

# Bracing Issues

By Kirk Grundahl

The following is a broad overview of truss bracing issues, and how both the structural engineering community and the truss industry look at bracing design and the implementation of that design. Our industry always welcomes a healthy exchange of ideas, where the viewpoints of all structural engineers and suppliers of engineered building products can be more thoroughly understood. This will help us design and build safe, reliable and economical structures more easily.

The recurring theme in much of the discussion between the structural engineering community and the wood truss industry revolves around who should be tending to the permanent bracing design for the roof, floor or wall system. Oftentimes, the perspective of the structural engineering community is that:

1. All temporary bracing and all permanent bracing design should be part of the sealed truss shop drawings, or what our industry calls truss design drawings.

2. There is an expectation that this is the responsibility of the Truss Designer, which then flows through to the Truss Manufacturer because they are the interface with both the Building Designer and the Contractor.



Figure 2: BCSI provides a series of key points that are highlighted like this. The need for good diagonal bracing is reiterated often.

The IBC 2003 code adopted ANSI/TPI 1-2002 Chapter 2 states that, regarding construction permanent bracing responsibilities:

- Section 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:...."

- Section 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."

- To further define responsibilities, 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

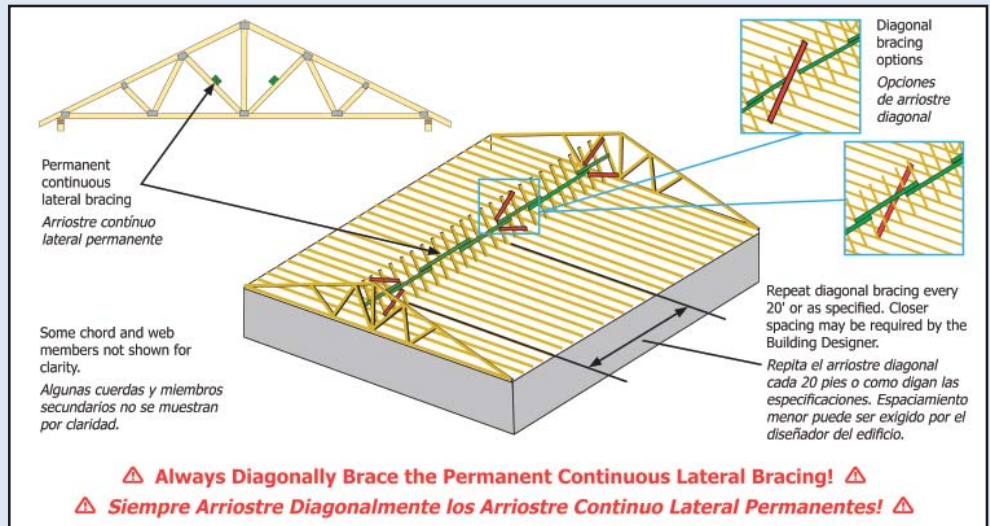


Figure 1: The key to permanent bracing performance is the application of the diagonal bracing, and flowing the permanent bracing loads into the diaphragms or shear walls.

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," and

- 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 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."

When one thinks about the construction process, the text referenced above provides reasonably logical areas of responsibility based on the specific expertise and skill of all the parties involved. However, the world in which we live often allows trusses to be deferred submittals, or the Structural Design Documents state "trusses designed by others." This results in a gap in the design process because the building design is completed before the design of the trusses is contemplated.

One might say that this approach to design is not very logical or safe, in a construction process that should be both logical and safe for all involved.

As stated above, our industry has produced BCSI 1-03 to provide guidance on both temporary and permanent bracing issues. Figures 1 and 2 provide a brief perspective on the treatment of permanent bracing within BCSI.

There are a few truss installation conditions where the top chord may not have sheathing applied and needs permanent bracing. A good example of this condition is called a piggyback truss, as shown in Figure 3.

The easiest permanent bracing solution for piggyback type trusses is to turn any of the top chord temporary lateral and diagonal bracing methods into the permanent bracing for the piggyback top chord. Figure 4 provides

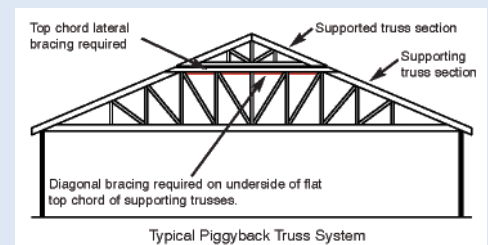


Figure 3: Typical piggyback truss application.

one of the BCSI examples of temporary top chord bracing that could easily be designed to become permanent top chord bracing.

As stated above, a key gap in the construction process is often the design and installation of the permanent lateral and diagonal bracing. Our industry's emphasis on this aspect of bracing is intended to help focus attention on this issue. We are now in the process of working on the second edition of BCSI 1-03, where we will provide additional information

on the bracing of piggyback, hip-end and long-span truss systems. To stay abreast of WTCA's work in this area, please visit our web site: [www.woodtruss.com](http://www.woodtruss.com). You can also find related articles within the Structural Building Components Magazine archives at [www.sbcmag.info](http://www.sbcmag.info).

As professional engineers, structural safety and reliability are our top priorities. Given this, everyone in the building design and construction professions should be on a mission to figure out the best possible ways of collaborating, so that there are no design and installation gaps. In addition, everyone that has a job to do in the process should be able to do that job, be treated fairly in the process, and be paid for the work that they are responsible for.

Our industry has always been in the solutions business, and our desire is to work together to ensure that we all have bright futures in this chosen profession. ■

## Introducing BCSI

In March 1998, TPI held a focus group session with truss installers and framers to understand temporary bracing from the perspective of those that actually have to implement bracing techniques in the field. Their conclusion: "Truss installers need a more simplified presentation to better understand temporary bracing." It became clear that our industry would be best served with a single set of bracing documents. This was done by consolidating the separate bracing documents produced by TPI and WTCA. The result is BCSI 1-03, an improved and expanded version of TPI's HIB-91 booklet.



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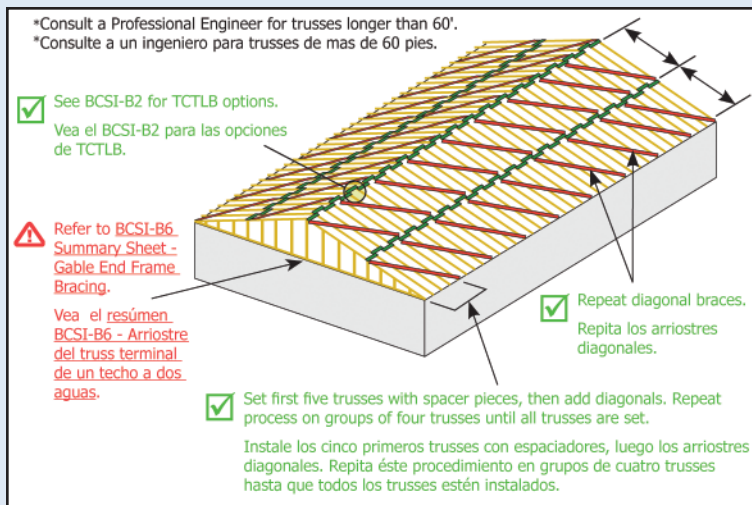


Figure 4: One of the examples from BCSI of the graphical representation top chord temporary bracing.

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BCSI 1-03 contains eleven chapters, which form the basis for the stand-alone summary sheets referred to as the "B-Series." Each B-Series Summary Sheet will include both English and Spanish text (on the same side).

- The BCSI 1-03 booklet, Guide for Handling, Installing and Bracing of Metal Plate Connected Wood Trusses, was released in October 2003 and can be viewed in its entirety at [www.woodtruss.com/structuremagazine.php](http://www.woodtruss.com/structuremagazine.php).

- BCSI-B1 summary sheet is a direct replacement of the HIB-91 Summary Sheet and the WTCA Jobsite Warning Poster. B1 was designed for 11x17 and plan size formats, so that the structural framing plan (a.k.a. truss placement diagram) can be printed on the back.

Our industry's Jobsite Safety Package contains BCSI-B1 and the following additional documents:

- BCSI-B2 Truss Installation and Temporary Bracing
- BCSI-B3 Web Member Permanent Bracing/Web Reinforcement
- BCSI-B4 Construction Loading

Our goal is to provide an economical package containing key safety documents in a resealable plastic bag to enhance field education.

Finally, the following B-Series documents were specifically created for special conditions that may be encountered during the truss installation and bracing process:

- BCSI-B5 Truss Damage, Jobsite Modifications and Installation Errors
- BCSI-B6 Gable End Bracing
- BCSI-B7 Temporary and Permanent Bracing for Parallel Chord Trusses
- BCSI-B8 Toe-Nailing for Uplift Reactions
- BCSI-B9 Multi-Ply Girders
- BCSI-B10 Post Frame Truss Installation and Bracing
- BCSI-B11 Fall Protection and Wood Trusses

**JOBSITE PACKAGE**  
**IMPORTANT DOCUMENTS ENCLOSED**  
**PLEASE REVIEW**

**Truss Technology**  
**IN BUILDING**

**Checklist for Handling and Installing Trusses**

If properly handled, installed and/or braced, trusses can become dangerous and may properly damage and/or injury those handling and erecting trusses. We suggest following:

- 1) Confirmance with the Truss Design
- 2) Check/inspecting connector plates
- 3) Cracked, damaged or broken etc.
- 4) Any other damage that may impact structural integrity of the truss.

**ADVERTENCIA:** The handling, moving, installation and/or bracing of trusses can become dangerous and may properly damage and/or injury those handling and erecting trusses. We suggest following:

- 1) Confirmance with the Truss Design
- 2) Check/inspecting connector plates
- 3) Cracked, damaged or broken etc.
- 4) Any other damage that may impact structural integrity of the truss.

For additional information and detailed outline of the new B-Series, visit [www.woodtruss.com/structuremagazine.php](http://www.woodtruss.com/structuremagazine.php).