



MIOSHA Fact Sheet

Construction Safety & Health Division

Wood Truss Bracing

Wood truss construction is often used by small and midsize contractors on residential and commercial projects. There are hazards associated with wood truss construction that must be addressed to prevent serious injury or fatal accidents.

Modern Wood Trusses

Metal plate connected wood trusses have a number of distinct *advantages*:

1. Engineered trusses are extremely strong.
2. Wood trusses are constructed from short lengths of 2x4 lumber, thereby providing a tremendous cost savings (more efficient use of natural resources too!)
3. With Computer Aided Drawing (CAD) facilities, custom-built shapes such as cathedral ceilings are becoming commonplace and less costly.
4. Trusses can span longer distances with the weight transmitted to the exterior walls. This makes the non-load bearing interior walls more flexible and easily moved.
5. Metal plate connected wood trusses can be installed quickly.

Metal plate connected wood trusses must be installed correctly to prevent a potentially deadly truss collapse. Taking shortcuts in wood truss construction is a recipe for disaster. **The following 8 elements address proper installation of wood trusses:**

1. Be aware the maximum strength and stability is only obtained when *all* the components of the structure being built have been properly installed (e.g., sheathing, permanent bracing).
2. Unacceptable temporary bracing practices during construction include;
 - a. Using 1x4s instead of 2x4s.
 - b. Using only short lengths of 2x4s between two trusses unless the trusses are diagonally braced at every truss per BCSI.
 - c. Using only one nail per truss instead of two.
 - d. Lack of diagonal and lateral bracing.
3. Do not overload or point-load the trusses.
4. Do not install damaged or improperly repaired trusses.
5. Do not make unauthorized changes to trusses.
6. Unacceptable connections to truss support structures include; no nails, nails too small, not toe-nailed.
7. Appropriate sheathing methods must be exercised to prevent tension-loading, depending on the truss design.
8. Structures supporting the truss assembly must be properly braced and adequate to carry the load.

Until the final nail is driven in place, the modern truss assembly must depend on properly installed temporary and permanent bracing.

MIOSHA Investigation and Proper Truss Bracing

In 2011 MIOSHA investigated an accident where 11 employees were working installing 81 foot long trusses when they collapsed resulting in one fatality and four other employees being injured. Improperly braced trusses not only result in serious or fatal injuries; they can be extremely costly in structure damages. In most truss collapses there is usually one of two reasons for the collapse:

1. The trusses did not have adequate temporary bracing installed (lateral and/or diagonal.)
2. The structure supporting the trusses was either structurally unable to carry the loads or was not braced adequately.

In many instances, the diagonal bracing is omitted to save time and money. Another shortcut is using short lengths of 1x4 or 2x4 lumber as “spacers” on the top chords or between the trusses, typically with only one nail at each end. These shorter lengths of lumber should only be used to hold the trusses in place during the erection process, and only until enough trusses (4 or 5) are set and a longer length of lumber can be installed. After the trusses are set in their final position on the bearing walls, the longer lengths of lateral and diagonal braces must be installed.

Wood trusses without proper bracing can be like dominoes during construction; push one over and they all collapse! Using short spacers without proper additional bracing will ensure two things:

1. When the trusses collapse, they will all fall.
2. When they are on the ground, they will all be equally spaced.

Saving time and money by skimping on bracing is no longer an issue when the structure collapses. Remember, a couple of carpenters are working within or on top of these “spaced” trusses during the erection process and could be seriously injured.

MIOSHA Rules

- The Michigan Occupational Safety and Health Act, Act 154 of 1974 as amended, states under Section 11(a): An employer shall furnish to each employee, employment and a place of employment which is free from recognized hazards that are causing, or are likely to cause, death or serious physical harm to the employee. **This is the General Duty Clause, which MIOSHA may cite if the employer is not properly addressing truss bracing issues.**
- The hazards associated with improperly bracing wood trusses during construction must be addressed in an Accident Prevention Program required by **MIOSHA Part 1, General Rules, Rule 114.**

Help is Available

Groups such as the **Wood Truss Council of America** and the **Truss Plate Institute** were formed to help building designers and contractors use wood trusses and eliminate the guesswork in their installation. Their recommendations are published in the booklet commonly known as the **Building Component Safety Information (BCSI)**. The BCSI recommendations require all bracing to be of 2x4 lumber and installed with a minimum of two nails per truss.

Critical erection and bracing information from 2013 BCSI is typically included with truss deliveries made in the United States. Contractors receiving wooden trusses receive a basic diagram of the trusses, indicating where permanent bracing has to be installed and a group of B-series Summary Sheets that pertain to temporary bracing when installing trusses. Contractors receiving trusses built in Canada and shipped to the U.S. for erection are required to follow the **Canadian Wood Council** and the **Truss Plate Institute of Canada** recommendations (TPIC-1996), which mirror those of their U. S. counterparts. (Note: TPIC-2011 is the current standard and will be referenced by the various building codes as they are updated.)

Truss assemblies are often erected using boom-trucks or cranes. Contractors erecting trusses need to be aware of potentially contacting overhead energized power lines. There is specific language in BCSI alerting contractors to the potential for electrocution. A few years ago in St. Clair Shores, employees were unloading trusses and stacking them under energized power lines. Two employees were electrocuted when the load line contacted the overhead power line while removing one of the trusses from the trailer. Cranes and boom trucks are required to maintain a minimum of **20 feet** clearance from energized electrical power lines that are 350KV or less and **50 feet** if the power lines are more than 350KV. If the power line voltage is verified by the utility owner the minimum clearance distances may be reduced to 10 feet or as stipulated in Table A in Part 10, Lifting and Digging Equipment, Rule 1016a - 1016e.

All employers are encouraged to contact the MIOSHA Construction Safety and Health Division at 517-284-7680 if they have questions regarding worksite health and safety or compliance issues. The MIOSHA Consultation, Education and Training (CET) Division provides training and onsite audit services for residential and commercial builders at the employer's request, free of charge. The CET Division can be contacted directly at 517-284-7720 or by visiting the MIOSHA website at www.michigan.gov/miosha.

LARA is an equal opportunity employer/program.

Auxiliary aids, services and other reasonable accommodations are available upon request to individuals with disabilities.



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