

TIMBER vs. STEEL

Timber and Steel are different materials that perform in different ways. Steel is a dense, man-made material with isotropic properties (they are the same in all directions). In comparison, Timber is not as dense, is a natural material with imperfections, and is anisotropic. This means for timber the properties are different measured along the grain or across the grain. Taking this into account there are benefits in using timber including workability and cost.

If you look at the properties of Radiata Pine LVL for example compared with Steel, you have bending strengths of **40MPa** (300 deep) and **250MPa** respectively. Taking the density differences into account the comparison is **65kPa/kg** and **33kPa/kg**, meaning that the timber option is almost twice as strong as steel weight for weight. Stiffness is the other main property and the base values are **13200MPa** and **210000MPa**. Adjusting for density the comparative values are **21MPa/kg** and **27MPa/kg**. Therefore, weight for weight steel is stiffer than timber. This helps to decide where to use steel and where to use timber.

When projects come in to the office to be designed or quoted there are often some engineering drawings which give preliminary sizes. These contain the steel beams and posts the engineer has calculated along with the timber beams to be used. In many cases the timber beams are referenced as TB (Timber Beam by others). This essentially means that the merchant or frame and truss plant needs to size and supply the beam. If you are sizing the timber beams, why not go the extra mile and see if you can substitute steel members with timber where appropriate. It will give you incremental sales (you would not have got this if you hadn't tried) and therefore a higher dollar value for the job.

SO WHICH BEAMS CAN YOU LOOK AT REPLACING?

There is one situation where it is best to keep the beam as steel and this is if it is supporting brickwork. Masonry sucks up moisture when it gets wet which can be transferred down into supporting beams and it also tends to crack easily if there is deflection in supports. As noted above steel is stiffer than timber weight for weight and hot rolled sections are also more durable under long term moisture conditions, therefore steel is the better option. This includes the posts supporting the steel beam.

Apart from this one case it is an open book to the potential for steel members to be converted to timber. There are instances where this is not practical though, like a large span bearer in a floor over an open plan area below. In this case it is best to keep the beam depth the same as the floor joist depth, so the design may have to be limited to steel. But let's look at other common residential scenarios like in ground floor external walls; you can make the top floor walls shorter to fit in a deep timber beam. Steel portals around large void areas can be substituted with timber portals. Steel posts under both steel and timber beams (unless supporting brickwork) can be replaced with timber studs/posts. Timber studs are much more efficient as they can be built into pre-fabricated wall frames rather than trying to cut in the wall frames to match steel posts.

The other sector which is more compelling is commercial jobs. There are numerous projects such as aged care homes that are part timber truss and have the open areas as steel beams and light weight steel purlins. I have looked at many of these and been able to provide solutions where the steel beams are replaced with girder trusses and the purlins are timber (LVL or I-joist). This creates incremental sales with little effort and makes the install easier for the builder as you no longer have to try and combine steel and timber to match up.

There are some items to note when trying to convert members from steel to timber. Firstly, the builder should be willing to embrace the change; which they usually are when you identify the 5-40% overall cost savings. You also need to confirm with the engineer that the designed members have no other loading on them which will affect the size. This is normally why a detailer will not progress down this path as they are not confident with taking responsibility for the design change. Meyer Timber technical personnel can come in at this point to assist. Our detailers can take care of the standard changes, and I can review the more technical projects, discussing options with builders, certifiers, engineers and developers. Not only can this increase your sales figure on the project but with continual substitution it will also filter through to the construction community that timber is a viable option to carry high loads and be competitive in commercial projects.