"TO BE DESIGNED BY THE FABRICATOR"

by ROBERT TAN
Senior Engineer,
MiTek Australia Limited

Over the past few years I have received an increasing number of complaints over tender drawings which carry the notoriously vexatious disclaimer, "... to be designed by the truss manufacturer."

And in most cases this is not confined to ordinary truss designs. One could speculate the possible reasons for this development, such as trends toward design and build projects, reduced consultant fees through competition, increasing sophistication and specialisation of timber roof structures and scarcity of engineers skilled in timber design.

However, there are great dangers in relegating design responsibility without adequate communication and co-ordination. This is particularly so when such plans do not clearly list the structural aspects expected of the truss manufacturer in design.

Of concern is the fact that the fabricator is being relied upon more and more to provide truss designs that have to resist loads beyond simple vertical loads. The inclusion of lateral or horizontal loads in the design of roof systems is a trap for the unwary.

Truss detailers all comprehend the concept of trusses supporting gravity loads and wind uplift. However, it is unreasonable to expect them to understand the structural relationships between different building components in stabilising an entire building.

For example, when the wind blows against a wall, it has to be supported by the floor and ceiling diaphragm so it does not fall over. And the ceiling diaphragm has to be strong enough to transfer these lateral loads to the bracing walls that may be quite far away. A suspended ceiling does not provide any diaphragm action. The standard roof-bracing layout is designed only for truss stability and not the stability of the building as a whole.

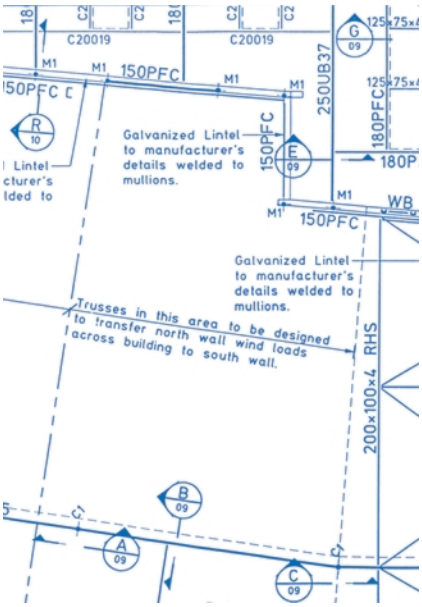
The responsible engineer should provide designs on how these wind loads will be restrained. Some expect the truss manufacturer to provide the complex engineering necessary to stabilize the building.

So for the suspended ceiling situation, some of the typical considerations are:

A ceiling diaphragm - This may take the form of diagonal speedbrace, plywood panels or wind trusses. It has to serve the dual function of stabilizing truss bottom chords under wind uplift and supporting lateral wind loads on external walls. Some designs include diagonal steel rod bracing that relies on trusses at the nodes to act in compression.

Location of bracing walls - The further apart bracing walls are, the stronger the diaphragm has to be. If the location and distribution of bracing walls are uneven, eccentric or lopsided, the diaphragm has to also resist torsional twisting.

Load transfer to diaphragm - With wind trusses and plywood panels that are typically on one side of the building, struts are required to transfer lateral (compression and tension) loads from walls at the other side. Truss bottom chords may have to be designed to act as these struts and ties.



Connection of diaphragm to bracing walls - The diaphragm has to be adequately fixed to the bracing walls.

With diagonal speedbrace, it may require local plywood ceiling panels on the truss bottom chords that are also connected to the top of bracing walls.

I am in praise of designers who provide all these structural details on their drawings. It is reasonable to request input from truss manufacturers where proprietary design is necessary, such as wind trusses.

In my opinion, it is risky to expect the truss manufacturer to develop a suitable structural system from scratch.

It would be better for the responsible engineer to decide on the structural system and have the drawings clearly mark the components to be supplied by the truss manufacturer to meet these requirements. Specific load information should also be provided for each component that has to be designed.

Fabricators should make use of engineering services by their nailplate supplier to assist in design and also to detect any traps or omissions that may be present. Feasibility and preliminary design services are also available to all consultants to help set up a workable plan that will ensure a smooth project.