SBCA has been the voice of the structural building components industry since 1983, providing educational programs and technical information, disseminating industry news, and facilitating networking opportunities for manufacturers of roof trusses, wall panels and floor trusses. SBCA endeavors to expand component manufacturers’ market share and enhance the professionalism of the component manufacturing industry.
Introduction

• Long span trusses are defined as trusses with clear spans 60' or greater.
• Due to their greater dimensions and weight, there is a greater chance of instability, buckling, and even collapse during handling and installation of long span trusses.
• This presentation provides guidelines for proper handling and installation of both wood and cold-formed steel long span trusses.
Key Definitions

- **Wood Truss** – An engineered structural component, assembled from wood members, metal connector plates and other mechanical fasteners, designed to carry its own weight and superimposed design loads. The truss members form a semi-rigid structural framework and are assembled such that the members form triangles.

- **Cold-Formed Steel Truss** – A truss constructed entirely of steel structural members cold-formed to shape from sheet or strip steel.

- **Building Designer** – Owner of the building or the person that contracts with the owner for the design of the building structural system and/or who is responsible for the preparation of the construction documents. When mandated by the legal requirements, the Building Designer shall be a registered design professional.

- **Truss Design Engineer** – Person who is licensed to practice engineering as defined by the legal requirements of the jurisdiction in which the building is to be constructed and who supervises the preparation of the truss design drawings.
Key Definitions

- **Contractor** – Owner of a building, or the person who contracts with the owner, who constructs the building in accordance with the construction documents and the Truss Submittal Package. The term “Contractor” shall include those subcontractors who have a direct contract with the contractor to construct all or a portion of the construction.

- **Truss Submittal Package** – Package consisting of each individual truss design drawing, and, as applicable, the truss placement diagram, the cover/truss index sheet, lateral restraint and diagonal bracing details designed in accordance with generally accepted engineering practice, applicable BCSI-defined lateral restraint and diagonal bracing details, and any other structural details germane to the trusses.

- **Wood Structural Panel (WSP)** – A panel manufactured from wood veneers, strands or wafers or a combination of veneer and wood strands or wafers bonded together with waterproof synthetic resins or other suitable bonding systems. Examples include: plywood, Oriented Strand Board (OSB), waferboard and composite panels.
Background

• Prior to 2009, building codes did not require a Registered Design Professional (RDP) to be responsible for temporary or permanent bracing.

• Truss industry safety literature like Building Component Safety Information (BCSI) highlighted the need for professional expertise in this area.
• The IBC now requires permanent bracing for long span wood trusses to be handled by an RDP.

• ANSI/TPI 1, a code referenced standard, also requires restraint and bracing design as well as special inspection, to be performed by a contracted RDP.

• 2.3.1.6 Long Span Truss Requirements
  – 2.3.1.6.1 Restraint/Bracing Design. In all cases where a Truss clear span is 60 ft. (18 m) or greater, the Owner shall contract with any Registered Design Professional for the design of the Temporary Installation Restraint/Bracing and the Permanent Individual Truss Member Restraint and Diagonal Bracing.
  – 2.3.1.6.2 Special Inspection. In all cases where a Truss clear span is 60 ft. (18 m) or greater, the Owner shall contract with any Registered Design Professional to provide special inspections to assure that the Temporary Installation Restraint/Bracing and the Permanent Individual Truss Member Restraint and Diagonal Bracing are installed properly.
Background – *IBC 2015*

- The *IBC* includes specific provisions for both wood and cold-formed steel long-span trusses:
  
  **Wood Trusses**
  - 2303.4.1.1 Truss design drawings
  - 2303.4.1.2 Permanent individual truss member restraint.
  - 2303.4.1.3 Trusses spanning 60 feet or greater.
  - 1705.5.2 Metal-plate-connected wood trusses spanning 60 feet or greater.

  **Cold-Formed Steel Trusses**
  - 2211.3 Truss design
  - 2211.3.1 Truss design drawings
  - 2211.3.3 Trusses spanning 60 feet or greater
  - 1705.2.4 Cold-formed steel trusses spanning 60 feet or greater
  - S214
  - B2.3 Truss Design Drawings.
  - B6 Design of Permanent Individual Truss Member Restraint/Bracing
While the IRC does not include specific language for long-span roof trusses, it references SBCA’s CFSBCSI and BCSI for bracing requirements.

- **Wood Trusses**
  - R802.10.2.1 Applicability limits.
  - R802.10.3 Bracing.

- **CFS Trusses**
  - R804.1.1 Applicability limits.
  - R804.3.6 Roof trusses.
  - S214
  - B2.3 Truss Design Drawings.
  - B6 Design of Permanent Individual Truss Member Restraint/Bracing
Analysis

• For structures with trusses spanning up to 60 feet, the guidance provided in CFSBCSI and BCSI is typically adequate.

• When trusses span 60 feet or more a RDP is required to design the permanent bracing.
Analysis

- For wood trusses:
  - Information on the forces that the RDP needs to design the permanent truss bracing is included on the truss design drawings per *IBC 2303.4.1.1, items 13 & 14.*
  
  13. Maximum axial tension and compression forces in the truss members
  14. Required permanent individual truss member restraint location and the method and details of restraint/bracing to be used in accordance with Section 2303.4.1.2
Analysis

• For CFS trusses:
  – Information on the forces that the RDP needs to design the permanent truss bracing is included on the truss design drawings per AISI S214, B2.3 and B6.
Installation Considerations

• **Inspect Before Installing**
  – Inspect each truss thoroughly prior to hoisting into place to take care of any damaged truss members.
  – Undiagnosed or unfixed damage has the potential to cause much bigger problems once the truss is airborne.
Installation Considerations

• Maintain Truss Straightness during Hoisting
  – Have you ever heard of a truss acting like a “wet noodle”?
  – During the hoisting process, long span trusses like to snake, often shaking, bending and flexing out of shape.
  – It is very important to provide support so the trusses flex as little as possible.
  – Invest in a spreader bar to prevent this from happening.
Additional Considerations

• **A Good Crane Operator is Helpful**
  – Finding a crane operator with previous long span truss experience can be very beneficial in determining the best approach for hoisting the superstructure and developing an overall plan.
  – Efficiency and safety must meet at the same point and an experienced operator knows where that point is.
Installation Considerations

• **Build the First Five on the Ground**
  – It is very important to ensure the bearing points are level.
  – Staying on the ground makes assembly much easier.
  – Keep in mind the superstructure provides the plumb and square foundation needed to attach the remaining trusses.
  – As more trusses are added to the superstructure once it is in position on the building, the assembly becomes increasingly rigid.
Installation Considerations

• **Sheath Top Chord as You Install Trusses**
  
  – This is an extremely effective method of developing much-needed rigidity to the installation process, with an added bonus of saving significant time by applying permanent top chord bracing immediately.
  
  – This process is also much safer as all the work is being done from a plywood deck.
Installation Considerations

- **Install All Permanent Bracing Immediately**
  - Once your crew become comfortable with the step-by-step approach, the web member and bottom chord bracing can be installed in the time it takes to release the hoist, pick up, and set the next truss.
  - Installing all the permanent diagonal bottom chord and web member bracing sooner than later saves time in the long run and maintains the rigidity of the entire roof system as it’s being installed.
Installation Example

• See DrJ Best Practices for a step by step installation example
References

- Building Component Safety Information (BCSI) Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses, Structural Building Components Association (SBCA)
- ANSI/TPI 1, National Design Standard For Metal Plate Connected Wood Truss Construction, Truss Plate Institute.
- Cold-Formed Steel Building Component Safety Information (CFSBCSI) Guide to Good Practice for Handling, Installing & Bracing of Cold-Formed Steel Trusses, Cold-Formed Steel Council (CFSC)
- AISI S214 North American Standard for Cold-Formed Steel Framing – Truss Design
References


• Structural Building Components Association, “Long Span Jobsite Package”