CARPENTRY & JOINERY

Community College HACKNEY

FCA

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THEORY

10 SIMPLE ROOF CONSTRUCTION Part 2

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Part 2

Double Roofs

A double roof is a roof whose rafters are of such a length that they require an intermediate support. This support is usually a beam which is secured under the rafters at a point half way between the ridge and the wallplate. This beam is known as a purlin.

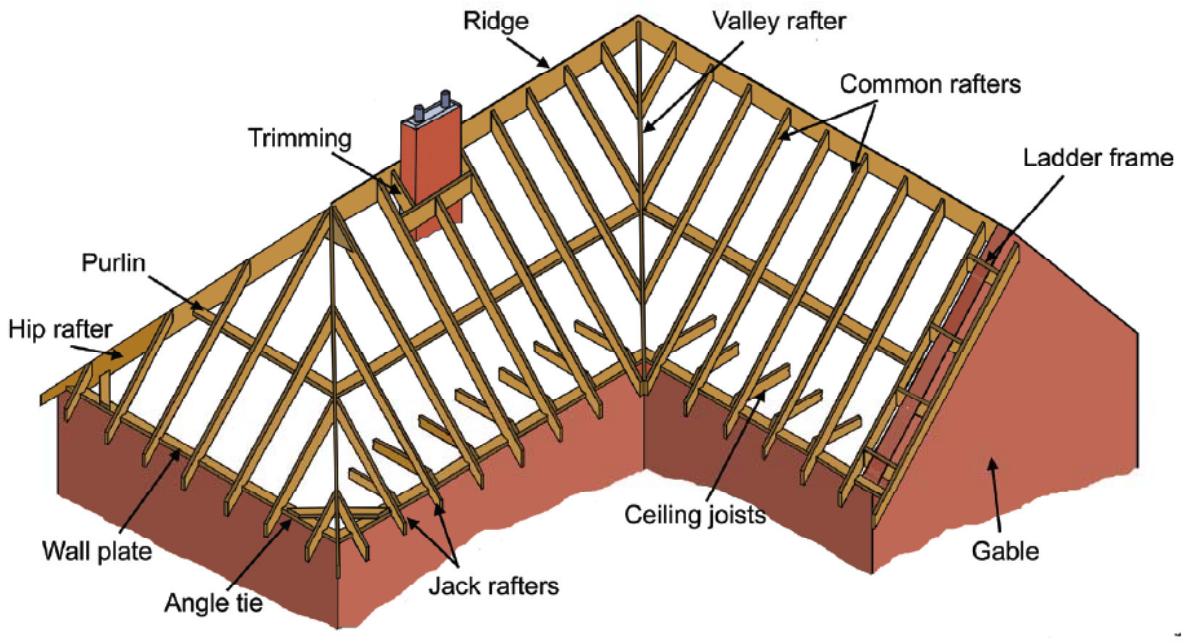
In gable roofs, the purlin is built into the gable wall to provide added support. In double pitched roofs, the purlin is fi xed to the rafters in a continuous length, jointed at all the internal and external corners of the roof.

In traditionally constructed roofs, the roof may also require added support in the form of roof trusses. This will depend upon the size of the roof and the type of roof covering the roof has to support.

In modern double roof construction, the whole of the roof is constructed of lightweight roof trusses called trussed rafters.

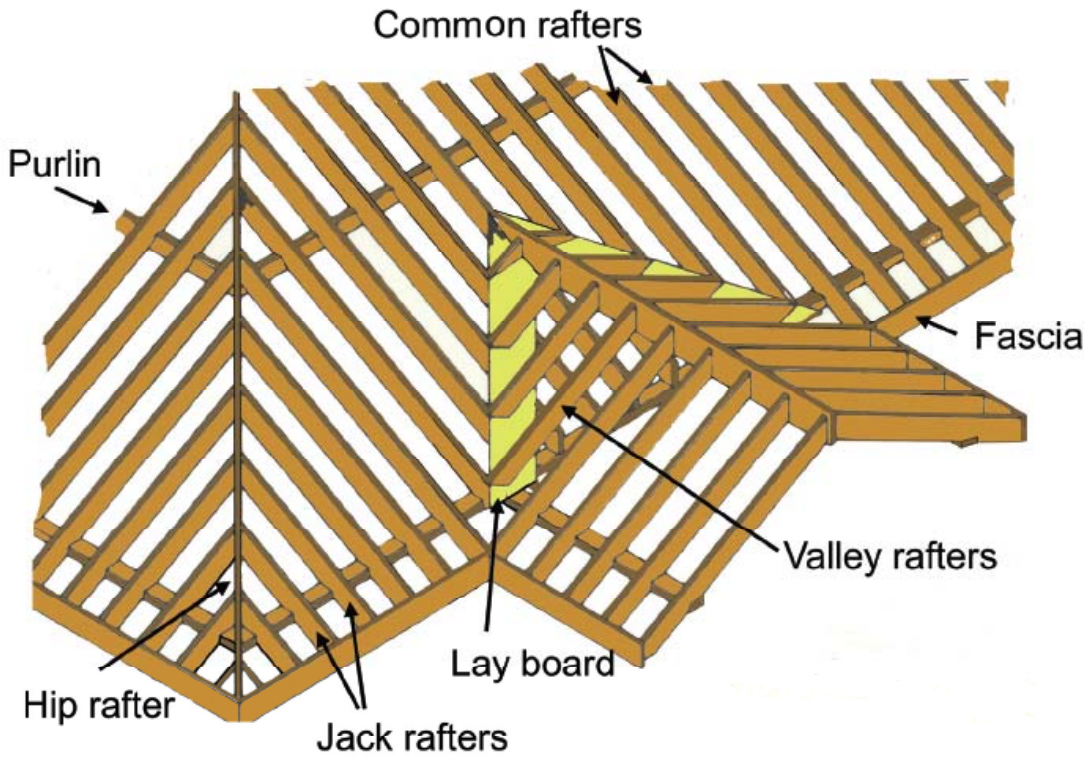
Double Roof With Hipped End
There are many designs and combinations of double roofs. The design of the roof will depend upon the size and shape of the ground fl oor plan of the building.

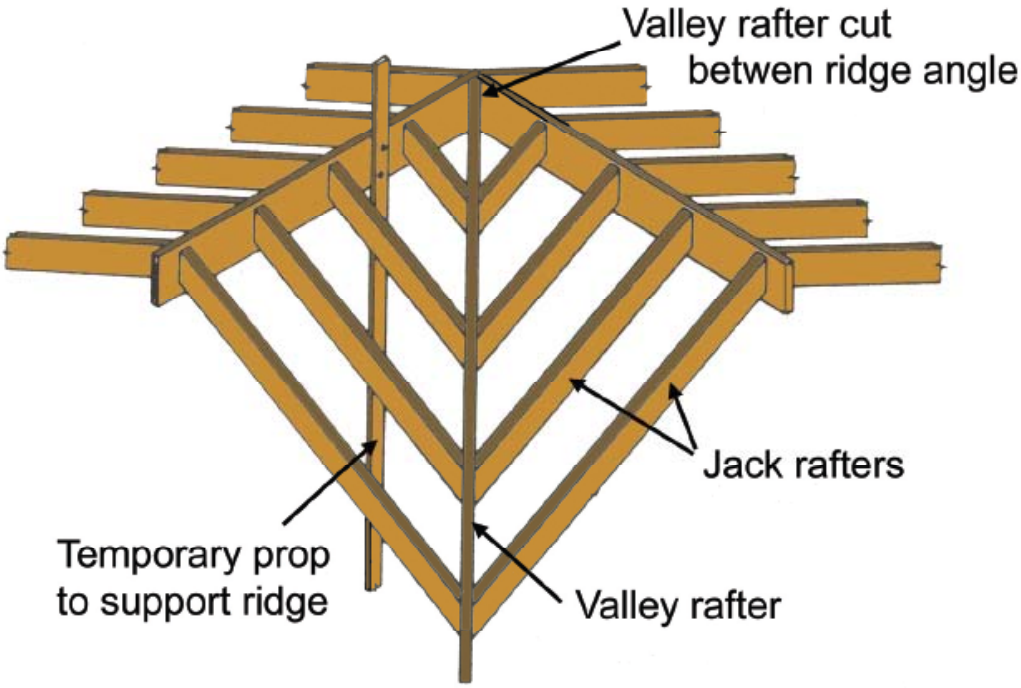
The drawing shows a partly hipped roof with one hipped end and one gable end. A fully hipped roof has no gables and the eaves run round the perimeter of the roof. The eaves are usually of the boxed or enclosed type.



Hipped and gable roof components and terminology

Valley construction using lay board





Alternate valley construction using valley rafter

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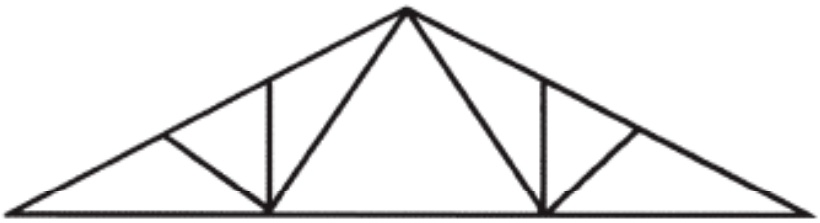
Trussed Rafters

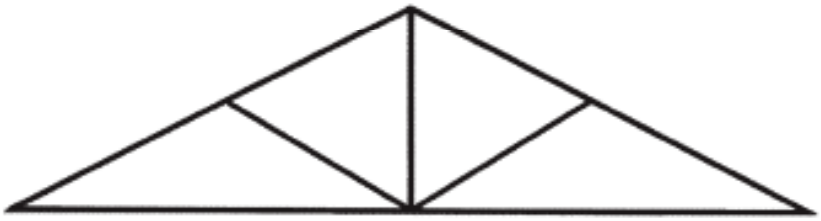
The majority of double roofs that are constructed today make use of trussed rafters. Trussed rafters are manufactured in factories, under strict quality control.

They are designed to be lightweight while, at the same time, able to support calculated roof loads. For those reasons they are manufactured in a variety of shapes and sizes to suit the needs of the builder.

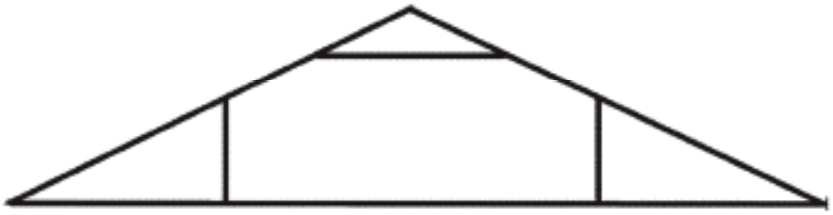
Below are a few of the many popular designs available:



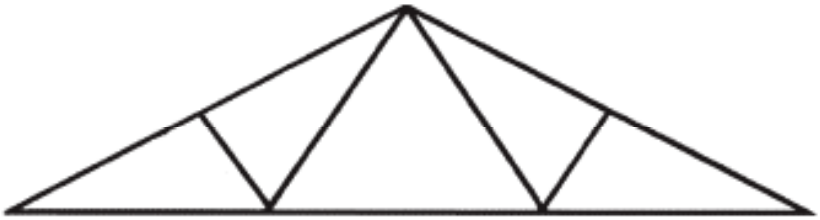
Fan truss



King post truss



Attic truss



'W' or Fink truss

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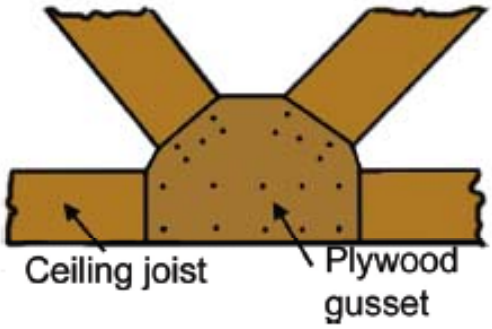
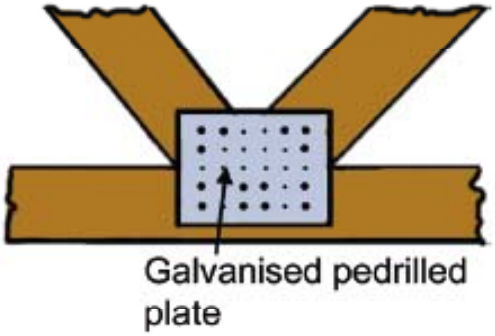
Trussed Rafters Construction

The trusses are manufactured in factories and are assembled using adjustable jigs. The assembly procedure has strict quality controls to ensure that all trusses meet the design requirements. All the timber used is stress graded softwood and the sizes of the roof members will vary according to the load that the truss has to support and the span of the roof. Usually, the cross section sizes vary between 35mm x 75mm and 145mm x 45mm.

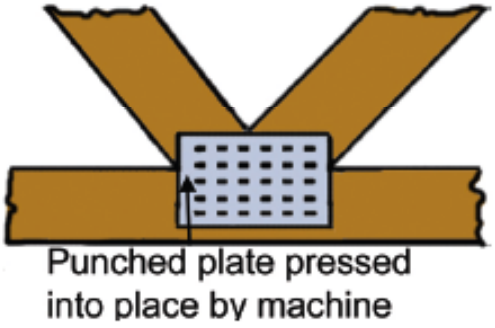
The individual roof members are butted together and jointed by the use of:
- Nailed plywood gussets.
- Nailed galvanised steel plates.
- Galvanised steel punched plates.



Plywood gusset



Predrilled galvanised plate



Punched plate

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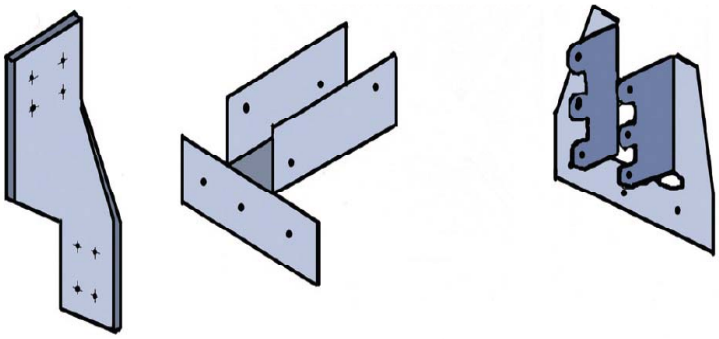
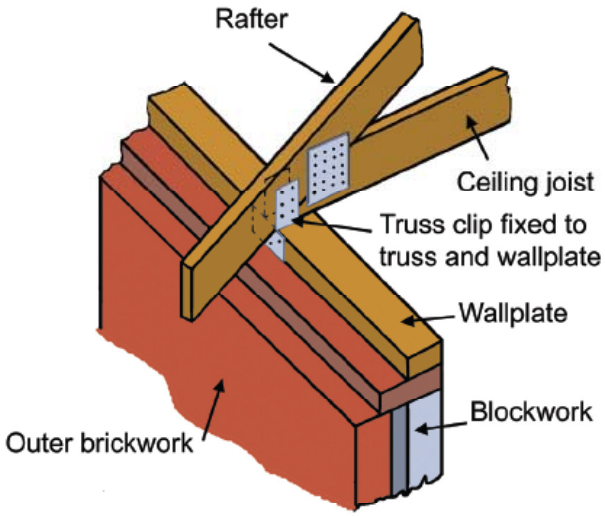
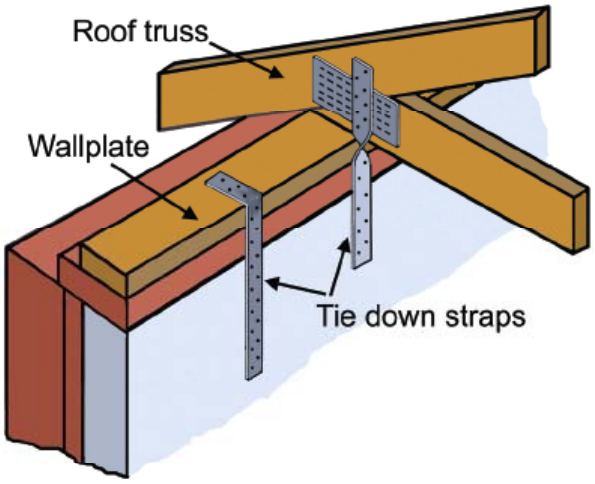
Truss Rafter Roof Construction

The roof is constructed of a number of truss rafters spaced at centres between 400mm and 600mm. The trusses are designed to sit directly onto a prefi xed wall plate and are fi xed in place by the use of truss clips and supported by galvanised wall straps or restraints to provide extra strength.







Truss rafter fixed to wallplate

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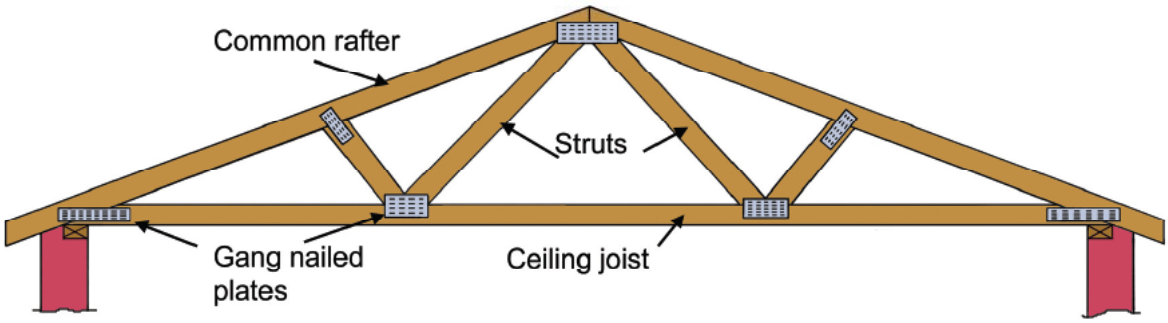
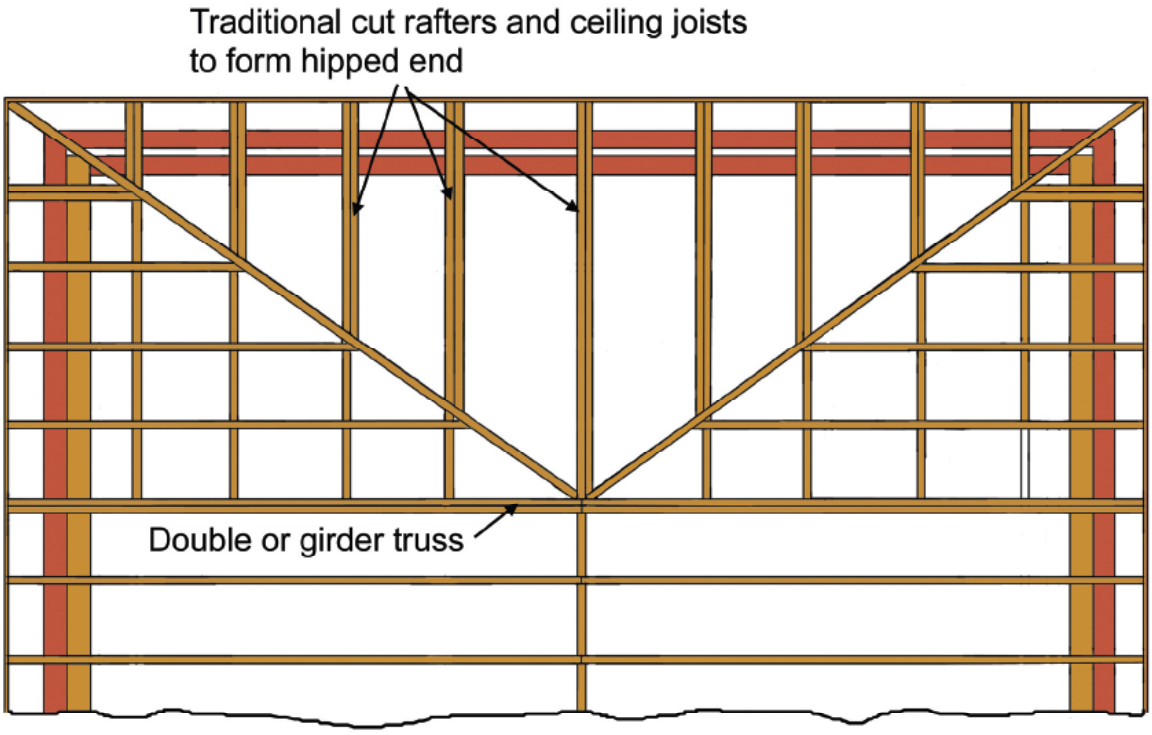
Typical truss

The hipped end of a double truss rafter roof can be formed by either:
• Traditional cut rafters and ceiling joists.
or
• Tailor-made trusses which are assembled on site to form the hip.

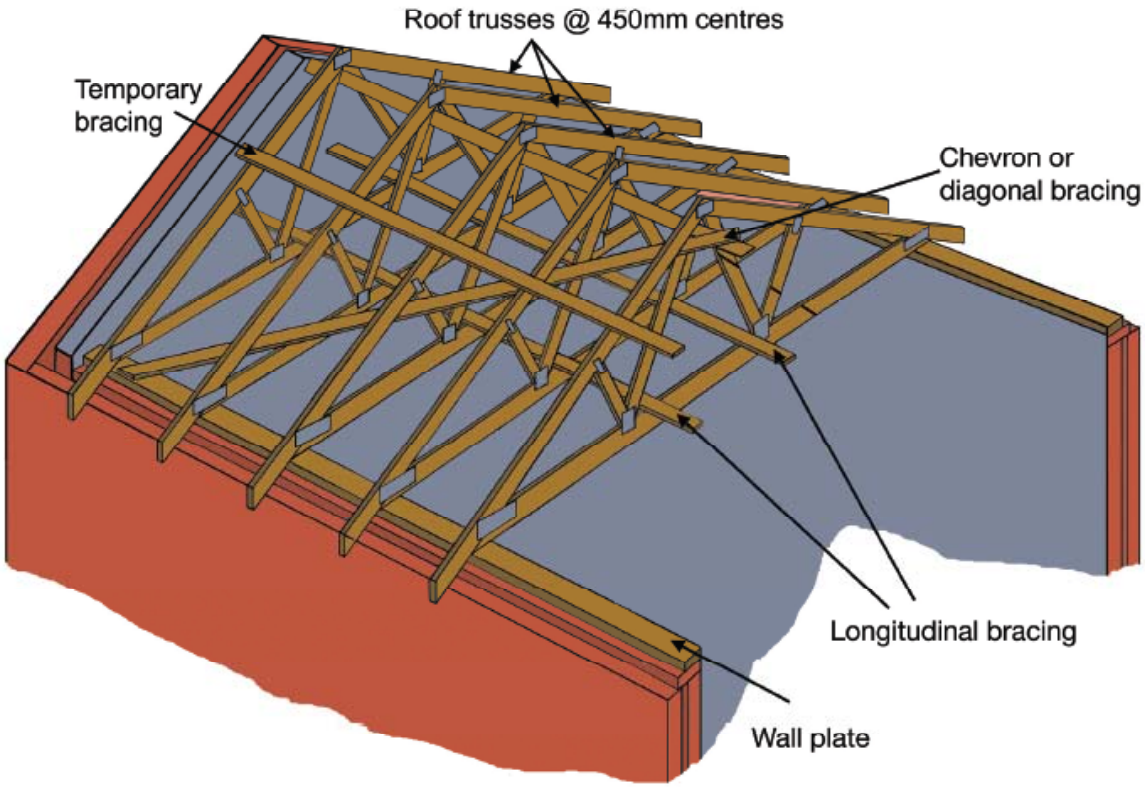


Typical 'W' truss rafter

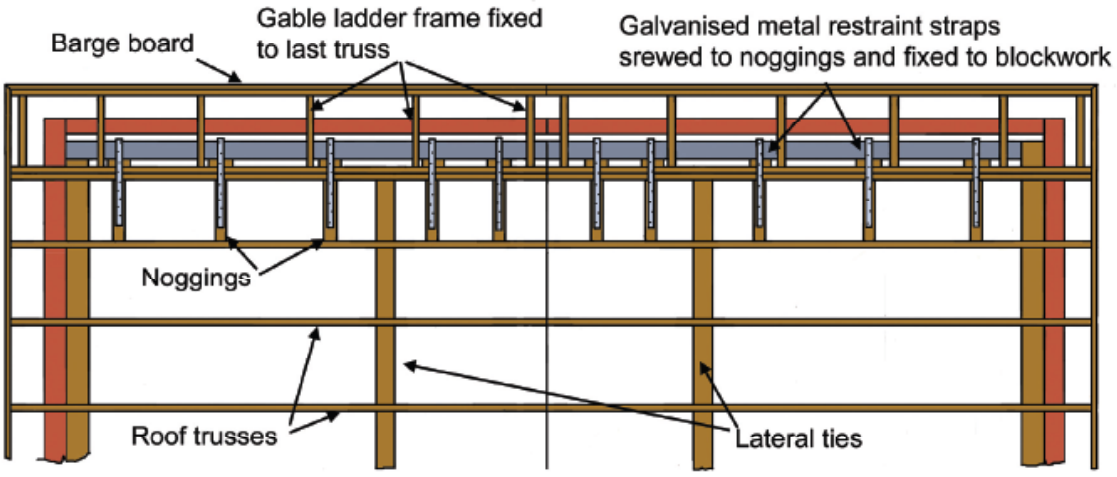


Hipped end detail

Roof Truss Spacing and Layout



Permanent and temporary bracing to support roof



Lateral restraint straps tying roof trusses to gable

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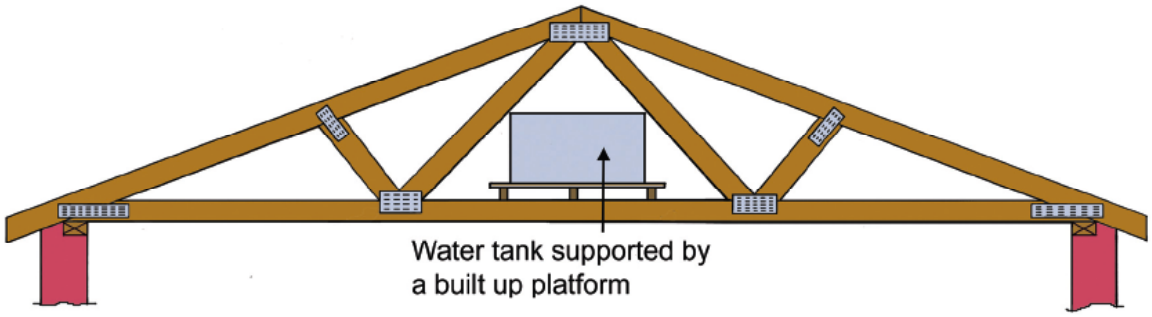
Water Tank Platform

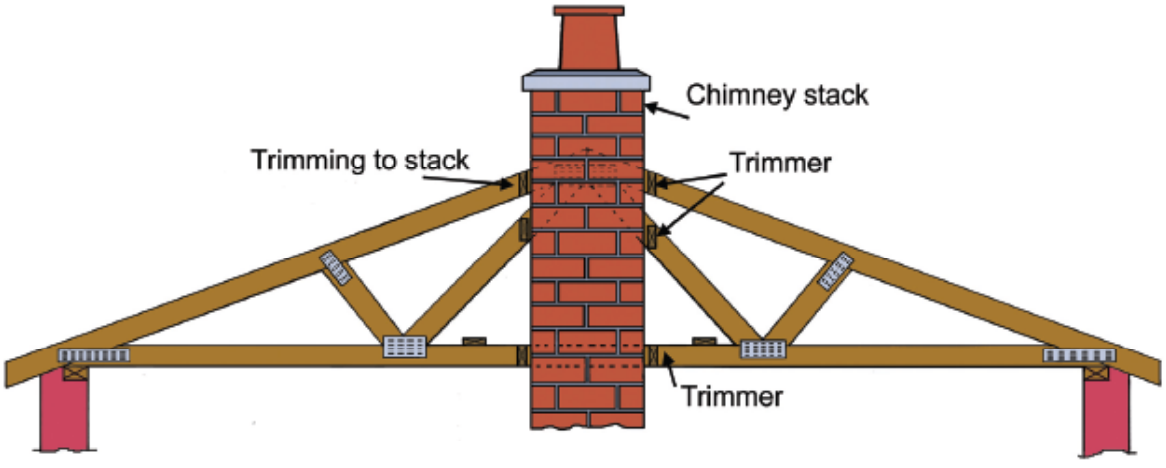
In most modern domestic housing, the water tank which supplies the house is housed in the roof space. To support and distribute the weight of a full water tank, a platform is built. The platform is usually placed centrally in the roof space and the load spread over at least three truss rafters. The platform consists of a sheet of 18mm plywood supported on three bearers fixed to the truss rafter ceiling joist.



Water tank support

Trimming to Openings

Where there are openings intended for such things as Velux windows, loft hatches or chimney stacks, the openings are trimmed. The trimmers are nailed to the rafters at the required dimensions to accommodate the item.



Trimming to openings within truss rafter roofs

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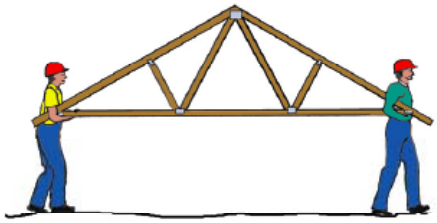
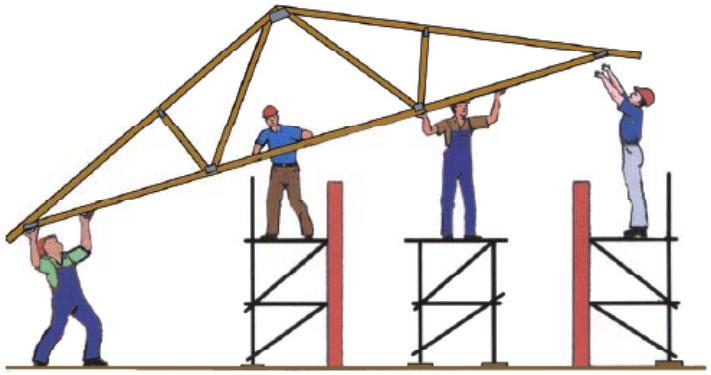
Handling and Moving Truss Rafters

When handling or moving truss rafters, care must be taken not to exert strain on the joints.

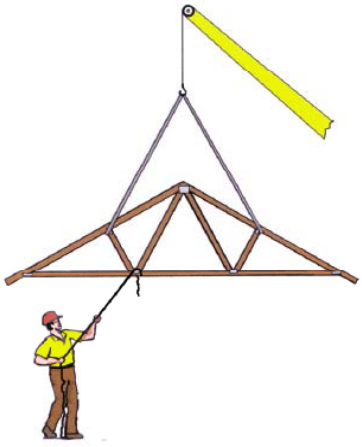
The rafters should be lifted and carried from the eaves and should be kept upright. When lifting the trusses into position, they can be manhandled using a team of workers. This will involve the use of extra scaffolding within the building to support the operative and assist in the movement of the trusses. When lifting the trusses to a great height, a crane is used, and the trusses are lifted in sets using a set of slings. To prevent the trusses from swinging, a guide rope is used to control the trusses. This guide rope is held by an operative at ground level.



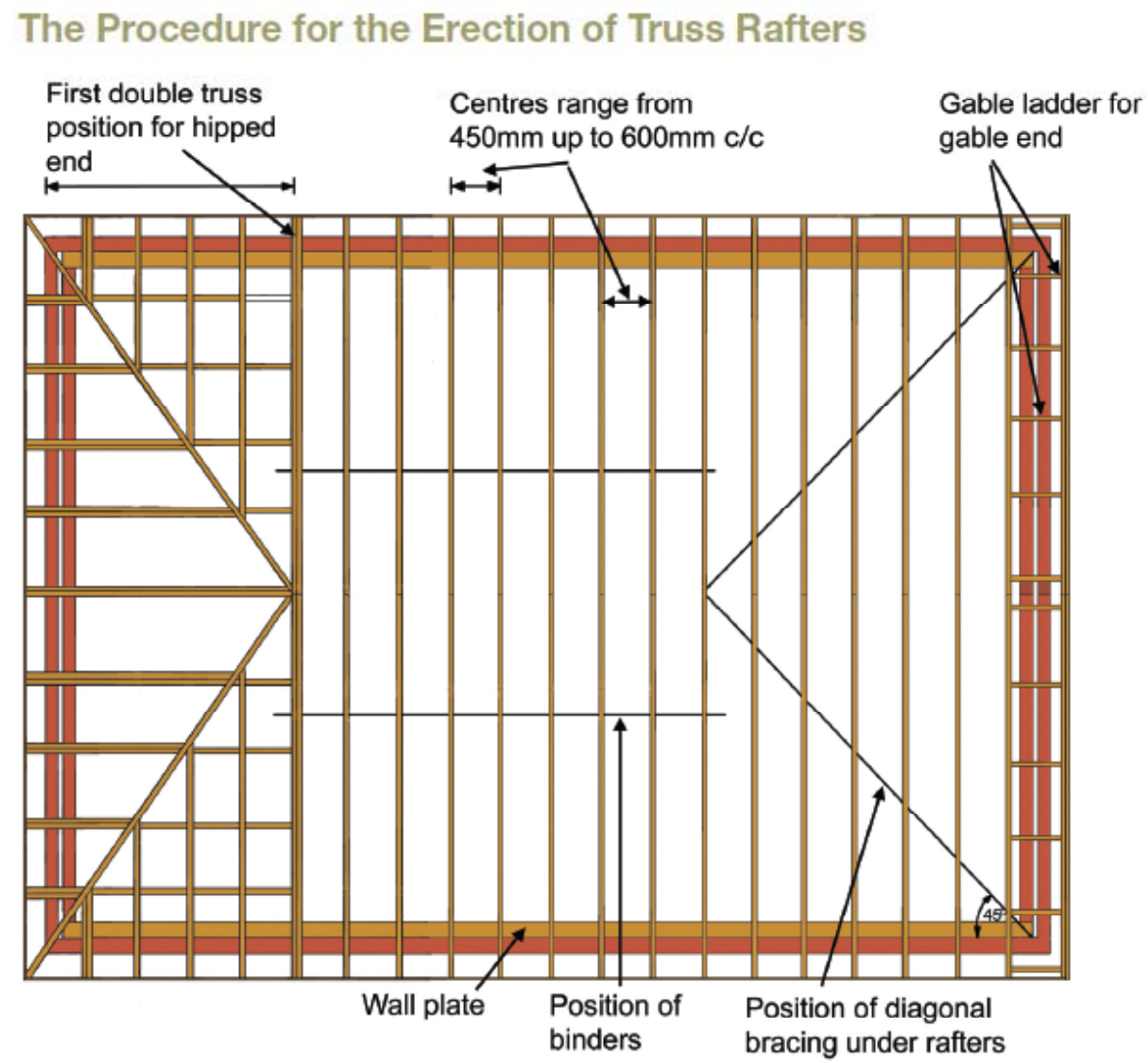
Two operatives carrying truss



Lifting truss into position using manhandling method



Lifting truss into position using a crane and a guide rope



The diagram shows the position of truss rafters and the position of relevant bracings and binders used to stabilize and strengthen the roof.

Erection Procedure

• The positions of the trusses are marked off on the wall plate.
• The rafters are lifted into place and stacked in an upright position at one end of the roof.
• The fi rst rafter is placed into position and secured with truss clips. It is plumbed and temporarily braced using diagonal braces and binders.
• The remaining rafters are slid into position, secured and braced temporarily.
• Once all the rafters are in place, the diagonal braces and the longitudinal braces are secured.
• All relevant strapping and restraints are secured in place.

Truss rafter being erected and fixed in place