FTMA TECH Talk

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THE IMPORTANCE OF PLATE PLACEMENT

Plate placement is a bit like driving a car. Your manufacturing plant will have been doing this for years but one mishap and it can all go wrong with serious consequences.

Consider this tech talk a bit like a defensive driving course to remind us of some core things we need to get right to protect the engineering of the truss.

So today it is worth re-visiting some of the fundamental requirements for one of the cornerstone products of the frame and truss industry – metal connector plates, and their placement in the assembly of trusses.

While software functionality may vary between suppliers, the net outcome from the software is to produce a truss that has a metal connector plate fitted to each joint that has sufficient design capacity to meet the expected loads for the design life of each truss.

In understanding how these designs come about it is worth noting that timber has an inherent tendency to split when fixings are made too close to the edge and the ends. The Australian Standards nominates edge distances for nails and screws to accommodate for this.

It is usually determined as a multiple of the diameter of the fixing.

Typical edge and end distances for fasteners are listed below:

	Edge Distance	End distance
2.8mm nails	14	56
12 Gauge screws	28	56

This is one of the beautiful things about metal connector plates.

Due to the small profile of individual teeth in the metal plates and the fact they are mechanically pressed into place the tendency for the timber to split is significantly mitigated which allows the edge and end distances to reduce accordingly.

This is shown graphically in Fig 1 below.

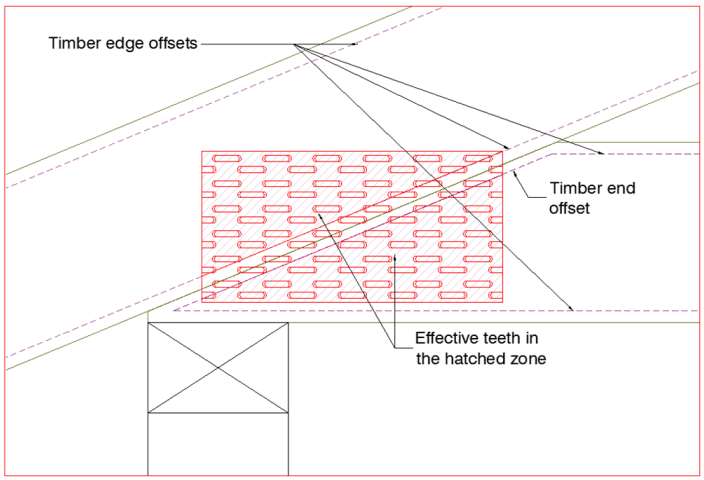

Fig 1.

Each of the pre-punched teeth in a metal connector plate has an ability to carry load.

The net number of teeth inside the 'effective teeth zone' (set by the timber edge and end offsets) all contribute towards resisting the design loads for each joint.

After the analysis of the tension or compression loads in each of the truss components is completed, then the cumulative number of teeth required for each member is calculated and the required plate is specified.

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Once the plate size is specified on the manufacturing sheet it then becomes critical to ensure the correct sized plate is selected and it is positioned accurately during production.

Plate position is typically nominated on the truss production sheets with a horizontal and vertical dimension from a nominated set-out point – see example in Fig 2 below.

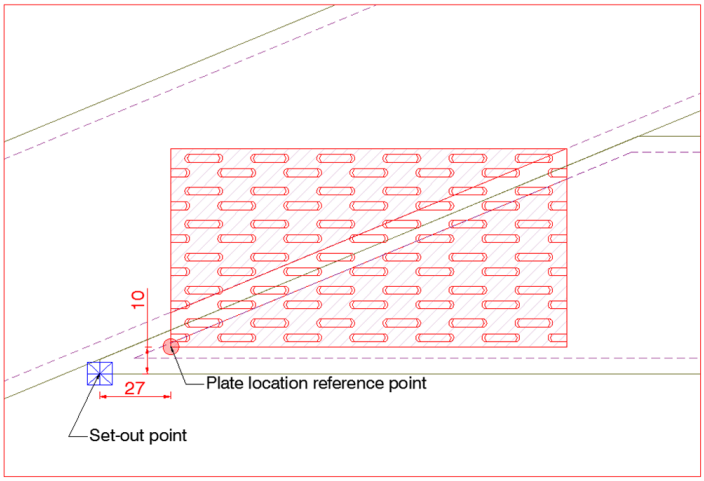

Fig 2.

Plate position becomes even more critical for highly loaded trusses such as Girder trusses, as the design loads may start reaching the upper threshold of the design capacity of the plates.

As shown in Fig 3 (top right) a 10mm variation in plate placement can shift the effective teeth significantly in one of the members - in this case around 20-25% effective plate area is lost in the bottom chord!

If the plate is close to its design capacity then this can be enough to compromise the integrity of the joint.

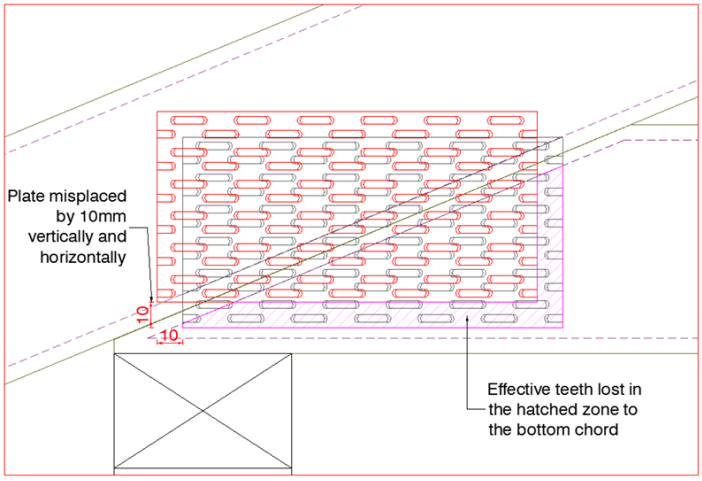

Fig 3.

A similar situation would exist if the plate was installed with an angular displacement as shown in Fig 4 below.

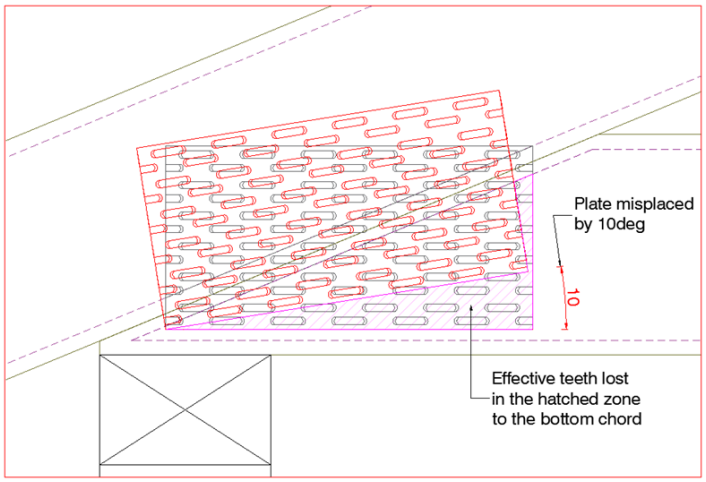

Fig 4.

It is critical to ensure that plate size and placement matches the design and location outputs from suppliers design software.

If inconsistent location tolerances are noted in manufacturing it is worth upsizing plates to allow for this variation or providing a design buffer in the software settings to allow for a suitable positional tolerance.

This edition of FTMA Tech Talk was written by Ian Hayward, Engineering Manager of our Gold Sponsor, Pryda.

If you have any questions for Ian, please don't hesitate to contact him.

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