6.2 ... The Contractor...shall determine the requirements of, and provide all materials for construction in accordance with the Structural Design Documents. These requirements and materials for construction shall include all necessary items for safe construction, including design and installation of, adequate temporary bracing during construction for the Building Structural System.

Further, according to TPI 1, the Contractor is responsible for the inspection of trusses to ensure that they fit for the intended application as follows:

ANSI/TPI 1-2002 Section 2.6.3 The Contractor shall be responsible...to review or inspect Trusses delivered or to review and inspect Trusses after erection for any problems, including dislodged/missing connectors, cracked, dislodged or broken members, or any other damage that may impair the structural integrity of the Truss. In the event that damage to the Truss is discovered that would likely impair the structural integrity of the Truss, the Contractor shall be responsible to ensure that the Truss not be erected and 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 such field repairs have been properly completed. In the event of such damage and unless otherwise specified by Contract, the Contractor shall contact the appropriate design professional to determine an adequate field repair and the Contractor shall be responsible to construct any such field repair.

According to TPI 1, the Truss Manufacturer and Truss Designer must rely on the Contractor to install the trusses safely and professionally as follows:

ANSI/TPI 1-2002 Section 2.6.5 The Truss Manufacturer and Truss Designer are not responsible for, nor do the Truss Manufacturer and Truss Designer have control of, construction means, methods, techniques, sequences, procedures, programs and safety in connection with the handling, storing, installation and bracing of the Trusses. These topics are covered in the BCSI 1-03: *Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses*. The Truss Manufacturer and Truss Designer are also not responsible for the failure to carry out the construction work related to the Trusses and the Structural Elements in accordance with the handling and installation information and/or the Structural Design Documents.

According to TPI 1, the Truss Manufacturer and Truss Designer must rely on the Contractor to take the information provided by the Truss Design Drawing and then install all the Permanent Individual Truss Member Restraint necessary to keep truss members from buckling out of plane and to integrate this with the building's load path system as specified by the Building Designer as follows:

ANSI/TPI 1-2002 Section 2.6.6 The Truss Manufacturer and Truss Designer shall not be responsible for the design, materials, or installation of permanent bracing for the Building, including bracing for all or any of the Trusses and Structural Elements. The approximate location for, or the maximum spacing between, permanent lateral bracing of Truss members will be indicated on the Truss Design Drawing and it shall be the responsibility of the Owner to engage the Building Designer or others to specify how the permanent lateral bracing is to be anchored or restrained to prevent lateral movement of all Truss members together.

The Contractor is the construction professional that is most intimately familiar with the plans and specifications and how all the materials of construction must fit together to transfer all the loads through the entire Building to the foundation. This expertise is critical to overall Building performance success.

The final step in a construction project involving metal plate connected wood trusses is to have an installation inspection performed to verify that the application of all trusses are in accordance with the approved Construction Documents and the prevailing building code. This is typically performed by the Local Building Official per MRC Section R109.1 (*see Appendix B*).

Conclusion:

In residential construction there is often no Registered Design Professional involved in the construction project. Often the Owner, Building Designer or Contractor assumes that the Truss Designer/Truss Manufacturer performs, at the very least, a portion of that role. In contrast, the structural building component industry operates under the expectation that the Owner is the Building Designer, who often delegates this responsibility to the Contractor.

The Structural Building Component industry, including those involved in the design and manufacture of metal plate connected wood trusses, operates under the expectation that the Building Designer and the Contractor are professionals who are competent to undertake the work they have agreed to perform on any given residential project, in compliance with all the legal requirements of engineering law, the code, and the contracts that are entered into. If the foregoing defined responsibilities are followed closely, it has been the experience of our industry that all operations needed to implement the residential construction project run smoothly.

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.

Michigan Statutes – Act 299 of the 1980 Occupational Code Article 20

339.2001 Definitions.

Sec. 2001. As used in this article:

- (a) "Architect" means a person who, by reason of knowledge of mathematics, the physical sciences, and the principles of architectural design, acquired by professional education and practical experience, is qualified to engage in the practice of architecture.
- (b) "Firm" means a sole proprietorship, partnership, corporation, or limited liability company through which a person licensed under this article offers or provides a service to the public.
- (c) "Person" means a natural person notwithstanding section 105(5).
- (d) "Person in responsible charge" means a person licensed under this article who determines technical questions of design and policy; advises the client; supervises and is in responsible charge of the work of subordinates; is the person whose professional skill and judgment are embodied in the plans, designs, plats, surveys, and advice involved in the services; and who supervises the review of material and completed phases of construction.
- (e) "Practice of architecture" means professional services, such as consultation, investigation, evaluation, planning, design, or review of material and completed phases of work in construction, alteration, or repair in connection with a public or private structure, building, equipment, works, or project if the professional service requires the application of a principle of architecture or architectural design.
- (f) "Practice of professional surveying" means providing professional services such as consultation, investigation, testimony, evaluation, planning, mapping, assembling, and interpreting reliable scientific measurements and information relative to the location, size, shape, or physical features of the earth, improvements on the earth, the space above the earth, or any part of the earth, and the utilization and development of these facts and interpretations into an orderly survey map, plan, report, description, or project. The practice of professional surveying includes all of the following:
 - (i) Land surveying that is the surveying of an area for its correct determination or description for its conveyance, or for the establishment or reestablishment of a land boundary and the designing or design coordination of the plotting of land and the subdivision of land.
 - (ii) Geodetic surveying that includes surveying for determination of the size and shape of the earth both horizontally and vertically and the precise positioning of points on the earth utilizing angular and linear measurements through spatially oriented spherical geometry.
 - (iii) Utilizing and managing land information systems through establishment of datums and local coordinate systems and points of reference.
 - (iv) Engineering and architectural surveying for design and construction layout of infrastructure.
 - (v) Cartographic surveying for making maps, including topographic and hydrographic mapping.

(g) "Practice of professional engineering" means professional services, such as consultation, investigation, evaluation, planning, design, or review of material and completed phases of work in construction, alteration, or repair in connection with a public or private utility, structure, building, machine, equipment, process, work, or project, if the professional service requires the application of engineering principles or data.

(h) "Principal" means a sole proprietor, partner, the president, vice-president, secretary, treasurer, or director of a corporation, or a member or manager of a limited liability company.

(i) "Professional engineer" means a person who, by reason of knowledge of mathematics, the physical sciences, and the principles of engineering, acquired by professional education and practical experience, is qualified to engage in the practice of professional engineering.

(j) "Professional surveyor" means a person who, by reason of knowledge of law, mathematics, physical sciences, and techniques of measuring acquired by professional education and practical experience, is qualified to engage in the practice of professional surveying.

(k) "Services" means professional service offered or provided by an architect in the practice of architecture, a professional engineer in the practice of professional engineering, or a professional surveyor in the practice of professional surveying.

339.2008 Sealing documents requiring governmental agency approval or record; projects involving overlapping of architecture and engineering professions; sealing documents not prepared by licensee prohibited.

Sec. 2008. (1) A plan, plat, drawing, map, and the title sheet of specifications, an addendum, bulletin, or report or, if a bound copy is submitted, the index sheets of a plan, specification, or report, if prepared by a licensee and required to be submitted to a governmental agency for approval or record, shall carry the embossed or printed seal of the person in responsible charge.

(2) If the overlapping of the professions of architecture and engineering is involved in a project, a licensed architect or licensed professional engineer who seals the plans, drawings, specifications, and reports may perform services in the field of the other practice if the services are incidental to the architectural or engineering project as a whole.

(3) A licensee shall not seal a plan, drawing, map, plat, report, specification, or other document not prepared by the licensee or under supervision of the licensee as the person in responsible charge.

339.2012 Persons exempted.

Sec. 2012. (1) The following persons are exempt from the requirements of this article:

(a) A professional engineer employed by a railroad or other interstate corporation, whose employment and practice is confined to the property of the corporation.

(b) A designer of a manufactured product, if the manufacturer of the product assumes responsibility for the quality of the product.

(c) An owner doing architectural, engineering, or surveying work upon or in connection with the construction of a building on the owner's property for the owner's own use to which employees and the public are not generally to have access.

(d) A person not licensed under this article who is planning, designing, or directing the construction of a detached 1- and 2-family residence building not exceeding 3,500 square feet in calculated floor area. For purposes of this subdivision, detached 1- and 2-family residence building does not include an adult foster care home licensed under the adult foster care facility licensing act, 1979 PA 218, MCL 400.701 to 400.737.

(e) A person who is licensed to engage in the practice of architecture, professional engineering, or professional surveying in another state while temporarily in this state to present a proposal for services.

(2) As used in this section:

(a) "Calculated floor area" means that portion of the total gross area measured to the outside surfaces of exterior walls intended to be habitable space.

(b) "Habitable space" means space in a building used for living, sleeping, eating, or cooking. Habitable space does not include a heater or utility room, a crawl space, a basement, an attic, a garage, an open porch, a balcony, a terrace, a court, a deck, a bathroom, a toilet room, a closet, a hallway, a storage space, and other similar spaces not used for living, sleeping, eating, or cooking.

Appendix B

Michigan Department of Labor and Economic Growth
Bureau of Construction Codes & Fire Safety
2003 Michigan Residential Code (MRC)
Part I: ADMINISTRATION

Chapter 1 ADMINISTRATION SECTION R102: APPLICABILITY

R102.4 Referenced codes and standards. The codes and standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference. Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

Exception: Where enforcement of a code provision would violate the conditions of the listing of the equipment or appliance, the conditions of the listing and manufacturer's instructions shall apply.

Chapter 1 ADMINISTRATION SECTION R104: DUTIES AND POWERS OF THE BUILDING OFFICIAL

R104.2 Applications and permits. The building official shall receive applications, review construction documents and issue permits for the erection and alteration of buildings and structures, inspect the premises for which such permits have been issued and enforce compliance with the provisions of this code.

R104.4 Inspections. The building official is authorized to make all of the required inspections, or the building official shall have the authority to accept reports of inspection by approved agencies or individuals. Reports of such inspections shall be in writing and be certified by a responsible officer of such approved agency or by the responsible individual. The building official is authorized to engage such expert opinion as deemed necessary to report upon unusual technical issues that arise, subject to the approval of the appointing authority.

Chapter 1 ADMINISTRATION SECTION R106: CONSTRUCTION DOCUMENTS

R106.1 Submittal documents.

Construction documents, special inspection and structural program and other data shall be submitted in 1 or more sets with each application for a permit. The construction documents shall be prepared by or under the direct supervision of a registered design professional when required by article 20 of 1980 PA 299, MCL 339.101 et seq., and known as the Michigan occupational code. Where special conditions exist, the building official is authorized to require additional construction documents to be prepared by a registered design professional.

R106.1.1 Information on construction documents. Construction documents shall be drawn upon suitable material. Electronic media documents are permitted to be submitted when approved by the building official. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in detail that it will conform to the provisions of this code and relevant laws, ordinances, rules and regulations, as determined by the building official.

R106.3 Examination of documents. The building official shall examine or cause to be examined construction documents for code compliance.

R106.3.1 Approval of construction documents.

When the building official issues a permit, the construction documents shall be approved in writing or by stamp. One set of construction documents so reviewed shall be retained by the building official. The other set shall be returned to the applicant, shall be kept at the site of work and shall be open to inspection by the building official or his or her authorized representative.

R106.3.2 Previous approvals. This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

R106.3.3 Phased approval. The building official is authorized to issue a permit for the construction of foundations or any other part of a building or structure before the construction documents for the whole building or structure have been submitted, provided that adequate information and detailed statements have been filed complying with pertinent requirements of this code. The holder of such permit for the foundation or other parts of a building or structure shall proceed at the holder's own risk with the building operation and without assurance that a permit for the entire structure will be granted.

Chapter 1 ADMINISTRATION

SECTION R109: INSPECTIONS

R109.1 Types of inspections. For onsite construction, from time to time the building official, upon notification from the permit holder or his agent, shall make or cause to be made any necessary inspections and shall either approve that portion of the construction as completed or shall notify the permit holder or his or her agent wherein the same fails to comply with this code.

R109.1.1 Foundation inspection. ...

R109.1.2 Plumbing, mechanical, gas and electrical systems inspection. ...

R109.1.3 Floodplain inspections. ...

R109.1.4 Frame and masonry inspection. Inspection of framing and masonry construction shall be made after the roof, masonry, all framing, firestopping, draftstopping and bracing are in place and after the plumbing, mechanical and electrical rough inspections are approved.

R109.1.5 Other inspections. In addition to the called inspections above, the building official may make or require any other inspections to ascertain compliance with this code and other laws enforced by the building official.

R109.1.6 Final inspection. ...

R109.2 Inspection agencies. The building official is authorized to accept reports of approved agencies, provided such agencies satisfy the requirements as to qualifications and reliability.

Michigan Department of Labor and Economic Growth
Bureau of Construction Codes & Fire Safety
2003 Michigan Residential Code (MRC)
Part III: BUILDING PLANNING AND CONSTRUCTION

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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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. The truss design data sheet, figure R802.10.1, may be provided to the building official at the time of permit application, as an alternative to design drawings as permitted in section R106.1.4. Truss design drawings shall include, at a minimum, the information specified below. Truss design drawings shall be provided with the shipment of trusses delivered to the jobsite.

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.

Michigan Department of Labor and Economic Growth
 Bureau of Construction Codes & Fire Safety
 2003 Michigan Residential Code (MRC)
 Part IX: REFERENCED STANDARDS
 Chapter 43 REFERENCED STANDARDS



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

Standard reference number	Title	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 – Standard Responsibilities in the Design Process Involving Metal Plate Connected Wood Trusses

2.5 BUILDING STRUCTURAL SYSTEM DESIGN DOCUMENTS

- 2.5.1 The Building Designer, through the Structural Design Documents shall provide that the Structural Elements and Trusses shall not be subjected to adverse influences including, but not limited to moisture, temperature, and corrosive chemicals and gases. This provision shall specifically include notice for the Truss Designer of environments expected to result in wood moisture content exceeding 19 percent, and temperatures and/or corrosion potential that are unusually high relative to typical wood buildings.
- 2.5.2 The Building Designer, through the Structural Design Documents shall provide information sufficiently accurate and reliable to be used for facilitating the supply of the Structural Elements and for developing the design of the Trusses for the Building, and shall provide the following:
- 2.5.2.1 All Structural Element and Truss orientations and locations;
- 2.5.2.2 Information to fully determine all Truss profiles;
- 2.5.2.3 All Structural Element and Truss bearing conditions;
- 2.5.2.4 The location, direction, and magnitude of all dead and live loads applicable to each Structural Element and Truss including, but not limited to, loads attributable to: roof, floor, partition including any directions other than given in ANSI/TPI 1-2002, mechanical, fire sprinkler, attic, storage, rain loads and ponding, design wind speed and exposure category, snow, snow drift, unbalanced snow load, and seismic forces;
- 2.5.2.5 All Structural Element and Truss anchorage designs required to resist uplift, gravity, and lateral loads;
- 2.5.2.6 Allowable vertical and horizontal deflection criteria and any specific criteria per ANSI/TPI 1-2002;
- 2.5.2.7 Proper transfer of design loads affecting the Structural Elements and Trusses;
- 2.5.2.8 Adequate connections between Trusses and between Structural Elements, including Truss to Structural Element connections, but not Truss to Truss girder connections except such connections that are excluded from the scope of the Truss Designer's responsibilities.
- 2.5.2.9 Permanent bracing design for the Building, including bracing to resist wind, seismic, or other lateral forces, and permanent bracing for all Structural Elements and Trusses. The permanent bracing design shall incorporate the continuous lateral chord and web member bracing that is designated on the individual Truss Design Drawings into the overall bracing for the entire Building Structural System.
- 2.5.3 The Building Designer shall be responsible for the adequacy of the design of the Building Structural System or the adequacy of the Structural Design Documents. The Building Designer shall evaluate the effect of the Trusses and the Structural Elements supplied, on the Building Structural System.

2.6 CONSTRUCTION RELATED ITEMS

- 2.6.1 Truss Submittals and Structural Element Submittals, and any supplemental information provided by the Truss Manufacturer, shall be provided to the Contractor or the individual or organization responsible for the installation of the Trusses and Structural Elements.
- 2.6.2 The Building Designer shall be responsible for determining appropriate field storage, handling, and installation measures for the Trusses and Structural Elements. The Contractor, unless otherwise specifically assigned by Contract, shall determine the requirements of, and provide all materials for construction in accordance with the Structural Design Documents. These requirements and materials for construction shall include all necessary items for safe construction, including design and installation of, adequate temporary bracing during construction for the Building Structural System.
- 2.6.3 The Contractor shall be responsible, unless otherwise assigned by Contract, to review or inspect Trusses delivered or to review and inspect Trusses after erection for any problems, including dislodged/missing connectors, cracked, dislodged or broken members, or any other damage that may impair the structural integrity of the Truss. In the event that damage to the Truss is discovered that would likely impair the structural integrity of the Truss, the Contractor shall be responsible to ensure that the Truss not be erected and 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 such field repairs have been properly completed. In the event of such damage and unless otherwise specified by Contract, the Contractor shall contact the appropriate design professional to determine an adequate field repair and the Contractor shall be responsible to construct any such field repair.
- 2.6.4 All Truss repairs shall be approved in writing by a Building Designer or a Truss Designer or other qualified person prior to the performance of the repair.
- 2.6.5 The Truss Manufacturer and Truss Designer are not responsible for, nor do the Truss Manufacturer and Truss Designer have control of, construction means, methods, techniques, sequences, procedures, programs and safety in connection with the handling, storing, installation and bracing of the Trusses. These topics are covered in the BCSI 1-03: *Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses*. The Truss Manufacturer and Truss Designer are also not responsible for the failure to carry out the construction work related to the Trusses and the Structural Elements in accordance with the handling and installation information and/or the Structural Design Documents.
- 2.6.6 The Truss Manufacturer and Truss Designer shall not be responsible for the design, materials, or installation of permanent bracing for the Building, including bracing for all or any of the Trusses and Structural Elements. The approximate location for, or the maximum spacing between, permanent lateral bracing of Truss members will be indicated on the Truss Design and it shall be the responsibility of the Owner to engage the Building Designer or others to specify how the permanent lateral bracing is to be anchored or restrained to prevent lateral movement of all Truss members together. Consideration shall be given to one of the following methods for providing this restraint or anchorage: (a) permanent diagonal bracing in the plane of the Truss members; or (b) other means when demonstrated by the Building Designer or other qualified person to provide equivalent lateral resistance.

Appendix D

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.



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