ROOM IN ROOF ('RIR') TRUSSED RAFTERS

The 'Room-in-Roof' ('RiR') or attic trussed rafter is a simple means of providing the structural roof and floor in the same component. This offers considerable advantages over other forms of living roof construction:

- There need be no restrictions on lower floor layouts since the trusses can clear span on to external walls although greater spans and room widths can be achieved by utilising internal loadbearing walls.
- 'RiR' trussed rafters are computer designed and factory assembled units, resulting in better quality control.
- Complex, labour intensive site joints are not required.
- 'RiR' trussed rafters can be erected quickly, offering cost savings and providing a weathertight shell earlier.
- Freedom to plan the room layout within the roof space.
- A complete structure is provided, ready to receive roof finishes, plaster board and floorboarding.

Fig. 1 Typical 8 metre span conventional trussed rafter

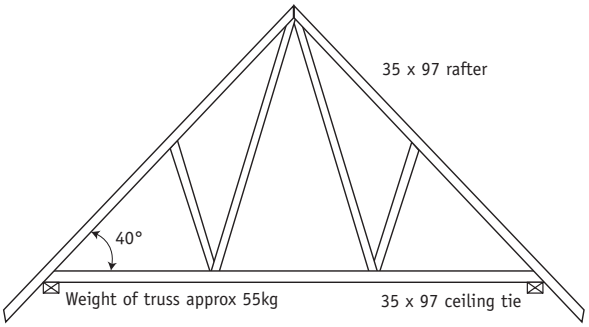
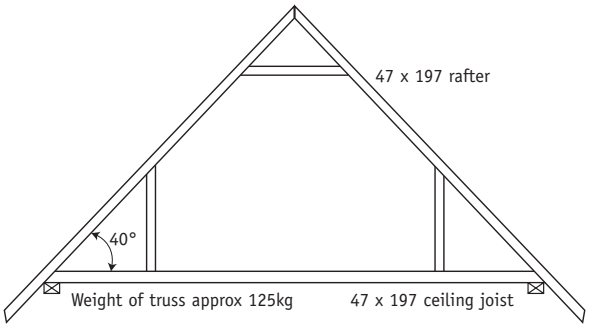


Fig. 2 Typical 8 metre span 'Room in Roof' trussed rafter



Comparing an 8 metre span standard trussed rafter (see opposite) with an equivalent 8 metre span 'RiR' truss, the external members will increase in width and depth. There are two reasons for this:

The 'RiR' truss supports approximately 60% more load than a standard truss of the same span and pitch. This difference in load is made up of plasterboard ceilings and wall construction, full superimposed floor loading and floor boarding.

Lack of triangulation in a 'RiR' truss is the second reason for increased member sizes.

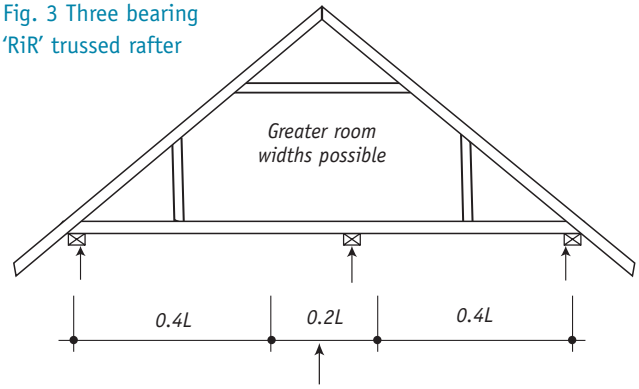
Predominantly 47mm thick timber is used, with member depths ranging from 145mm to 245mm.

Some basic guidelines to the construction of roofs from 'Room in Roof' trusses are as follows:

Three-Bearing 'RiR' Trussed Rafters

For most purposes 'RiR' trussed rafters can be designed to clear span between the front and rear walls of a dwelling thus avoiding the need for building loadbearing walls and foundations on lower storeys. However, if loadbearing walls exist or can easily be added then they can be used to good effect to provide additional support to the 'RiR' trusses. In this way greater room sizes are possible but to be effective they should occur within the centre 20% of the truss span and are most effective when placed near the mid-span of the truss. See Fig. 3

Fig. 3 Three bearing 'RiR' trussed rafter

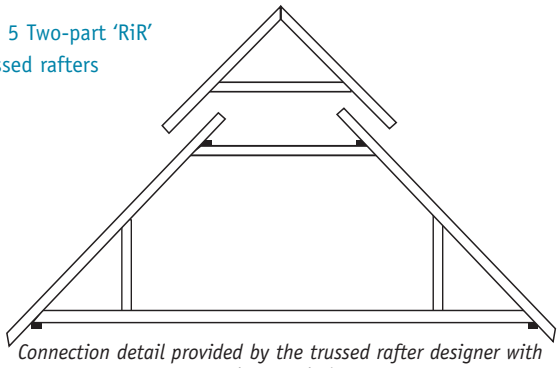


To be most effective the third support to be located in this zone and as near to centre line as possible

Size of 'RiR' Trussed Rafters

Where possible keep the size of 'RiR' trussed rafters within the limits dictated by safe transportation. There may be local conditions that affect this but generally an overall height of truss of 4 metres is easy to transport. If greater height is required then trusses may be constructed in two parts. The two-part trusses will be structurally joined on site and instructions for this will normally be provided by the trussed rafter fabricator. This joint is often made with a proprietary connector plate. Fig. 5 shows a typical two-part truss arrangement

Fig. 5 Two-part 'RiR' trussed rafters

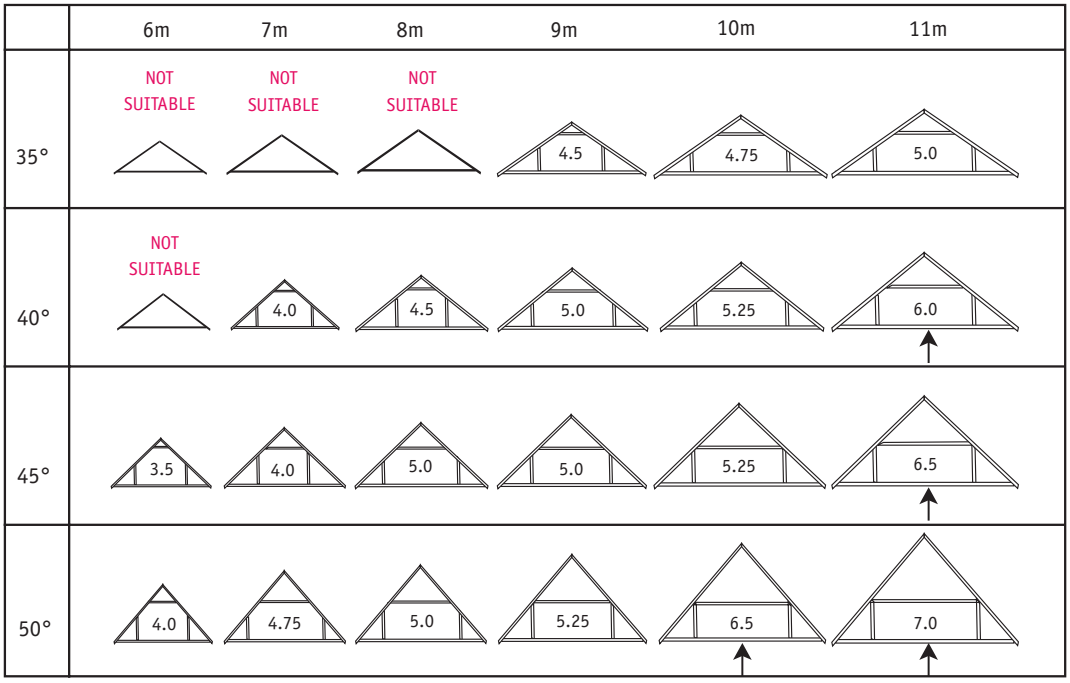


Connection detail provided by the trussed rafter designer with each truss design

Some Typical 'RiR' Configurations

Fig. 4 gives some ideas on the size of loft rooms available from differing configurations of span and pitch of 'RiR' trusses (all room widths shown in metres). These sketches are intended to show geometry of roofs at various spans and pitches and not structural details. In some cases extra intermediate supports may be necessary to achieve these spans. Internal, intermediate members may be needed within the non-habitable spaces of the trussed rafters on very large trusses and in some cases trusses may need to be produced in two parts. For clarity such details have been omitted from the sketches.

Fig. 4 Some basic configurations



Services in 'RiR' Trussed Rafters

The lower void area in 'RiR' trusses is an ideal location for services, allowing lateral runs to be positioned between the bottom chords of the trusses (see Fig. 6). Access to this void area and the service runs can be made via a small hatch in the low level partition.

The lower member of the truss forms not only the floor joist for the attic room but it also makes a vital contribution to the stability of the whole roof. Under no circumstances should the floor joist of a 'RiR' trussed rafter be notched or drilled to accommodate services.

Layout of 'RiR' Trussed Rafters and Planning Position of Openings

The application of a few basic principles at the concept stage of a project can often result in substantial cost savings by maximising the use of prefabricated components and minimising loose infill areas. Try to locate opening in the roof to fit in with the normal spacing of 'RiR' trussed rafters (usually 600mm). This can often result in reducing the number of trussed rafters required (see Fig. 7).

Dormer windows and stairwell openings are formed by placing multiple trusses either side of the openings and framing the resulting space with loose timbers. Placing stairwells parallel to truss spans and ensuring that windows are positioned opposite each other will make the overall roof design simpler and cheaper. Fig. 8 exemplifies the problems associated with misaligned roof features.

Bracing of 'RiR' Trussed Rafters

In common with all other trussed rafter roofs, 'RiR' trussed rafters need to be braced. Special attention must be given to diagonal bracing of the rafters since the space beneath them will form part of the habitable space of the roof.

It is not possible to provide bracing details within the scope of this Product Data Sheet but full details are given in the Trussed Rafter Association's Technical Handbook ('Technical Handbook - Site Installation Guide', available from the Trussed Rafter Association).

Water Tanks in 'RiR' Trussed Rafter Roofs

Full details of supporting water tanks in 'RiR' trusses are given in the 'Technical Handbook'.

Fig. 6 Services in trussed rafter roofs

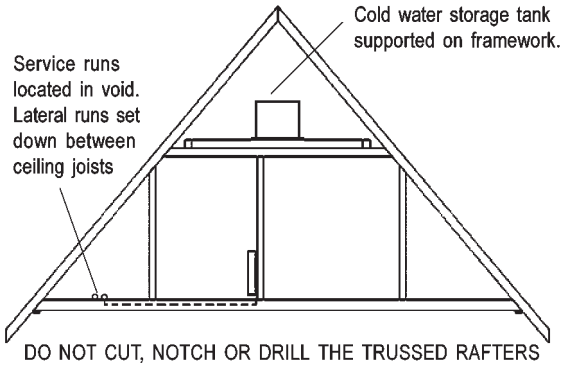


Fig. 7 Positioning of trussed rafter

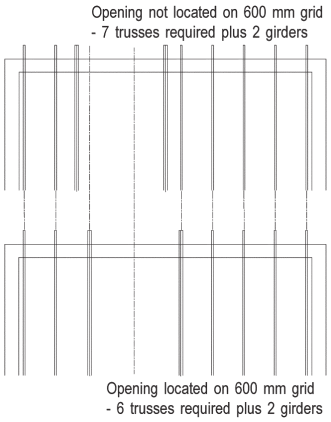
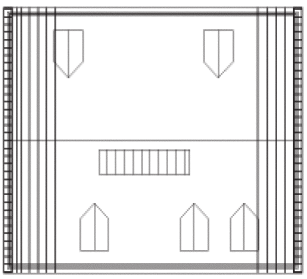
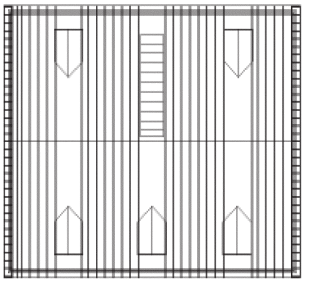


Fig. 8 Positioning of roof features



Unsuitable layout - very difficult to provide 'RiR' trusses to support this roof since windows and stairs all overlap



Suitable layout - since staircase parallel to trusses, windows directly opposite and small widths may be site framed

Thermal Insulation

Thought should be given at an early stage to the type and position of the thermal insulation since this could affect the size of rafter required.

Shown below are two different arrangements for insulation within the roof of a 'Room in Roof' trussed rafter construction. In both cases an air gap of 50mm should be provided between the top of the insulation and the underside of the roof covering. In addition eaves level vents equivalent to a continuous 25mm gap must be provided.

Fire Resistance

Under normal circumstances dwelling roofs are not required to have fire resistance under UK Building Regulations. However, 'RiR' trussed roofs are slightly different since the ceiling tie of the truss forms the floor of the upper storey and, therefore, are controlled in exactly the same way as any other intermediate house floor.

Where the 'RiR' forms the second storey of a dwelling then the floor must provide a 'modified' 30 minute fire resistance. In the case where the roof space forms the third storey then the floor must provide a full 30 minute fire resistance.

The only formal guidance on roof construction is given in Approved Document 'Timber Intermediate Floors for Dwellings' published by TRADA. Fig. 11 shows the principle recommendations of the TRADA AD.

As an alternative solution TRADA recommend a simpler form of construction that satisfies both the 'modified' and full 30 minute fire resistance requirements by employing a thicker or higher grade of plasterboard to the ceiling beneath the floor. This is shown in Fig. 12.

This information sheet gives a brief introduction to the use of 'Room in Roof' trussed rafters to form living accommodation in the roof space of new dwellings. It is not intended to be comprehensive and it is accepted that there may be many other solutions to the various aspects of construction discussed. Readers are advised to discuss their particular design situations with their specialist trussed rafter supplier.

The guidelines contained within this information sheet are given in good faith but without liability and its use shall be entirely at the risk of the user.

Fig. 9 Roof insulation

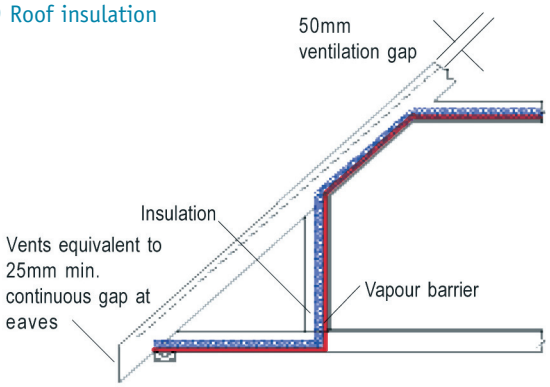


Fig. 9 Roof insulation - alternative arrangement

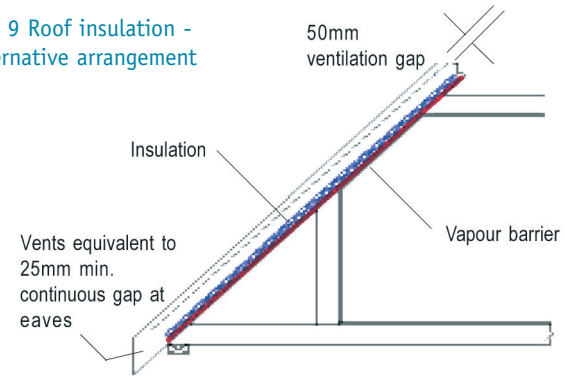
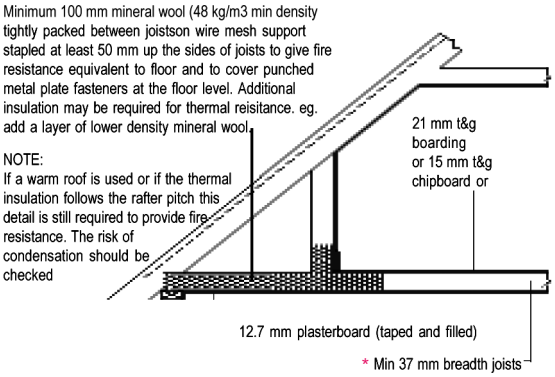
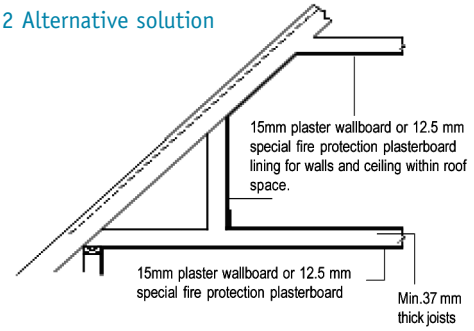


Fig. 11 Requirements of TRADA Approved Document



*37mm is the absolute minimum thickness required where joists form part of fire resisting constructions. Joists for 'RiR' trussed rafters will normally be nominally 47mm thick

Fig. 12 Alternative solution



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