Autobuild News

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BUILDING ON INNOVATION

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SOLVING THE CAMBER PROBLEM

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Even the simplest of buildings will consist of a number of small components working together to form a suitably strong and stiff frame on which to place cladding material to protect occupants from the elements of weather, and for appearance.

In a typical brick veneer house these smaller components include roof battens, roof trusses, wall frames and possibly floor joists and bearers. Cladding material is typically brick, tiles, plaster, windows and doors.

The performance of these cladding materials is very much dependant on the strength and stiffness of frame elements such as trusses. Failure in the frame element may lead to failure in the cladding material resulting in an unsightly or unserviceable building.

To fail, a member does not necessarily have to break or fall down. Serviceability failures due to excessive movement in the frame, or frame element, may not be as spectacular as strength failures, but can still be very costly to repair as they are generally not noticed until the building has been finished and requires not only repair to the frame or trusses, but also to the cladding, cornice, flashings and paintwork.

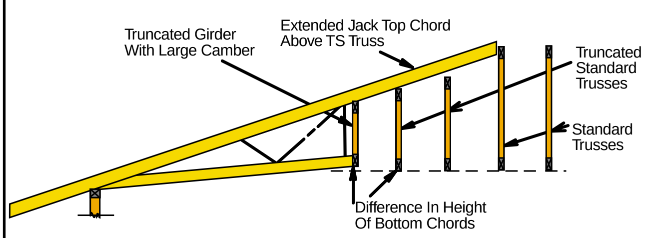
Most serviceability problems with roof trusses can be avoided by designing and manufacturing trusses with suitable camber.

TRUSSES WITH LARGE CAMBERS

Large cambers in standard trusses may result in significant height differences between truss and internal walls creating problems for plasterers when fixing plasterboard sheets and cornice. Note that the slotted holes on the Gang-Nail Internal Wall Bracket are 30mm long to allow for up to 25mm movement after installation. They are not suitable for use on trusses with cambers greater than 25mm.

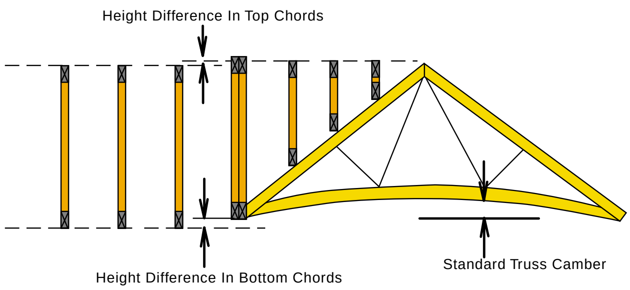
Large relative cambers between adjacent trusses in a roof structure may also create problems for both tilers and plasterers. For example, where camber in the Truncated Girder of a hip end is significantly larger than camber in an adjacent Truncated Standard, the extension to the Jack truss top chord will be higher than the Truncated Standard truss as shown in Figure 2. This may tempt the builder to either pack between the extended Jack top chord and Truncated Standard, or birdsmouth the Jack top chord at the Truncated Girder. Either option may result in an unsatisfactory roof after loading with tiles or sheet. In addition the height difference between bottom chords on the Truncated Girder and Truncated Standard may create difficulties for the plasterer.

FIGURE 2 – Section Through Hip End



Similar problems would be encountered with large camber in a Standard Girder truss relative to the adjacent Standard as shown in Figure 3. Large cambers in this case would make it difficult for the plasterer to achieve a level ceiling under long term loading.

FIGURE 3 – Section through girder carrying standard trusses.



SPECIAL CASES

Relative camber between Standard trusses and Scissor, Cut-Off, Cantilever or internally supported trusses may also provide problems for following trades.

In general, Scissor trusses are shallower than adjacent Standard trusses and will require more camber. Conversely, Cut-Off trusses span less and will generally have less camber than the adjacent standard truss.

Some Cantilever trusses may require negative camber, i.e. some panels of the truss may deflect upwards on loading, while other panels will deflect down. Trusses with internal supports will have zero camber at the support with positive camber at other panel points in the bottom chord. In both cases the camber should be compared with adjacent trusses to determine camber difference before quoting or manufacturing trusses.

LIMITS ON CAMBER

Most of the above problems can be avoided by limiting truss camber as follows:

a) STANDARD TRUSSES

$$\text{Maximum Camber} = \frac{\text{Truss Span}}{300}$$

(Up to a max 20mm.)

e.g. for a 12000mm span truss the maximum camber should be the smaller of:

$$\frac{12000}{300} = 40 \text{ or } 20\text{mm.}$$

Therefore the design should be modified so that the calculated camber is 20mm or less.

b) RELATIVE TRUSSES

$$\text{Difference in Camber} = \frac{\text{Truss Spacing}}{100}$$

e.g. for trusses at 900 crs. The recommended maximum difference in camber between Girder and Standard Truss is

$$\frac{900}{100} = 9\text{mm}$$

OPTIONS FOR DETAILERS

Where truss cambers are excessive there are a number of options available including:

1) Increasing the grade of timber in the top and/or bottom chords.

2) Increasing the timber depth in the top and/or bottom chords.

3) Using thicker timber, e.g. change timber width from 35 to 45mm.

4) Using double or triple trusses.

5) Using internal supports if available.

6) Revise truss layout if possible.

When using the above options it is always necessary to redesign trusses to calculate the truss camber using the modified sizes. In some cases it may be necessary to use more than one of the above options to reduce cambers to an acceptable limit.

Applying too much camber to a truss during manufacture may also create problems as the camber may not be lost when trusses are loaded.

Be sure to check the amount of relative camber specified at each change in truss type to avoid customer dissatisfaction.