

Limits of use for Trussed Rafters

Trussed rafters provide a flexible method of framing many required roof profiles. However, due to the commercial limits of available timber sections, transport limitations for length and height and

manufacturing limitations of the pressing machinery, the following section provides some ideas as to the types of truss available in the UK and Eire at present.

Physical Dimensions

Trussed rafters can be manufactured in spans up to approximately 20 metres and heights up to approximately 5 metres, although the more normal range is 15 metres span and 3.5 metres high.

Trusses outside the above ranges may be manufactured in two or more sections and site-assembled to the required profile (see section 3.4 on two-tier construction).

Timber Sections

Trussed rafters up to 11 metres in span will generally be fabricated from minimum 35 mm thick timbers. For trusses over 11 metres and up to 16 metres in span, thicker timber sections up to 47mm wide will

be used. Above 16 metres in span trusses will consist of multiple trussed rafters permanently fastened together by the manufacturer in the factory, or a greater width than 47mm may be used.

Profile

Within the above physical limits, many profiles of roof truss are possible, depending on the requirements of the roofscape. The creation of cantilevers over supports, the cutting back of a profile to form a recessed 'bobtail' area, the introduction of a pitched ceiling to form a 'scissor' truss, the creation of hip end and corner framing and many more common and not so common roof shapes are easily achieved by specification of trussed rafters.

It should also be remembered that, to avoid problems with both manufacturing and deflection of the roof structure, the trussed rafter profile should be of sufficient depth overall.

The recommended minimum depth for manufacturing purposes is approximately 600mm. The recommendation for structural depth is that the span of the trussed rafter divided by its overall depth should not be greater than 6.67. (This is known as the span to depth ratio).

Cantilevered hip ends and corners can create problems due to a pivoting effect if the cantilever distance is very large and will also require special propping arrangements to be made for loose timber hipboards and jack rafters.

Careful geometry checks should be made if a cantilevered area and an area with standard bearing abut each other to avoid any problems with roof alignment.

Basic Design Principles

A trussed rafter is an engineered framework consisting of structural members forming triangles. The framework derives its inherent strength from this triangulation.

The members around the perimeter of the trussed rafter are known as Chords (top and bottom, also called rafters and ceiling ties), and the internal

members providing the internal triangles are known as Webs (sometimes also called struts and ties).

A true trussed rafter is formed only when the webs form triangles between the top and bottom chords. Attic frames and Raised-Tie trusses (see section 1.7 and 3.13), do not provide this triangulation and are therefore technically not trussed rafters.

Principles of design

When loading is applied to a trussed rafter (from tiles, ceiling construction, snow etc), forces are generated in the members forming the truss.

The magnitude of the bending moment in a particular chord is largely due to the Panel Length (the distance between the joints at each end of the member, usually measured horizontally, also known as the Bay

Length). The general rule is, the longer the panel length the greater the bending moment and hence the larger the section of timber required to safely resist these forces.

Further, BS.5268-3 defines the maximum bay lengths permitted in Table 3 (page 5) a copy of which is given below:

Figure 1

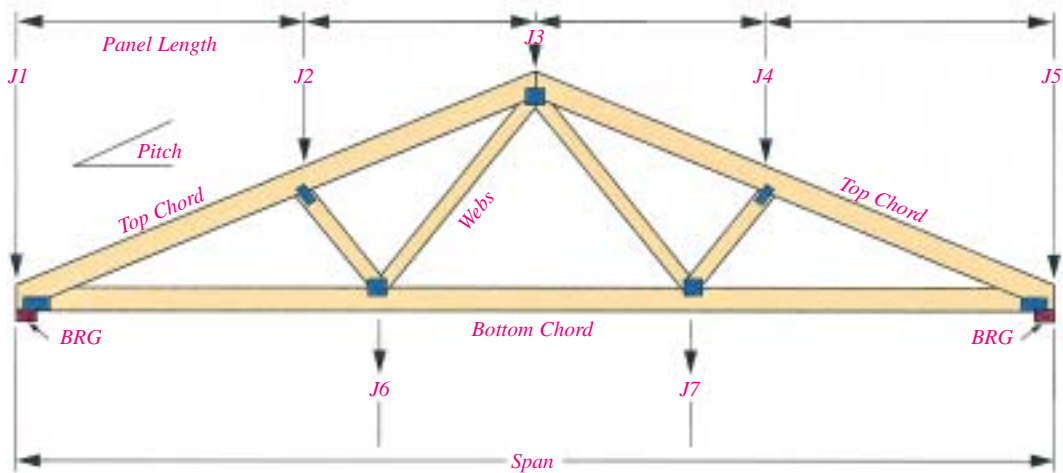


Table 3: Maximum Bay Lengths of Rafters and Ceiling Ties

Depth of member	Maximum length (measured on plan between node points)			
	35mm thick		47mm thick	
	Rafter	Ceiling Tie	Rafter	Ceiling Tie
Mm	m	m	m	m
72	1.9	2.5	3.3	3.3
97	2.3	3.0	3.6	4.3
120	2.6	3.4	3.9	5.0
145	2.8	3.7	4.1	5.3

These lengths are to ensure robustness of the truss during manufacture and handling. The choice of a different truss type with a smaller

panel length (and hence more webs) will usually yield a smaller section of timber required.