GANG-NAIL GUIDELINES No.101

ANOTHER MITEK ADVANTAGE

THE BACKGROUND TO JOINT GROUPS

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We are all aware that timber fasteners have design properties which differ across the range of timber species.

Today, the performance of fasteners such as nails, screws and bolts is determined largely by the density of the timber in which they are being used.

The higher the density, the better the fasteners are expected to perform.

This simple approach was not the case a few decades ago.

In the late 1960's, engineers were presented with a problem of designing timber structures at that time when the commonly available structural timber was a mixed species of green hardwoods.

In fact, there were some 200 odd species of hardwoods being harvested, most of which was not identified but sold as a regional mixed species groups, e.g. "Victorian Hardwood" or "Southern Highlands Hardwood".

How were they to know the strength of a fastener in this vast range of timber species?

To overcome this problem, a "Joint Group" system was introduced with the first Australian timber engineering code in 1972.

It was found that the strength of a connector was somewhat aligned with the density of the material into which it was fastened.

Hence, this system used the average species density range as a means of classifying that species into a connection strength group, called a "Joint Group".

The joint group system works well for connectors such as nails, screws and bolts where the fasteners penetrate deep into the timber and cross multiple growth rings.

The fact that these fasteners penetrate multiple growth rings overcomes the effect of the very large variation of the density of wood fibre between the late wood (the dense dark wood) and the early wood (the lighter soft wood) of the timber's growth rings.

In other words, the deep penetration of these types of fasteners has an effect of averaging the variation in timber density, thereby making the use of the species average density a relatively good indicator of the fastener's performance.

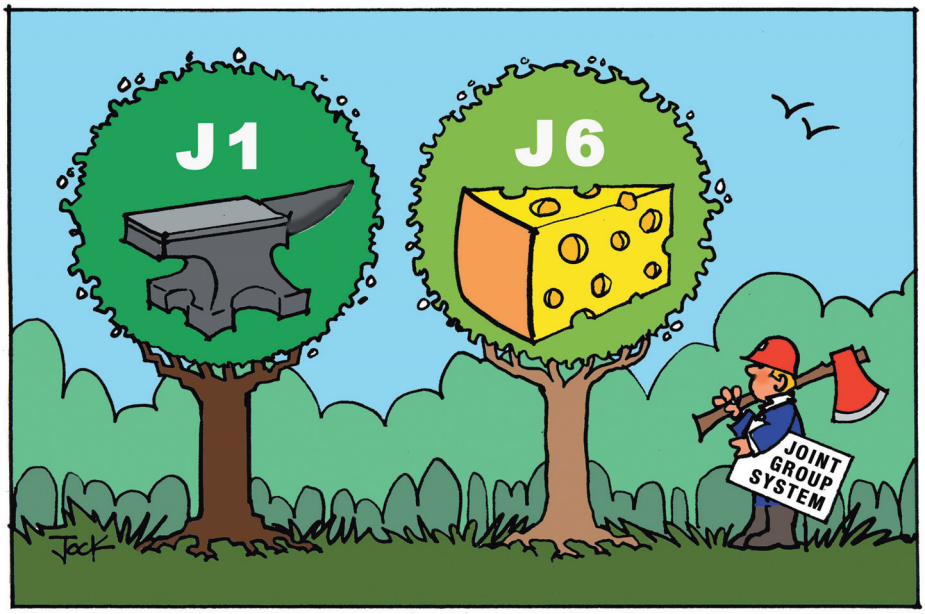
This solved the problem of having to test connectors in each and every species of commercially available timbers in Australia.

By simply knowing the average density range of the species across all strength grades, designers could now predict the strength of a fastener in that material with some confidence.

For simplicity, the timber code classifies the joint groups into a limited range between J1 to J6 for unseasoned timber, and JD1 to JD6 for seasoned timbers.

The lowest joint group number represents the strongest connector performance.

When designing timber-to-timber connections (such as girder boots, or truss tie down), the weakest joint group of the different members in the assembly should be the one used in determining the capacity of the fixing.



Hence, apart from a heavier connection, a simple way of increasing the capacity of a connection is to improve the joint group of the weakest member.

In my next Gang-Nail Guideline, I will explain why nailplates do not fit neatly into joint groups based on simple density ranges as nails, bolts and screws do, and discuss the impact on truss design and fabrication.