NO PLACE FOR MISPLACEMENT

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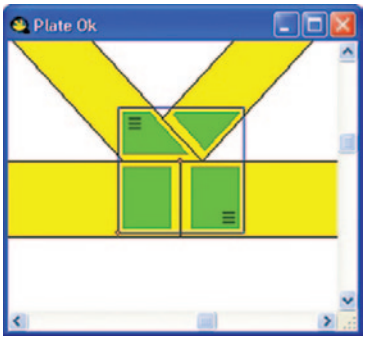

Figure 1: Perfect Placement

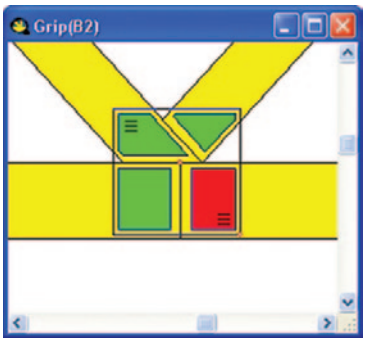

Figure 2: Misplacement Error

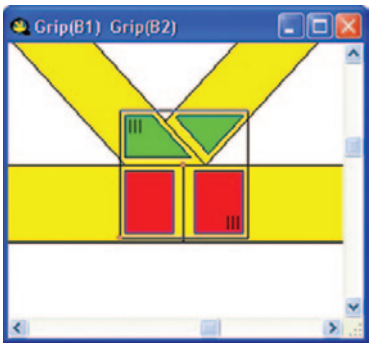

Figure 3: Disorientation Error

In previous articles on effective nailplated joints, GN Guidelines No. 80 addressed the importance of full embedment into timber and No.127 stressed the quality of timber in the plated zone.

In this GN Guideline, the significance of nailplate selection, orientation and placement will be highlighted.

I was recently involved in two separate projects where inaccurate nailplate placement led to truss failures.

One case involved a run of standard trusses and the other related to a couple of girder trusses.

They were residential applications and were manufactured approximately five years and nine years ago, respectively.

The failures were first noticed when large ceiling deflections started to occur.

In both cases, some nailplates were not pressed into their correct positions as shown in their detailing sheets and as a result, there were insufficient teeth in the tension webs to prevent them pulling away from their joints.

Millions of dollars are spent each year by this nailplate manufacturer (and others) to develop design software that processes very complex truss calculations in milliseconds.

The analyses cover every member and every joint of every truss in various permutations of loads. It then calculates the optimum nailplate that is able to resist every load combination.

A typical joint design routine starts with the smallest plate size in the inventory and checks its suitability in a range of positions.

If it does not satisfy strength requirements, the design cycles to the next smallest nailplate until a suitable plate is found.

In examining plate strength, allowance is made for a slight potential misplacement of the nailplate (usually no more than ± 6mm) as well as the ineffectiveness of some teeth in close proximity to timber edges.

Figure 1 shows a typical panel point splice that has been successfully designed.

The hatch lines in the nailplate show the direction of the nailplate axis, which in this case indicates that the nail slots are to be placed parallel to the bottom chord.

A highlighted green area indicates that there is sufficient nail coverage in that timber member.

If the nailplate is then moved just a few millimetres to the left as shown in Figure 2, the highlighted red area tells us that there are now insufficient teeth into the bottom chord member on the right.

If the nailplate was placed in the correct location (as in Figure 1) but rotated through 90° as shown in Figure 3, the teeth in the bottom chords are no longer adequate because the strength capacity of tooth nails has a complex relationship with the plate axis, timber grain and load direction.

Another step to be careful of is picking the correct gauge of nailplate for placement. Some heavily loaded trusses such as girder trusses require thicker gauge nailplates to resist higher forces.

However, while thicker gauge nailplate's size and tooth profile may appear very similar to standard thinner nailplates its characteristics are quite different.

Although thicker gauge plates have higher steel strengths than thinner gauges, they do not always have as many teeth.

As a result, they may actually be weaker in tooth grip. So it is important to pick the exact gauge of nailplate shown in the detailing sheets and not to select a thicker or thinner gauge without approval.

However, it is acceptable to use a larger nailplate of the same gauge to compensate for some minor timber defect or if the exact size were out of stock.

In this case, it is essential that the direction of nailplate orientation is maintained and that the minimum required coverage into each member (as shown in the detailing sheet) is retained, with extra coverage into the defective member as necessary.

Good quality control measures are necessary to ensure that timber is free from defects at joints and that nailplate sizes, gauge, orientation, location and embedment are compliant.

Automated presses with cassette feeds or laser projection systems can also help overcome manual oversight and prevent mistakes. TTN