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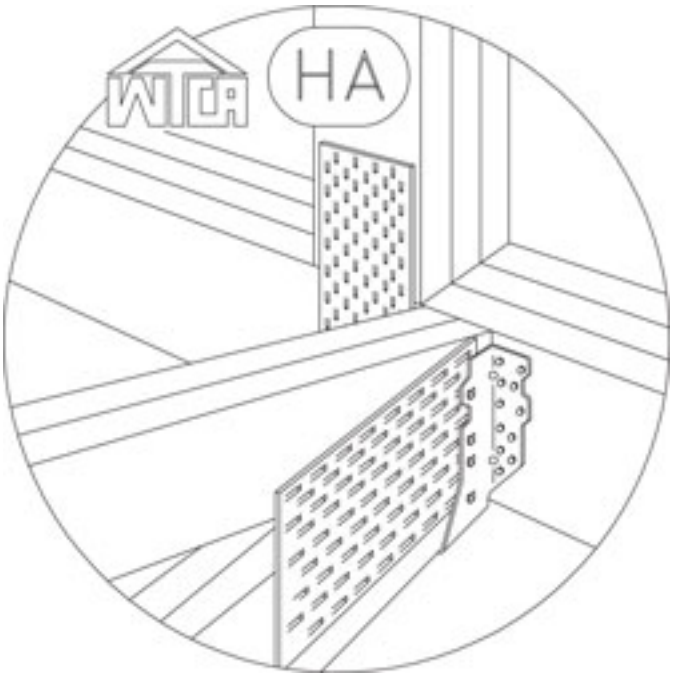
Frequently Asked Questions

Fasteners & Truss Connectors by Richard Zimmermann

Truss designers are responsible for the specification of truss to truss connections. There are two major factors that influence the ability of a connector or hanger to perform within its allowable design capacity:

- The connector design itself
- The fastener used to attach the connector to the bearing member:
  - Diameter of fastener specified
  - Quantity of fasteners specified
  - Length of fastener penetration into supporting member
  - Species of wood of the supporting member:
    - Douglas Fir/Larch (DF/L)
    - Southern Pine (SP)
    - Spruce/Pine/Fir (SPF)
    - Hem Fir (HF)
    - Other



Connectors are designed and tested rigorously to perform as listed in catalogs. The least result of three tests determines the published allowable design load:

- Ultimate test load divided by three
- Load at 1/8" deflection
- Calculated load using specified fastener design values plus seat bearing values (Generally testing is done using DF/L or SP or only DF/L)

QUESTION:

A face mounted connector is specified to carry a 2500 lb load and requires 14-16d common nails in the carrying member and 6-16d common

nails in the carried member (both members are DF/L). What are the consequences of using different fasteners from those specified?

ANSWER:

On occasion installers will use whatever nail they have in their nail pouch to fasten the connector. Or, if they look at the specifications and see 'common' nail might assume that a 16d sinker or gun nail with a similar size designation is equal to a 16d common nail.

Catalogs from the major connector suppliers include instructions to the installers cautioning them about making fastener substitutions. Since the default specification is for common nails and common nails are seldom "commonly" available, one cannot assume that the installer will even have the correct fastener on the jobsite, let alone be certain to use it. The catalogs include information on how to adjust for fastener substitutions, but these charts may not be available at the time the connectors are installed.

It is critical that the installer understands that all the specified fasteners may be required to achieve the design capacity. The load capacity for each 16d common nail in DF/L is 134 lbs. A total of 20-16d common nails are specified (20 x134 = 2680 lbs). If more than one nail is omitted, the connector will be overstressed because too few fasteners were used.

If 16d sinkers are substituted for 16d commons, the carrying capacity is only 112 lbs per fastener (20 x3 112 = 2240 lbs). One can also use the reduction factor of 0.84 from a supplied table (2680 x3 0.84 = 2251 lbs). In either case, the connector will be overstressed because the wrong diameter fastener was used.

If the specified common nail is being driven into SPF instead of DF/L, an adjustment of 0.86 will have to be applied to the load (2680 lbs x 0.86 = 2305 lbs) because fasteners do not have the same capacity in every species of lumber. The connector might be overstressed and fail because it's being nailed into a different material than originally assumed.

If the member that the fastener is being driven into is thinner than 12 times the diameter of the fastener, an additional reduction needs to be taken into account using the following equation:

$$\text{Reduced Load} = \frac{\text{Published Load x Actual Penetration}}{\text{Nail Diameter x 12}}$$

The minimum penetration of a 16d common nail is 12 x 0.162 = 1.94". If the member is a single 2x, the edge dimension is only 1.5". Thus, the reduction equation must be applied.

$$\text{Reduced Load} = \frac{134\text{ lb} \times 1.5"}{0.162 \times 12} = \frac{201}{1.94} = 103.6\text{ lb}$$

The load carrying value of each of the 16d common nails nailed into the single 2x is reduced from 134 to 103.6 lbs (20 x 103.6 = 2072 lbs). This situation might also be the cause of a

connection overstress.

Fortunately, connector failure is rare. If it happens, it is generally an installation issue—the wrong connector installed or the improper use of fasteners.

To pose a question for this column, email us at faq@woodtruss.com. To view other questions visit the WTCA website.

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