



TRUSS INDUSTRY STANDARD OF CARE ISSUES

by Scott D. Coffman, PE., SECB & Jim Vogt, PE.

PART 4

Truss industry standard of care items are contained throughout *ANSI/TPI 1*,¹ *The National Standard for Metal Plate Connected Wood Truss Construction*. The focus of this article is *ANSI/TPI 1* Chapter 2, Section 2.3.5.1 and companion Section 2.4.5.1, which require a truss designer to prepare truss design drawings (TDD) based on design criteria and requirements set forth in the construction documents. The truss industry should expect to get this information from the building designer (BD), which may include the building owner, contractor or a registered design professional (RDP). Particularly when there is an RDP for the building, the design community expects the truss industry to design components that conform to the truss framing plan and specified design parameters within the construction documents, unless instructed otherwise in writing.

No matter who the BD is, it is important that the design parameters used by the component manufacturer (CM) in the design, manufacture and placement of the components for the building are fully defined in writing. The ideal situation is that this information is reviewed and approved by the BD. In circumstances where this is not possible, the CM has, at the very least, defined all the conditions and/or set forth all the assumptions they used in the design in writing and the opportunity to make changes prior to manufacturing the trusses has been given.

Contractors and owners often request a truss manufacturer to review construction documents for a project and “optimize” the truss package. Common practices employed by a truss designer may include modifying truss spans, framing orientation, bearing locations, the number of truss plies, and lumber size. Although this may reduce the overall truss package cost, it can result in load paths not intended by the BD, or create other unintended consequences given that the truss design is focused on the individual component. Some common optimization examples, where the BD review and approval process was not as thorough as required by *ANSI/TPI 1*, that have contributed to field issues and related unintended consequences include:

1. A hip roof girder truss and several step-down trusses were eliminated by using an interior wall to support end jack trusses. Unfortunately, the wall framing members were not designed to support truss end jack reactions, lateral loads or uplift forces, and no foundation was installed below the interior wall.
2. A hip roof girder truss was relocated to create uniform end jack framing for the entire project. A header above an opening, rather than the original column within the wall framing, supported the new girder truss location. The header, jack studs and foundation were not designed to support the concentrated load from the hip girder reaction.
3. A girder truss was changed from the specified 3-ply to a 2-ply because the truss designer could get a 2-ply to “work.” The BD specified a 3-ply girder to minimize the relative deflection between the hip girder truss and adjacent step-down truss, to accommodate the bearing width of the specified wall size, and to obtain the uplift capacity of the specified tie-down connector.

Editor’s Note:

The purpose of this article series is to identify truss-related structural issues sometimes missed due to the day-in and day-out demands of truss design/production and the fragmented building design review and approval process. This series will explore issues in the building market that are not normally focused upon, and provide recommended best-practice guidance. As with the previous articles (November and December 2014, and March 2015), the objective is to raise awareness of these issues and, ultimately, improve overall quality of truss roof and floor system construction.

¹ References to *ANSI/TPI 1-2007*



4. Stubbed truss components were shown in the construction documents by the BD supported by an interior wall. The truss designer replaced the stubbed truss members with additional main body truss components and a girder truss supporting one end. The wall framing at the girder bearing locations was not designed to support the girder truss reaction points, a continuous load path from the girder truss to foundation was absent, and a thickened footing was not present for the girder truss reaction.

5. A steel beam and the supported wood wall framing were replaced with a 2-ply wall girder truss. Lateral loads about the girder truss minor axis (i.e., 3" dimension) were not investigated, exterior wall sheathing was insufficiently supported and fastened, minimum wall insulation thickness was not satisfied, and girder truss elements were cut for plumbing and electrical.

6. A BD framed a 60' wide building with two mono roof trusses having a top chord overhang to the ridge. A double wall provided interior truss bearing. The BD intended to have gypsum installed to the truss end vertical to obtain a fire rated assembly. The truss supplier designed one 60' truss with no interior support locations. The truss placed additional load to exterior walls and prevented gypsum installation.

7. A truss designer eliminated foundation piers by replacing a solid sawn wood floor system with floor trusses and engineered wood beams spanning between piers. The foundation footing size was not increased for the additional floor area supported, which contributed to differential settlement.

8. A BD used engineered beams within wood wall framing around the building perimeter to support floor trusses. A truss designer eliminated the beams in the "tall" building and extended floor trusses across the wall. The modification conflicted with the intent of the BD to minimize the effects of wood shrinkage and provide a solid beam member for exterior framing members.

9. A truss designer proposed to eliminate all interior bearing support with clear span trusses for a multi-level building. The increased floor truss depth resulted in an overall building height that exceeded the story height that the building code allowed for the type of construction and building occupancy.

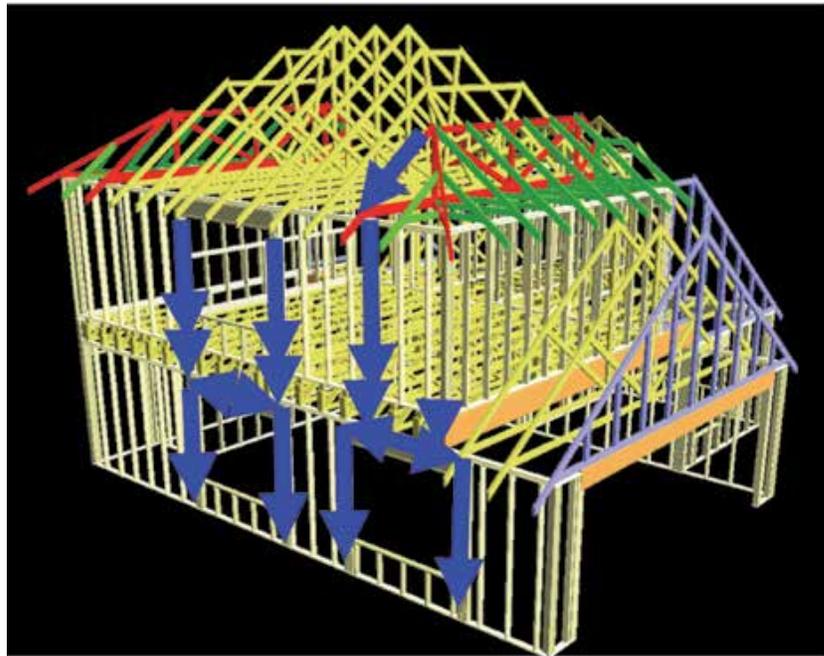


Figure 1. Revising truss placement without receiving written approval from the Building Designer can adversely affect the intended flow of loads through the building.

These "real-life" truss package optimization examples demonstrate how a limited viewpoint of the overall project may result in code violations, building serviceability and/or structural integrity issues and potential unintended life/safety problems. Many of these issues may not be readily apparent and may manifest themselves after the building has been placed into service.

ANSI/TPI 1 states:

The Contractor, after reviewing and/or approving the Truss Submittal Package, shall forward the Truss Submittal Package for review by the Building Designer [or the Registered Design Professional for the Building] and the Contractor shall not proceed with the truss installation until the Truss Submittal Package has been reviewed by the Building Designer [or Registered Design Professional for the Building].²

The CM generally provides a significant number of 8½" x 11" sheets of paper, and the law expects the contractor or the contractor's personnel to review and approve the information these documents contain. To the extent the CM can help the contractor with implementation, this provides the opportunity to develop a strong working relationship. Any initiative that the truss manufacturer and truss designer can take with respect to contacting the BD and obtaining written approval for modifications prior to deviating from the construction documents is a huge benefit in preventing unintended consequences like those presented above. Additionally, the intended owner of the trusses or contractor must alert the

Continued on page 20

² See Part 1 of this series in the November 2014 issue of *SBC Magazine*: sbcmag.info/article/2014/truss-industry-standard-care-issues-part-1.

Truss Industry Standard of Care Issues

Continued from page 19

truss manufacturer and truss designer to be aware of and consider that the construction documents he/she is working from have already been approved and permits issued by local code enforcement and foundation work commenced. Often in this case, any optimization must be limited to the truss itself, unless the BD, truss owner and/or the contractor has solicited assistance during the preliminary phase of building design.

Many construction documents contain detailed specifications for the implementation of wood trusses. It is the responsibility of the owner or BD to provide detailed instructions and considerations in the construction documents per *ANSI/TPI 1* as follows:

2.3.1.2 Registered Design Professional Designation.

The Owner shall engage and designate on the Building Permit application the Registered Design Professional for the Building, if the Building Designer is required to be a Registered Design Professional.

2.3.2.1 Construction Documents.

The Construction Documents shall be prepared by the 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.

2.3.2.4 Required Information in the Construction Documents.

The 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:

2.3.2.3 Review Submittal Packages.

The 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.

ANSI/TPI 1 helps the truss manufacturer and truss designer with the following counsel:

2.3.6.1 Truss Design Criteria and Requirements.

The Truss Manufacturer shall obtain the Truss design criteria and requirements from the Construction Documents.

2.3.5.1 Preparation of Truss Design Drawings.

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 Building Designer as supplied to the Truss Designer by the Contractor through the Truss Manufacturer.

2.3.6.3 Alternate Truss Designs.

If an alternative or partial set of Truss design(s) is proposed by

either the Truss Manufacturer or the Truss Designer, such alternative set of design(s) shall be sent to and reviewed by the Building Designer for the Building prior to manufacturing. Where the Legal Requirements mandate a Registered Design Professional for buildings, these alternative set of design(s) do not require the seal of the Truss Designer until accepted by the Building Designer, whereupon these alternative Truss Design Drawings shall be sealed by the Truss Designer.

2.3.6.6 Special Application Conditions.

The Truss Manufacturer shall be allowed to provide detail drawings to the Contractor to document special application conditions.

2.3.6.7 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; Building Designer and/or Contractor for review and/or approval per Section 2.3.4.2.

2.3.6.8 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 Building Designer and/or Contractor.

There are times, however, where business relationships and contractual obligations do not allow for robust communication. Truss manufacturers and truss designers must consider this and be very clear about communicating the decisions and assumptions that they have made in the design of the trusses and related components. Poor communication of changes due to the fragmented nature of contracts and who owns the trusses, and the fact that a review and approval process did not take place, is the leading cause of unintended consequences in the field.

Where it is in the truss industry's control to do so, it must begin the process of ensuring truss design and installation information is conveyed to the contractor and building designer in a clear and concise manner. Obviously, the best way to do this is to eliminate the fragmented silo process encouraged by deferred submittals and contracts. However, this is a paradigm shift that will not change in the short-term, given current traditions and challenges related to exempt structures. To the extent the CM can help the contractor or owner with implementation, this provides the opportunity to develop a strong working relationship and support services that can set any CM apart. The goal is that this "extra" service creates a loyal customer who finds that, without this service, the components purchased have far less value. **SBC**

Scott Coffman has over 30 years in the wood truss and component industry and is a past committee member of TPI 1. He is currently employed by Construction Science and Engineering as a forensic engineer specializing in construction defects.

Jim Vogt is SBCA's Director of Technical Services and has over 25 years of experience in the industry.