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GN GUIDELINES No. 185

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CREEPER CONNECTIONS - WILL SHE BE RIGHT?

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My previous topic on creeper trusses in Guideline No. 175 had to do specifically with their overhang support.

Now it's time to flip to the other end of the truss, to where the connection onto the hip truss is another place where the rulebook (namely AS 4440 - Installation of Nailplated Timber Roof Trusses) has sometimes been ignored by ill-informed builders.

Many builders in North Queensland like batten screws and mistakenly assume they are also suitable for creeper connections. Don't get me wrong; they are a great fastener that are easy to install and have good capacities.

But there are several constraints that limit their usefulness in hip end creeper connections. So let's go through them.

INADEQUATE END DISTANCE

The Standards require batten screws to have a minimum distance of 10 x screw diameter from the end of a timber member.

A 14g (6.3mm diameter) screw must therefore not be driven within 63mm from the end. That is very difficult to achieve when a creeper truss is 45° to the hip girder.

If a 14g screw is closer than 63mm from the end (Figure 1), it is likely to initiate splitting either immediately during installation or when a load is applied, e.g. when someone walks on the roof or during a severe event such as a cyclonic storm.

The moment timber splits, the connection loses its integrity and strength and risks complete failure.

Figure 1 – Too close to end grain

EXPOSED SHANK

If an attempt is made to meet the minimum end distance, the shank of the batten screw will become exposed between the creeper truss and hip girder (Figure 2).

The design screw capacity in the Timber Code requires the screw to be fully embedded.

If a part of the screw (about 15mm in this example) is exposed, the exposed shank will easily bend under load, which will eventually result in excessive movement and premature failure.

INADEQUATE EMBEDMENT

The third deficiency of a 14g batten screw in a creeper connection is that it does not develop sufficient embedment in either the creeper truss or the hip girder to develop full strength.

The required embedment to develop full strength is 63mm in the first member and 45mm into the second member.

As both members are usually only 35mm thick, the reduced embedment means a reduced capacity.

In fact the code states that a screw is virtually useless if its embedment is less than 25mm.

So a 75mm long screw entering the creeper truss at an angle and having about 15mm of its shaft exposed will result in less than 25mm embedment into the hip girder; which means that this connection is highly unreliable.

Figure 2 – Exposed shank

LABORATORY PROOF TESTING

The Australian Standard AS 4440 stipulates the use of a Creeper Connector plate (Figure 3) and does not accept batten screws for joining these trusses together.

A batten screw cannot be substituted for a Creeper Connector plate because its design capacity just doesn't stack up.

To demonstrate this, we conducted a laboratory test to compare the performance of a 14g x 100mm Type 17 bugle head batten screw (assembled as shown in Fig 2 with additional 2/3.1 x 75mm skewed nails) against a standard Creeper Connector plate. The results are shown in Figure 4.

Figure 3 - Correct Creeper Connector

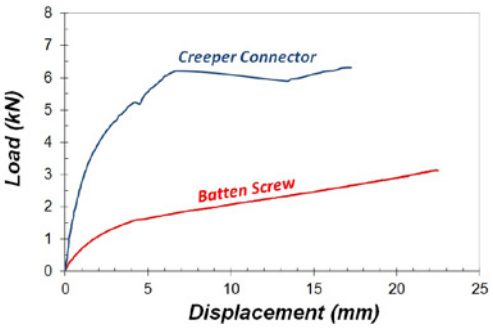

Figure 4 - Performance comparison

Notice firstly how the Creeper Connector reached a maximum load of 6.3kN whereas the batten screw came apart before it even reached half way.

Secondly, observe how much steeper the blue line is than the red line which shows how much more rigid a Creeper Connector is.

At 2.5kN, the Creeper Connector joint slipped only 1mm whereas the batten screw moved 18mm under the same load.

Maybe there is good reason why batten screws are not called creeper screws.

So the next time creeper trusses appear in your job, make sure that Creeper Connectors are supplied and installed according to AS 4440. TTN