Trusses

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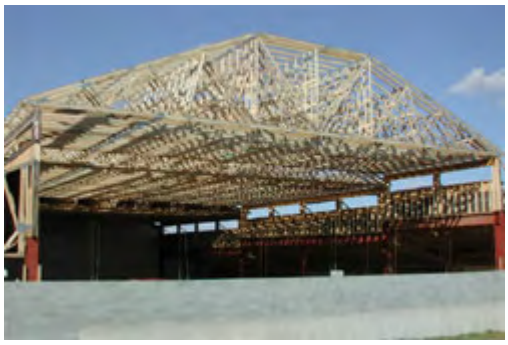


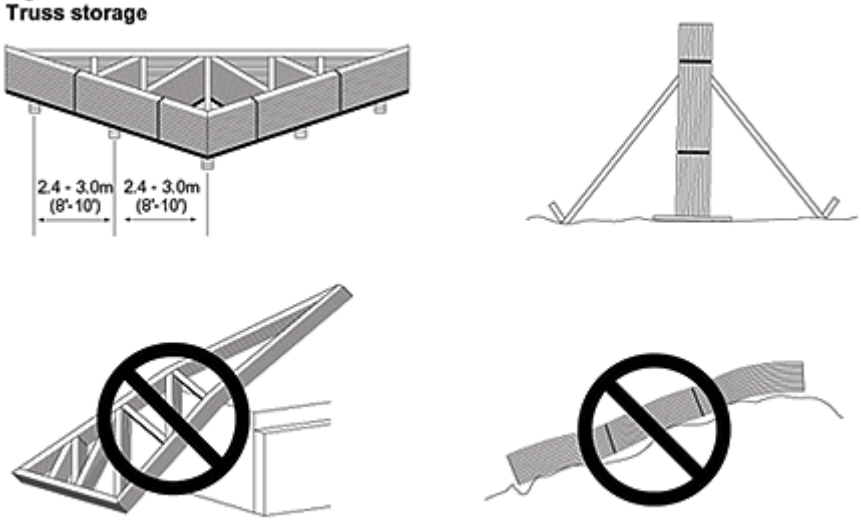
Storage

Trusses are slender elements. They are very strong when placed in the vertical position, but can be easily damaged or broken if racked or bent in the lateral direction. Damage or failure can occur at the joints (connector plates) or within the lumber members.

When trusses arrive at the job site they should be checked for any permanent damage such as cross breaks in the lumber, missing or damaged metal connector plates, excessive splits in the lumber, or any damage that could impair the structural integrity of the truss.

If truss plates have separated from the wood member beyond the limits specified in the quality control documents, under no circumstances should the loose plate be hammered back into position. This is because the grip values of the truss plate and the integrity of the lumber are likely to be affected. If corrective repair measures are required, , the fabricator must be advised. In some cases the fabricator will consult a structural engineer to identify remedial measures.

Figure 4
Truss storage

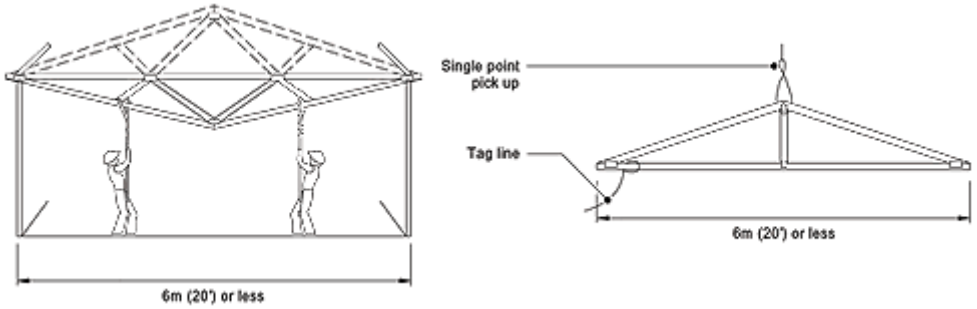


Whenever possible, trusses should be unloaded in bundles on dry, relatively smooth ground. They should not be unloaded on rough terrain or uneven spaces that could result in undue lateral strain possibly distorting the metal connector plates or damaging parts of the trusses such as overhangs and soffit returns (Figure 9).

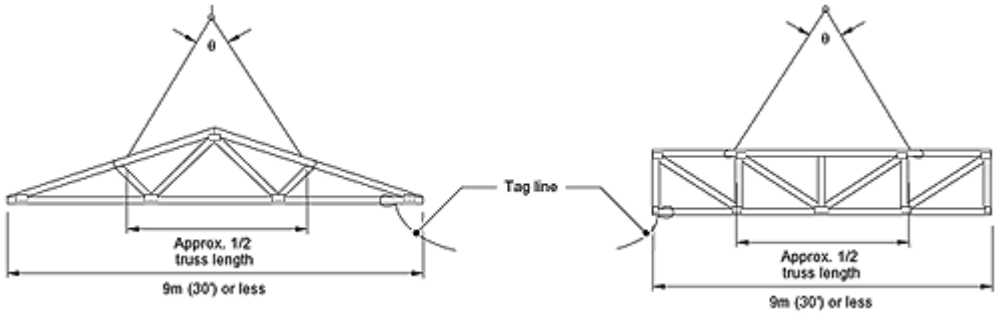
Wood trusses can be stored horizontally or vertically. If stored in the horizontal position, trusses should be supported on blocking spaced at 2.4 m (8') to 3m (10') centres to prevent lateral bending and lessen moisture gain from the ground. When stored in the vertical position, trusses should be placed on a stable horizontal surfaced and braced to prevent toppling or tipping. If trusses need to be stored for an extended period of time measures must be taken to protect them from the elements, keeping the trusses dry and well ventilated.

Handling and Installation

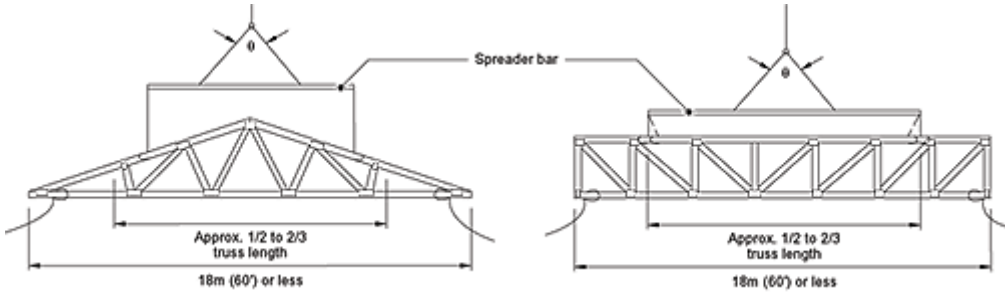
During unloading and erection, trusses should be handled with care. Proper lifting equipment is to be used at all times. They should be transported in the vertical position to minimize the strain on the plated joints.



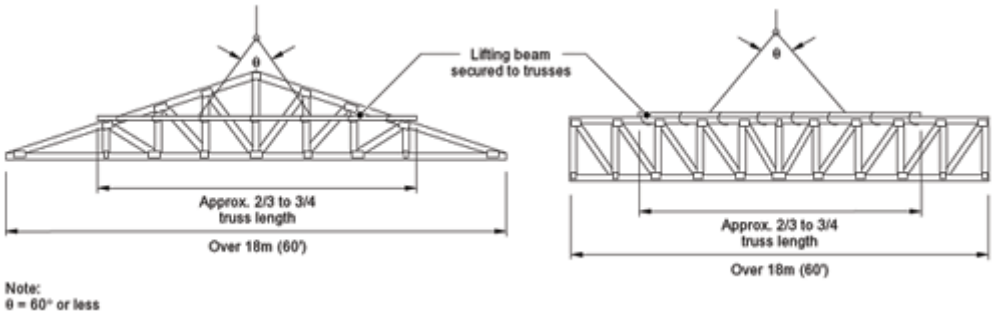
Wood trusses can be installed by hand if their size and configuration are such that they can be handled into place without causing an excessive lateral deflection of the truss. Any lateral deflection greater than 75mm (3") is considered excessive.



Trusses installed by mechanical means should be supported at intervals of 7.5m (25') or less. Adequate rigging (crane, fork lift, slings, tag lines, spreader bars, etc.) should be used to ensure safety and prevent damage.



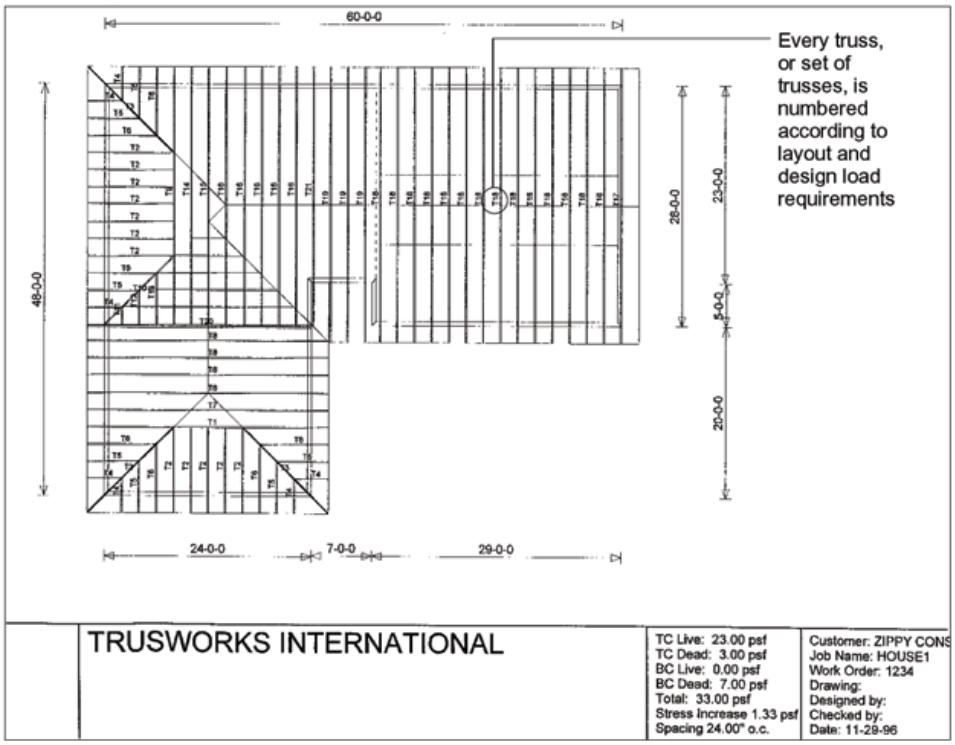
Lifting devices (slings, chains, cables, nylon strapping, etc.) should be connected to the truss top chord with a closed-loop attachment. Trusses will be placed according to framing plans. They will be held with the hoisting equipment until the ends of the trusses are securely fastened and temporary braced.



The maximum angle between lift lines (ø) should not exceed 60 degrees in order to minimize lateral distortions in the truss.

A truss layout drawing showing the location of each truss type on a roof or floor plan, and a shop drawing for each truss should be included with each truss shipment. The layout should also include all hardware required for Truss connections and tie downs. The hardware list must indicate type, manufacturer & capacity as well as specific nails or fasteners required.

Figure 2
Truss reference and layout plan



Bracing

Trusses must be braced to ensure safety and performance. For more details on the design responsibilities of the truss designer, the building designer and the contractor consult the TPIC design procedures page iii

Temporary Bracing

Temporary bracing is required during erection to enable the truss assembly to:

- withstand the gravity forces of its own weight,
- resist wind loads during construction,
- support temporary construction dead loads such as the weight of sheathing and roofing materials
- keep the trusses plumb, and
- assure correct truss spacing.

Permanent Bracing

Permanent bracing is required to ensure that the trusses are integrated into the overall building structure to:

- prevent buckling of web members loaded in compression
- share loads between adjacent trusses,
- transfer lateral forces to diaphragms, and
- restrains overall lateral displacements.

For more details consult:

TPIC's handling, Erection and Bracing of Wood Trusses

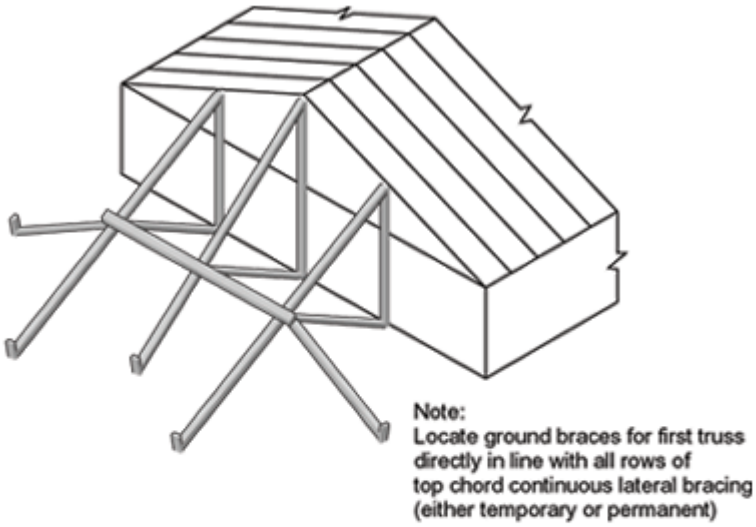
Wood Trusses

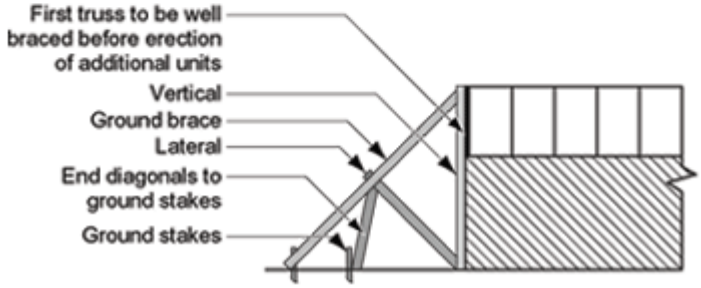
Wood Truss Council of America publications on Bracing

The following 7 pages illustrate standard bracing methods recommended by TPIC.

Step 1: Bracing First Truss

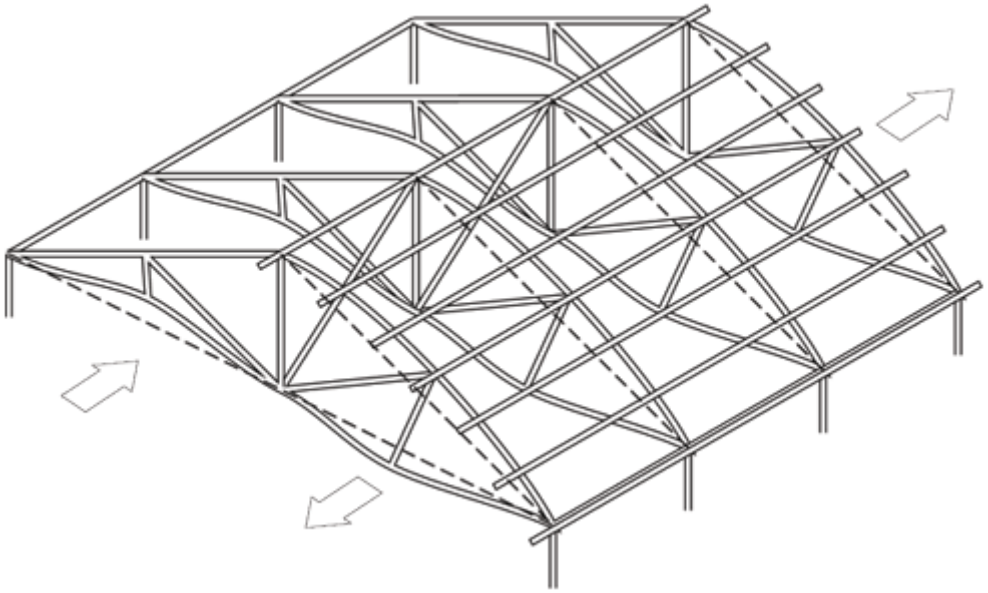
Long span trusses are braced securely at the end of the building. Shorter trusses can be supported laterally by a single gable end brace. The ground braces should be located directly in line with all rows of top chord continuous lateral bracing, otherwise the top chord of the first truss can bend sideways and allow the trusses to shift, putting a substantial strain on all connections of the bracing system. Scabs should not be nailed to the end of the building to brace the first truss. These scabs can break off or pull out, thus allowing a total collapse.





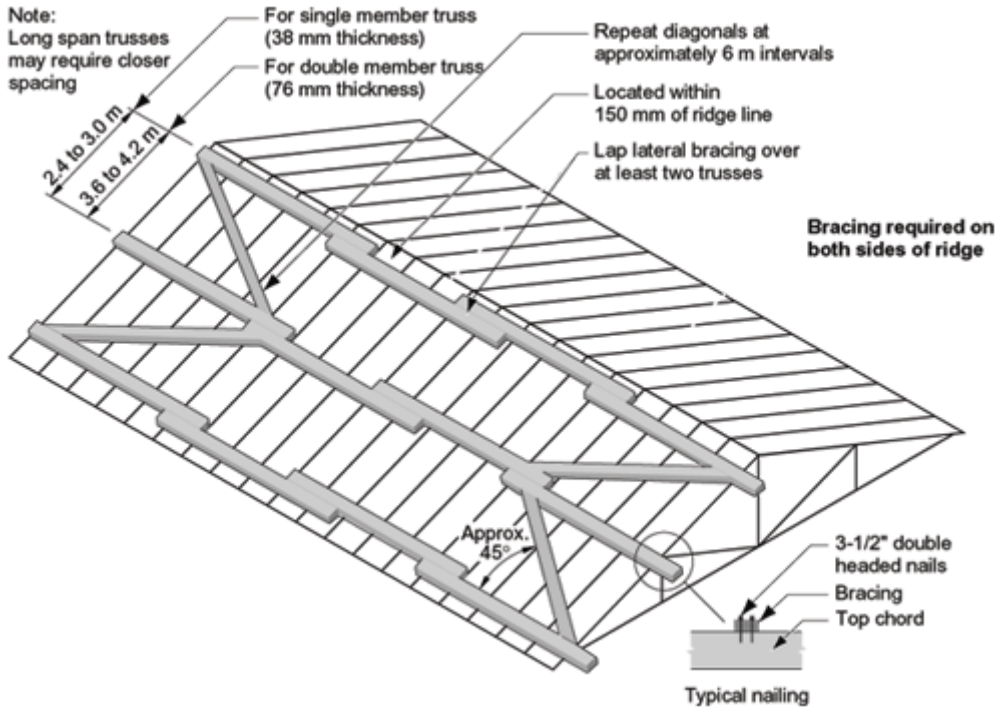
Step 2: Cross-bracing subsequent trusses to prevent buckling

As trusses are continuously set in place, sufficient temporary bracing is applied to hold the trusses plumb, in alignment and secure untill permanent bracing, decking and/or sheathing can be installed. Temporary bracing should not be less than 38 × 89 mm lumber and should be as long as possible. The use of short spacer pieces of lumber between adjacent trusses is not considered a means of bracing. Temporary bracing should be nailed with two 3-1/2" double headed nails at every intersection with the braced members. The practice of removing bracing to adjust spacing of trusses as sheathing is applied can cause trusses to topple if a key connection is removed at the wrong time. Therefore, exact spacing of trusses should be maintained as temporary bracing is applied. Cross bracing should be installed as soon as the first few trusses are in place, in the vertical plane, between trusses, together with continuous lateral braces fastened to the top and bottom chords to prevent the trusses from toppling.



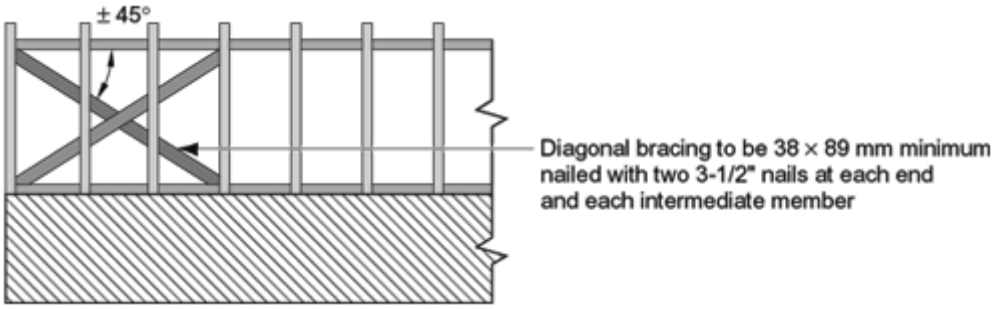
Step 3: Temporary bracing of top-chord plane

Truss top chords are very susceptable to lateral buckling before they are braced or sheathed. Continuous lateral bracing shold be installed within 150 mm of the ridge line or centre line and at approximatly 2.4 to 3 m intervals between the ridge line of sloped trusses or centre line of flat trusses and the eaves. Diagonals, set at 45° between the lateral bracing, form the required stability of the top chord. On longer span trusses, lateral bracing and diagonals may require closer spacing. If possible the continuous lateral bracing should be located on the underside of the top chord so that it does not have to be removed as sheathing is applied. This will ensure that the trusses are held securely during installation of the decking. Bracing lumber should be no less than 38 × 89 mm by 3.05 m long.



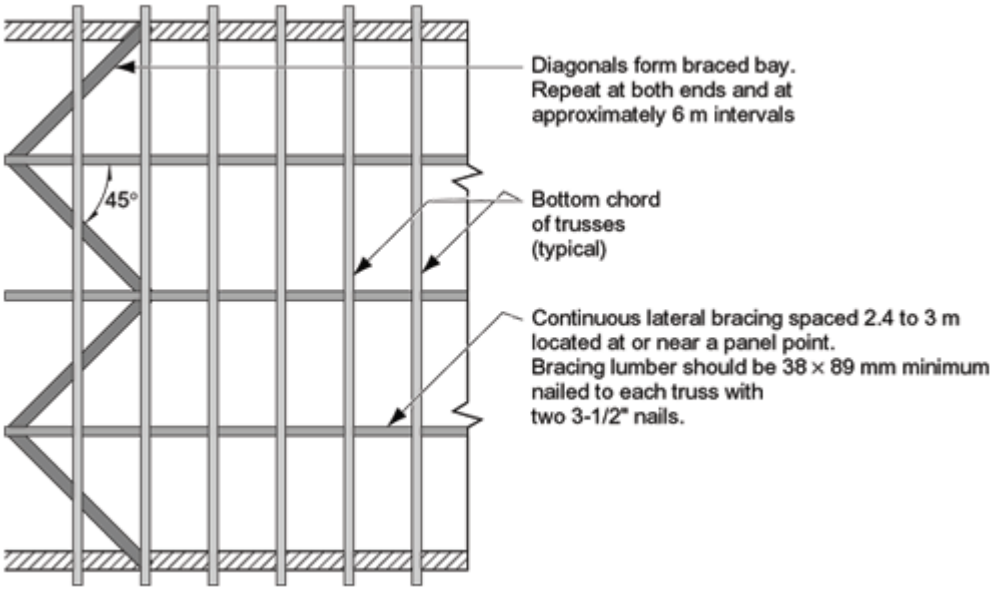
Step 4: Temporary bracing of web member plane

Temporary bracing of the web member plane is usually installed at the same location specified on the engineering plan for permanent bracing. Permanent lateral web bracing should be called out on the truss design to reduce the buckling length of the individual web members. The bracing can form part of the temporary and permanent web bracing system. Sets of diagonal bracing should not be spaced more than 6 m apart (clear space between end of one set of braces and start of another set).



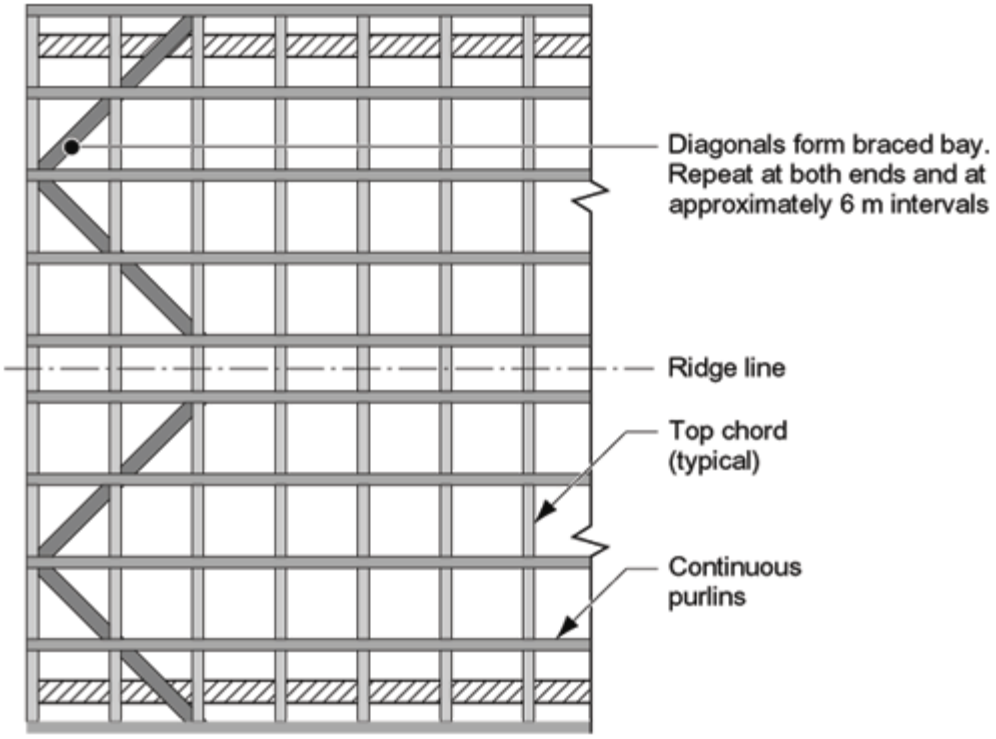
Step 5: Temporary bracing of bottom chord plane

To hold the proper spacing of the bottom chord, continuous lateral bracing at no greater than 2.4 to 3 m on center along truss length is used for the full length of the building, secured to the bottom chord. Diagonal bracing at 45° between laterals will stabalize this bracing system. The bracing is usually left in place to become part of the permanent bracing system. Once the temporary bracing is properly installed, permanent bracing and decking can be installed. Concentrated loads from sheathing or roofing material should not be placed on trusses. These loads should be spread evenly over a large area to prevent overloading of any one truss. A limit of eight sheets of plywood should be placed on any pair of trusses and should be located adjacent to the supports.



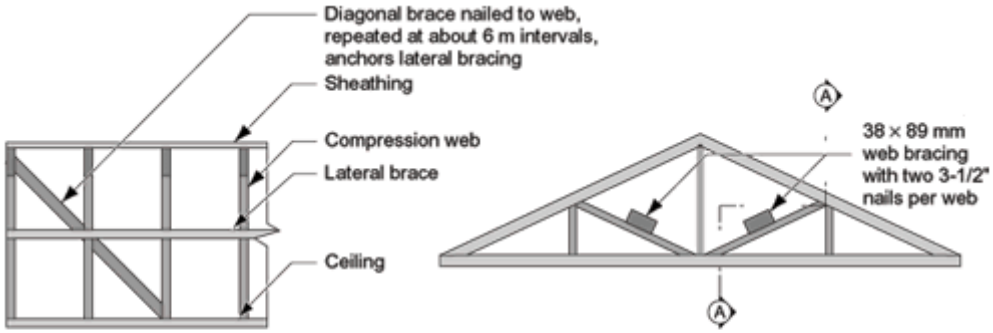
Step 6: Permanent bracing of top chord plane (large buildings)

If plywood floor or roof sheathing is properly applied with staggered joints and adequate nailing, a continous diaphragm action is developed to resist lateral movement at the top chord, and additional bracing in the plane is generally not required. Some metal roofing materials may act as a diaphragm when properly lapped and nailed, but selection and use of these materials is at the discretion of the building designer. If purlins are used, spaced not to exceed the buckling length at the top chord, diagonal bracing should be applied to the underside of the top chord to prevent lateral shifting of the purlins. The diagonal bracing should be installed on both sides of the ridge line in all end bays. If the building exceeds 18 m in length, this bracing should be repeated at intervals not exceeding 6 m.



Step 7: Permanent lateral bracing to web member or bottom chord plane (all buildings)

Permanent bracing in web and bottom chord planes is usually applied as temporary bracing (Steps 4 and 5). Lateral bracing of compression web members is a typical method to prevent buckling. The method used to anchor the lateral bracing must be specified by the designer. Bottom chord bracing helps to maintain truss spacing, also can resist buckling caused by stress reversal. Multiple-bearing or cantilevered trusses can result in compressive forces in bottom chords.



Section A - A

Permanent lateral bracing reduces buckling length of compression web members

Note:
Where lateral bracing is shown on the truss design drawings, it must be installed so that truss will support design loads.