

FRAMING ROOF TRUSSES

Roofs framed with trusses are engineered systems that demand careful installation and bracing. Any changes in bearing or loading to the original plan, or any field modifications to trusses, needs an engineer's approval.

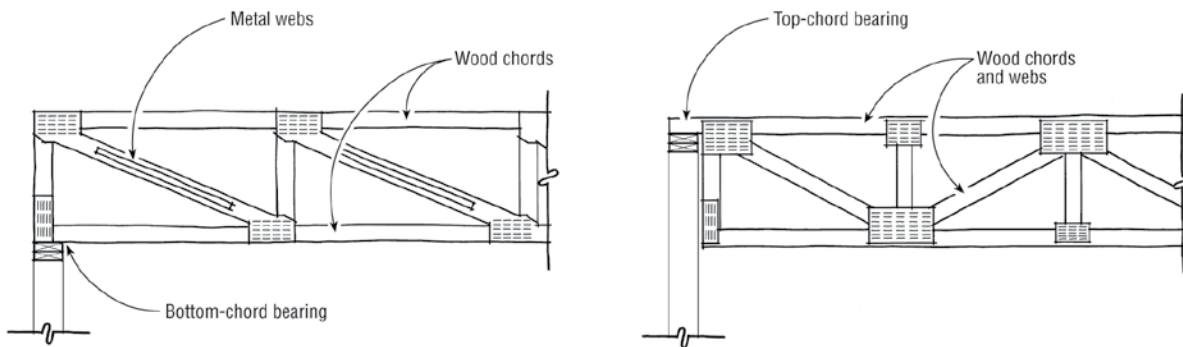
Truss Types

TRUSS TYPES

Floor trusses can be designed to sit on either their bottom chord or their top chord (**Figure A**).

Handling Trusses

FIGURE A: TRUSS TYPES



Floor trusses typically have either wood or metal webs. **Bottom-chord-bearing** trusses (left) sit atop a wall plate or sill like a standard floor joist. **Top-chord-bearing** trusses (right) hang from the top plate.

Caution: Loose Plates

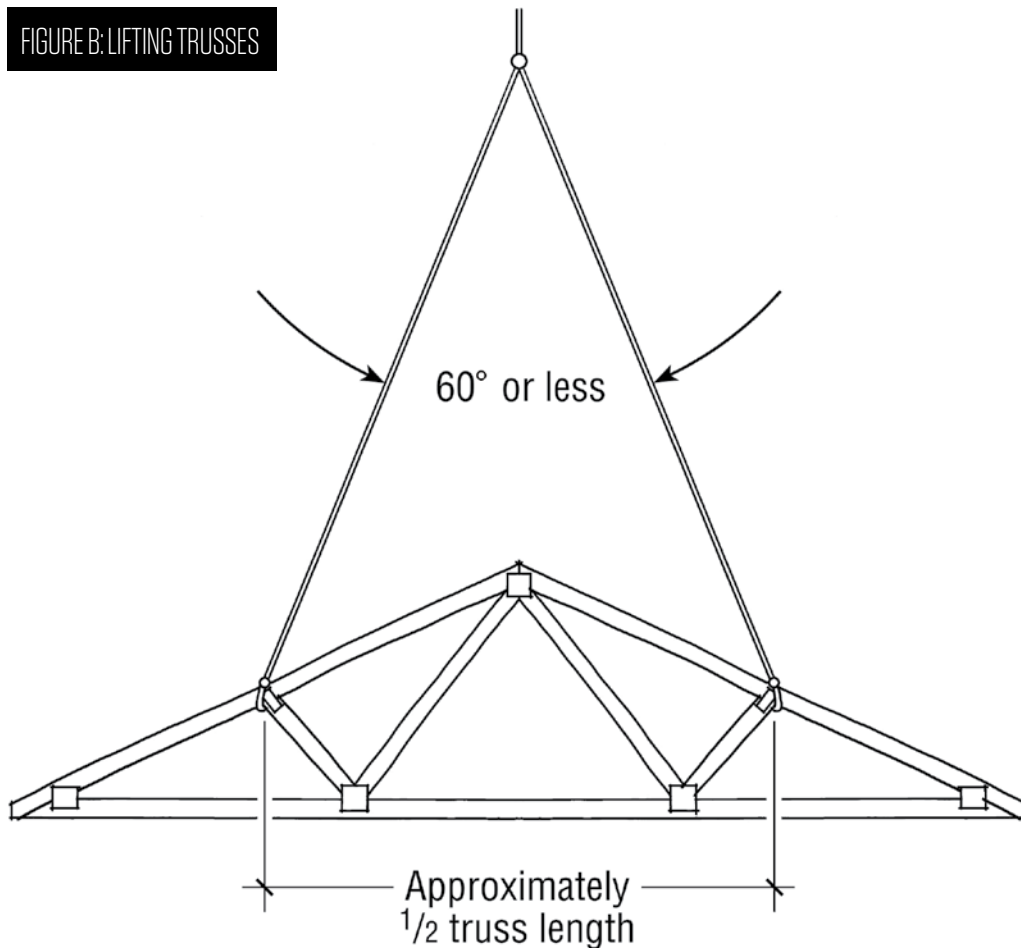
Connector plates should be centered over the joint and firmly embedded in the wood. Never refasten a loose plate: The bond cannot be restored once it's been broken.

HANDLING TRUSSES

Trusses are vulnerable to damage until they are installed, sheathed, and braced. To prevent damage, use the following precautions:

- Inspect trusses when receiving a shipment. Look carefully for loose plates and reject any damaged trusses.
- Banded trusses should be lifted off the truck from two points on the top chords. Individual trusses should be lifted the same way (**Figure B**).
- Store trusses horizontally on relatively level, dry ground. To prevent any bending or twisting that could loosen truss plates, support the trusses with blocking placed every 8- to 10-ft.
- If trusses must be stored vertically, make sure they are braced and blocked in a stable manner. Gable trusses should be stored with their peaks up, scissors trusses with their peaks down.

FIGURE B: LIFTING TRUSSES



Handling Trusses

Bracing Roof
Trusses

To prevent trusses from twisting and damaging plate connections, lift trusses less than 30 ft. long at two balance points. Longer trusses require reinforcement with strongbacks before lifting.

BRACING ROOF TRUSSES

Trusses are inherently unstable until sheathed and require two types of bracing: temporary and permanent.

Use temporary bracing to safely erect the trusses; permanent bracing is required to stabilize the trusses throughout the life of the structure. The truss fabricator or “designer of record” should provide a permanent bracing plan.

Usually some of the elements of the temporary bracing stay in place as part of the permanent bracing. In general, all bracing should be placed near panel points (where truss members meet).

Temporary Bracing: The First Truss

It is important to accurately plumb the first truss and to brace it substantially, since additional trusses rely on the first one for stability.

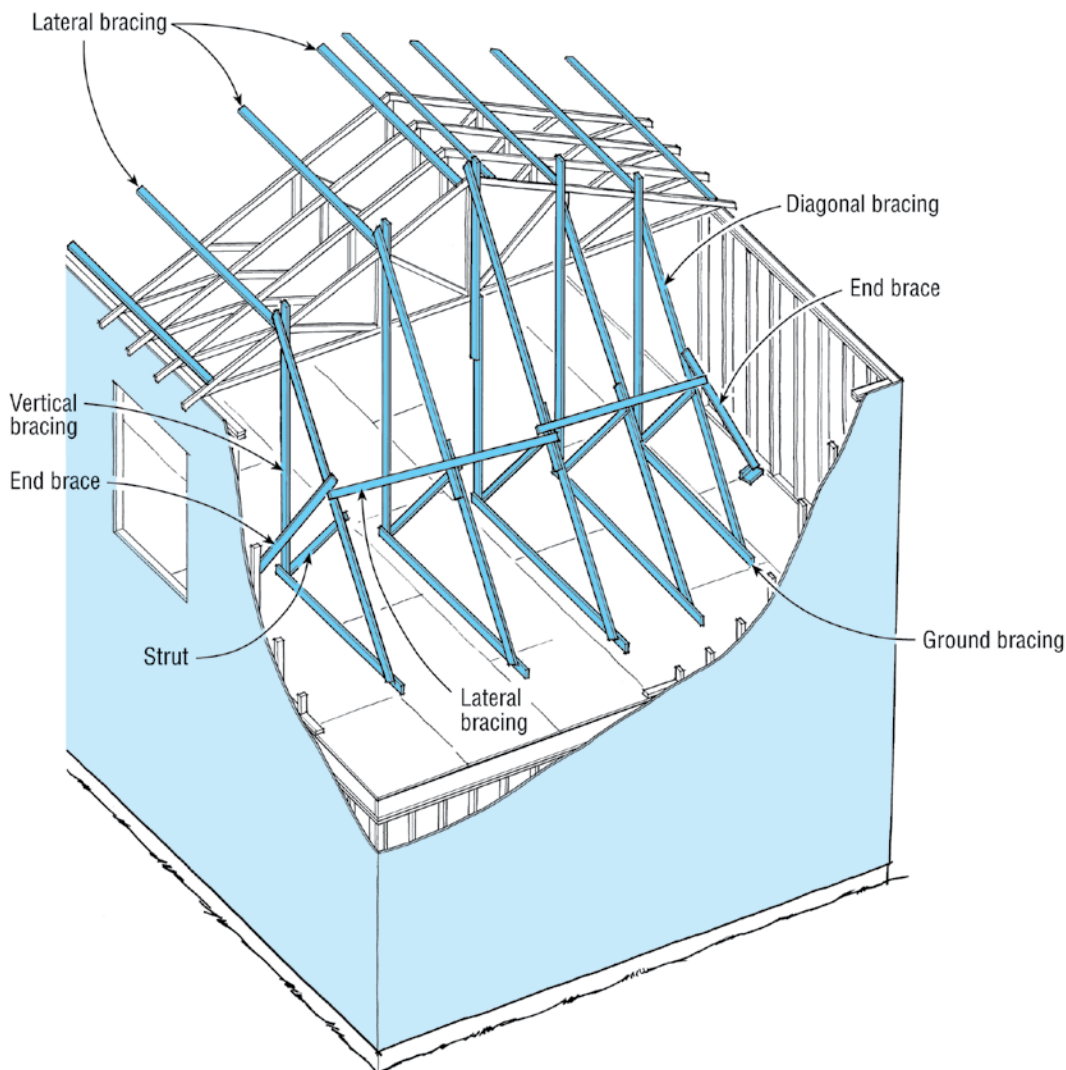
All bracing must be of 2x material.

Start with the gable-end truss. Most builders start by sheathing the gable-end truss on the ground and lifting that first. Unfortunately, the gable-end truss is difficult to brace back to the deck without the braces interfering with the second truss. On a one-story building, the gable-end truss can be braced to stakes driven in the ground.

Start several trusses in. Alternatively, start the first truss 8- to 12-ft. in from the gable end and brace it to the deck (**Figure C**). Then work away from the braced end, filling in the open 8- to 12-ft. section last, after permanently bracing the rest of the trusses.

Or brace the trusses to an end wall (**Figure D**). It may first be necessary to solidly brace the end wall to the deck to keep the top plate rigid.

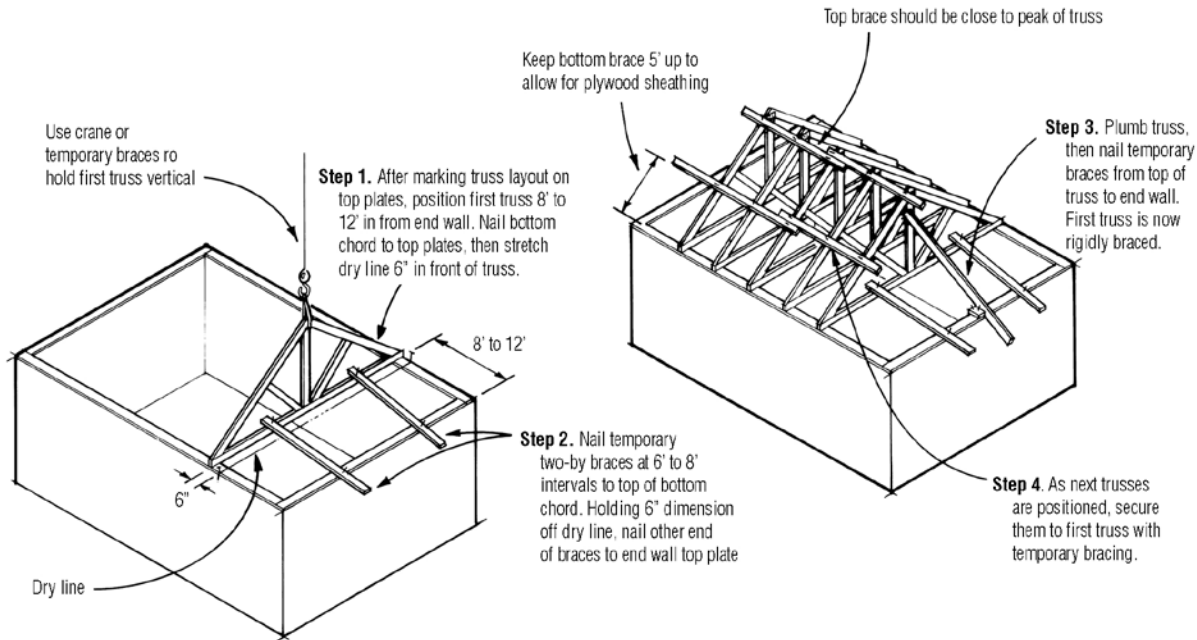
FIGURE C: BRACING TO THE DECK



The first truss must be straight and plumb and securely braced. This temporary bracing configuration, which starts several trusses in from the end and braces against the floor deck, is recommended by the Truss Plate Institute.

FIGURE D: BRACING TO THE END WALL

Bracing Roof Trusses



Builders have developed a variety of field techniques to brace the first truss. This approach requires that the end wall first be braced to keep the top plate rigid.

Temporary Bracing: Subsequent Trusses

Spacers. As trusses are added to the roof, they can be spaced from the preceding truss with short 1x4 or 2x4 spacers pre-cut to length, with light-gauge metal spacers or with heavy-duty fold-out metal braces. (The heavy metal braces can also serve as temporary lateral bracing for the top chord.)

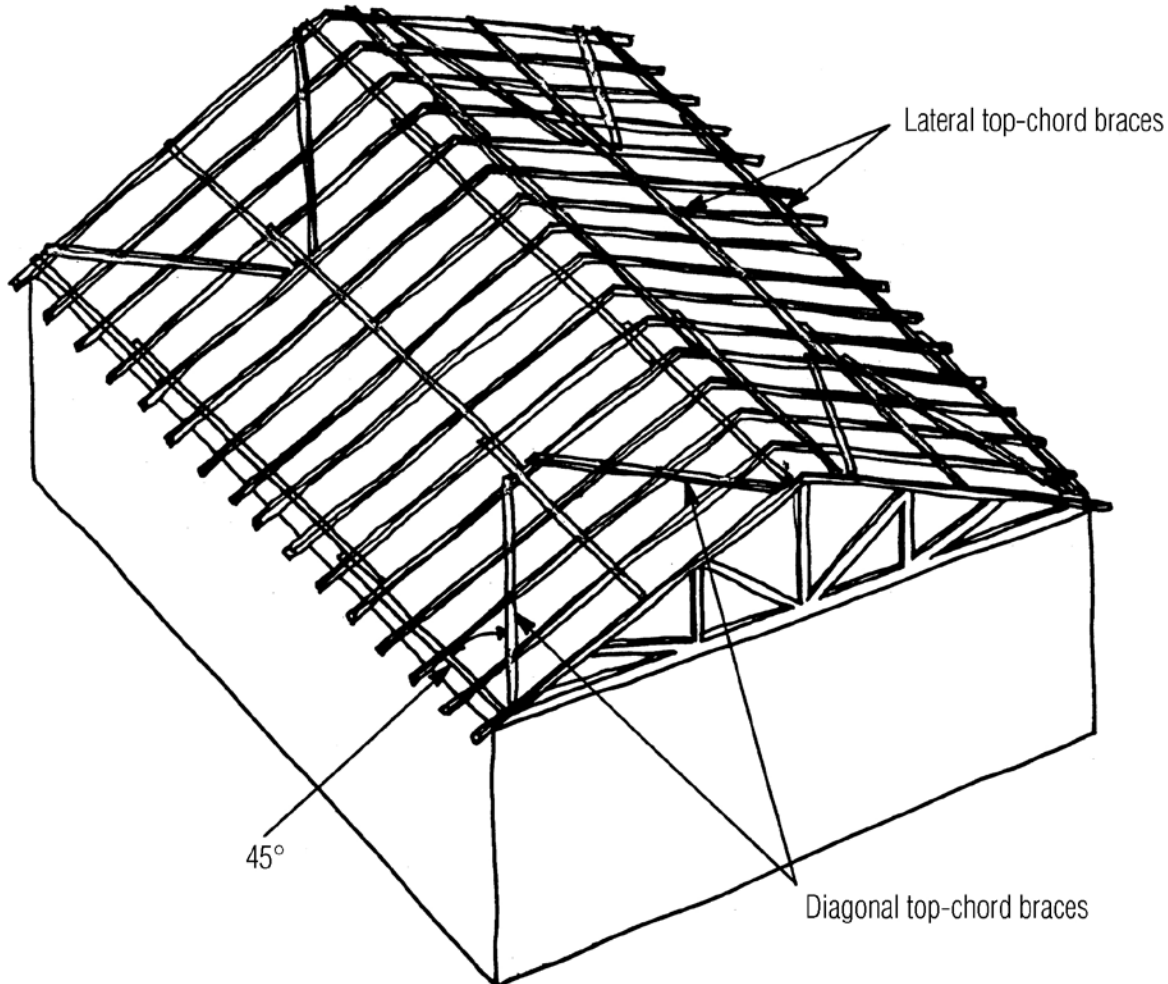
Top-chord bracing. As soon as the fourth truss is up, start fastening lateral bracing across the top chords — one brace near the peak and one near the midpoint of each top chord. If required, place diagonal bracing at each end of the roof and at 20-ft. intervals in between (**Diagonal Top-Chord Bracing, below**).

All lateral bracing should be minimum construction-grade 2x4s, at least 10 ft. long and nailed with two 16d nails at each intersection. Individual pieces should lap at least one bay.

Roof sheathing. To quickly stabilize the top chords, some builders start installing sheathing after about a dozen trusses have been installed. The sheathing acts as both temporary and permanent bracing for the top chords.

FIGURE E: DIAGONAL TOP-CHORD BRACING

Bracing Roof Trusses



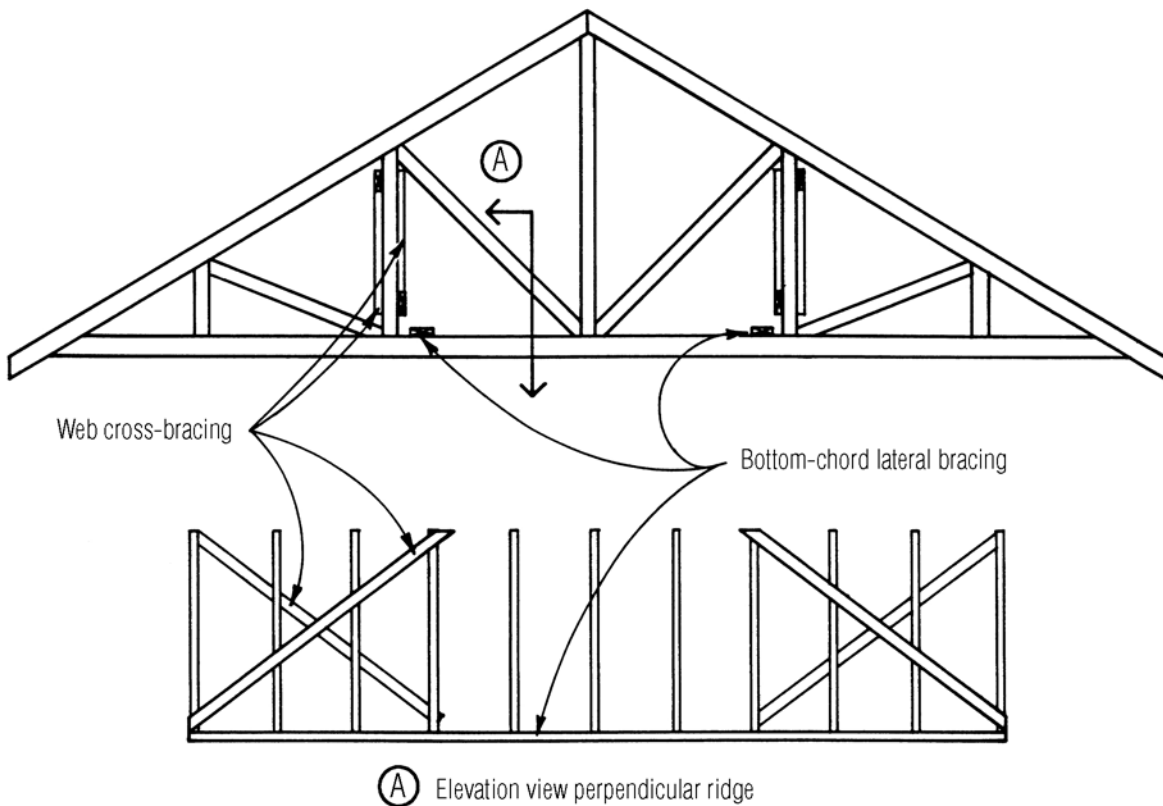
Diagonals are recommended to prevent racking until the sheathing is applied. Some builders place the lowest lateral bracing at least 4 ft. up to allow room for the first layer of plywood.

To simplify installation of the sheathing, some builders keep the lower top-chord braces 5 ft. up from the eaves line to allow room for the first course of sheathing. Unless the sheathing is installed shortly after erecting the trusses, diagonal top-chord braces may be needed to prevent racking in the roof or truss collapse.

Bottom-chord bracing. After the fourth truss is up, also start installing lateral bracing on the bottom chord (along its top edge if the bottom chords are receiving drywall). Install bottom-chord bracing according to the permanent bracing plan and leave in place. On large trusses, diagonal bottom-chord bracing may be required at each end and at 20-ft. intervals in between.

Web cross-bracing. After the fourth truss is up, also start fastening diagonal cross-bracing to the vertical webs. Cross-bracing of the vertical webs goes in an X pattern at each end of the building and every 20 ft. in between (**Figure F**). Install web cross-bracing according to the permanent bracing plan and leave in place.

FIGURE F: BOTTOM-CHORD BRACING AND WEB CROSS-BRACING



Bottom-chord bracing should be no more than 15 ft. o.c. Pairs of web cross-braces triangulate the trusses on each end of the building and every 20 ft. in between. These braces should be installed according to the permanent bracing plan and left in place.

Permanent Truss Bracing

To perform as designed, roof trusses require permanent bracing after assembly, as specified by the “designer of record” on the job. In the absence of an architect or engineer, this responsibility may fall to the general contractor.

Permanent bracing typically consists of many of the same elements as the temporary bracing (**Figure F**), most of which are left in place after construction. One exception is any top-chord bracing, which must be removed to allow installation of the roof sheathing. The roof sheathing then serves as permanent top-chord bracing.

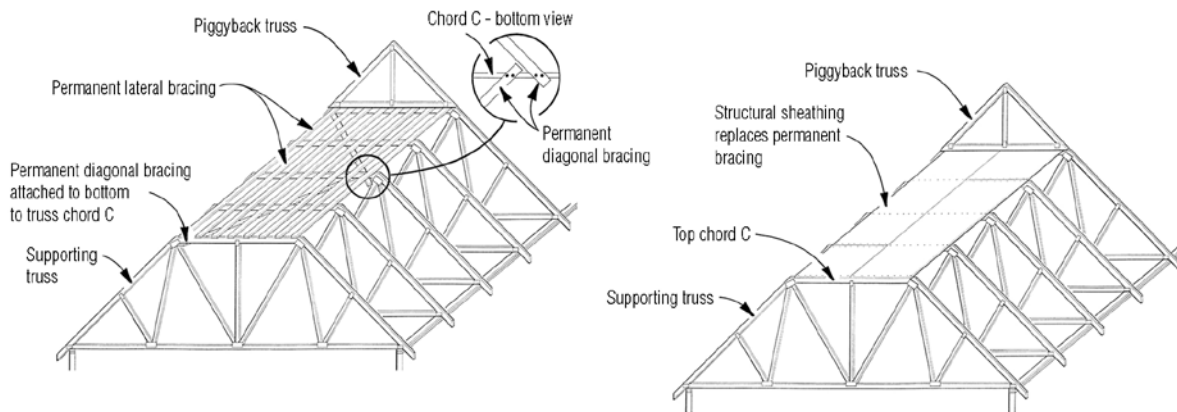
PIGGYBACK TRUSSES

When trusses exceed 12- to 14-ft. in height, they are typically shipped in two sections to comply with highway transportation limits. These so-called “piggyback trusses” have special bracing requirements. Ignoring these requirements can lead to catastrophic failure under heavy loads such as snow.

Piggyback Trusses

In particular, it is critical to stabilize the top chords of the lower truss sections with either plywood or diagonal bracing (Figure G). Other permanent bracing may also be required.

FIGURE G: BRACING PIGGYBACK TRUSSES



Proper bracing of chord C is critical in piggyback trusses. Use lateral bracing above and diagonal bracing below chord C (left), or use structural sheathing (right). With proper nailing, the sheathing acts as a diaphragm providing both lateral and diagonal bracing.