



Township of Lower Makefield
OFFICE OF THE FIRE SERVICE DIRECTOR
1100 Edgewood Road Yardley, PA 19067
(267) 274-1127 firesafety@lmt.org



TRUSS IDENTIFICATION INFORMATION

History

A truss is a structural component that is made up of smaller members that are arranged in triangles and connected at their intersections. Individual truss members are either in compression or in tension. Trusses are usually used to span distances that are too long for conventional beams; or, in smaller dimensions, to reduce weight and cost during construction.

The structure in this photo was built around 1960, and used the bowstring truss so that there would be a large unobstructed floor area for retail sales and so that the roof would easily shed rain and melting snow. These trusses are usually built of either wood or steel, although some have wood for the top and bottom chords and steel for the web members. Bowstring trusses were originally designed for bridges but became popular during World War II to support the long roof spans of aircraft hangers and manufacturing facilities.



Throughout past decades, fires in buildings with bowstring truss roofs have caused catastrophic structural failures that have claimed the lives of firefighters. Among these were the 1988 Ford dealership in Hackensack, New Jersey, and the 2012 theater fire in Abbotsford, Wisconsin.

Trusses have been in common use in North America since before 1800. Some truss designs were developed for bridges and adapted for use in buildings. The photo here shows a timber roof truss in a "mill" (the ancestor of modern Type IV or heavy timber) building from 1840. The compression members of this truss are of wood, ranging from 8 x 8 inches to 12 x 12 inches. The tension members of this truss are wrought-iron rods.





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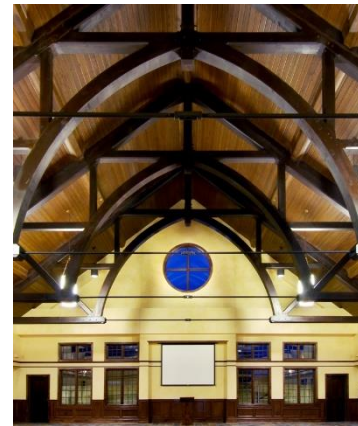
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The photo here shows the trusses supporting the ceiling and roof assembly of a church, built in the late 1800s. The ceiling in this church is attached to the bottom of the same rafters that support the roof. These trusses are not only decorative—they support the ceiling and roof.

Wood trusses were in use in Europe for centuries before they appeared in North America; and were in widespread use during the Middle Ages. The roof of Westminster Hall in London, England was completed in the late 1390s, with a span of 66 feet.

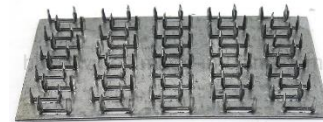
The modern wood truss made of wood and metal gusset plates was developed in the 1950s, was widely used by the 1970s, and is common today in both new construction and remodeling. Steel bar joists are common in both buildings with masonry load-bearing walls and in buildings with structural steel frames.



Trusses of any age or design have common characteristics:

- Trusses use the least amount of material to achieve the greatest strength for long spans.
- Trusses have a smaller cross-section and considerably less mass than a solid beam of the same strength, resulting in less inherent fire resistance and early failure in fires.
- Failure of a single connection can cause the failure of the entire truss.
- Failure of either the top chord or bottom chord can cause the failure of the entire truss.

A metal plate connector or “gusset plate” hails originally from Fort Lauderdale, Florida, in 1958. Originally dubbed “grip plate for truss,” they are metal plates made of light gauge steel that are hydraulically pressed on one side, forming small spikes or teeth on the other side. The teeth of the metal plate connector are about 1/4-3/8 inch. The plates are secured by hand at first to truss members and are then passed on to be secured by a hydraulic press. There is an allowance of a 1/8-inch max space between web and chord members.





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Experience has shown us that the weakest part of a wood truss is the connection or panel point. This is where web members and chords meet by connection via a metal plate connector (gusset plate). As previously stated, they penetrate the wood fibers 1/4-3/8 inch. This connection is limited to the premise that there is no mishandling of the truss during transport and installation.



Should a truss undergo a significant impact to the panel point and the penetrations are dislodged, they cannot be appropriately set back in. It has been observed on one occasion that the gusset plate connector that was dislodged was re-secured with a 1/2-inch steel staple. Gusset plate connectors are made from galvanized light gauge cold formed steel. This type of steel experiences compromise at 800°.

Lower Makefield Township Fire Code Ordinance #433

Any commercial building construction that consists of truss floor and/or roof materials will have the appropriate signage placed on the building to advise incoming emergency responders of the hazard present. These signs are obtained by the business/property owner and shall be installed above or next to each entrance of the building unless otherwise directed by the office of the fire service director. Below are examples of what to look for in your attic or floor to determine if your building has this type of construction. Any questions please contact the office.

Example of floor truss construction (this will be scene between basement & 1st floor or between 1st floor & 2nd floor)





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Example of roof truss construction (this will be scene in the attic or ceiling of top floor)





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Below are images of what the truss identification signs look like that will be placed on the building. The signs should be a minimum of 12" W x 6" H and be reflective. Only place the sign on your building that represents the type of construction it has.



For Buildings that have Floor & Roof Trusses



For Buildings that have only Roof Trusses