Construction Concerns: Connections: Lightweight Steel Trusses

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By Gregory Havel

For www.fireengineering.com Photos by Author

These lightweight steel trusses are fabricated from galvanized steel strips that have been rolled into shapes to add strength. They are commonly used in residential and commercial construction. Photo 1 shows these trusses being set in place to support the roof of a veterinary clinic. Photo 2 shows these trusses in place to support the roof of a school building.
Photo 3 shows the end view of a bundle of trusses. Note that the cross-section of a top or bottom chord has eight 90° bends as well as several other bends, which give these truss members great rigidity when compared to the flat strip of steel from which they were formed.
Photo 4 shows the end view of trusses by another manufacturer. Note that the cross-section of a top or bottom chord has six 90° bends plus two longitudinal ribs, which give these truss members great rigidity when compared to the flat strip of steel from which they were formed.
Self-drilling screws are the most common way to assemble the trusses at the factory and connect them to the walls and other load-bearing members at the building site.

In photos 3 and 4, note that a single screw will penetrate all of the layers of the components of a truss and that several screws will be used at each panel point. These screws are designed to be installed with electric or pneumatic screw guns. The screw gun uses the drill tip of the screw to make a hole through the layers of metal to be jointed. As part of the same procedure, the screw threads into the hole when drilling is complete. An adjustable clutch on the screw gun allows the operator to set the gun so that the completed screw connectors have the proper amount of torque for maximum strength. If the clutch on the screw gun is set too tight, the screws may strip in the metal of the studs, making a loose or weak joint. If the screws are not driven home, the joint will also be weak. In either of these cases, adding moisture from weather or leaky pipes will accelerate the rusting and weakening of the joints.

Wood screws are used to connect lightweight steel truss to a wood top plate on a wall, while self-drilling screws are used to connect a steel joist or steel stud assembly. If the truss has members configured, as shown in photo 4, drive the screws through the bottom flange of the truss member. If the configuration is similar to what is shown in photo 3, you can use attachment plates (photo 5) to connect the truss to the top of the wall.

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Firefighters working inside a building with a roof supported by this type of truss should be concerned with the following:

- Since these trusses have little mass, they will begin to lose their strength at temperatures well below the temperature of a flashover, whether the roof sheathing is made of corrugated steel, plywood, or oriented strand board (OSB). These trusses may fail from the heating and softening of truss members without failure at a panel point.
- Self-drilling screws are always long and have sharp points (as shown in photos 3, 4, and 5).
- The metal shapes from which the truss members are formed are often cut to length using abrasive saw blades, which leave razor-sharp burrs (photo 3) and can damage personal protective equipment (PPE) clothing as well as the skin inside the PPE.
- Any vertical ventilation on a roof supported by these trusses is most safely done from an aerial platform or ladder.
- Roofs and other structural assemblies using these lightweight trusses deserve a note on our preincident plans for these buildings.
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