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Trussed Rafter Association

Technical Handbook Site Installation Guide

February 1999 - Issue 1
(Revised April 2000)

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Trussed Rafter Association

The Trussed Rafter Association is the trade body which represents the interests of the whole of the Prefabricated Timber Roof Truss Industry.
Prefabricated timber trusses are used in over 90% of all modern housing and in an increasingly large proportion of Commercial and Industrial buildings, particularly those which have been designed to give a varied and interesting roofscape. Thus, the Industry plays a significant role in the Construction Sector and must ensure that its voice is heard in consultation with:

- Customers
- Government, its Agencies and other Authorities
- Standards Institutes in UK and Europe
- Other Sectors of the Construction Industry

The members of the Association are:

- Truss System Holders who supply software and nailplates to Truss Manufacturers. The timber engineering software enables roofs to be designed and manufactured safely.
- Truss Manufacturers who supply prefabricated roof trusses and other components, including engineering calculations, up to whole roof structures, to the construction industry.
- Specialist Suppliers of timber, preservatives, machinery and other products related to the Industry.

A list of members can be supplied on request.

The Trussed Rafter Association is recognised as the voice of the Industry continues to develop safely in the interests of the general public, its customers and its members.

- This handbook is for general guidance only.

- This handbook has been prepared by the Technical Committee of the Trussed Rafter Association who gratefully acknowledge the assistance of the following organisations:

  - Building Research Establishment
  - Timber Research and Development Association
  - National Standards Authority of Ireland

- Neither the Trussed Rafter Association nor any of its member companies can warrant the stability or efficiency of any particular roof construction (unless they are retained in the role of roof designer). The recommendations contained in this handbook are supplied in good faith but without liability and their use shall be entirely at the risk of the user.

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01 Storage & Handling

1.1 Introduction

(General Information relating to Health and Safety issues in Trussed Rafter Construction)

When the Construction (Design and Management) Regulations were published in 1994, a fundamental change in approach was initiated with regard to, the attitude toward and significance of, issues relating to Health and Safety in the Construction Industry. Since that time, a raft of further supporting legislation has been drafted and published which together now document in great detail the duties, obligations and responsibilities of those engaged in the process of Construction, from members of the original design team to trainee operatives working on site.
In order to fully understand and implement the requirements of these Regulations it is necessary to appreciate and recognize these new philosophies by making the necessary changes in working practices to elevate the profile of Health and Safety issues across the full spectrum of Construction Activities. This can be achieved by undertaking Risk Assessments, designing out hazards where evident, providing sufficient resources at all times, proper training and good levels of communication channels within the design team and on site.

The advice that is set out within the Sections of this Handbook which provide assistance relating to issues of Health and Safety is therefore illustrative only and does not form prescriptive advice on any of the matters discussed. It is vital that each project should be approached by the parties involved as a fresh challenge from the point of view of Health and Safety to allow creative and innovative solutions to be developed. Readers of this handbook are therefore encouraged to fully acquaint themselves with the various Regulations, and in particular :-

Health and Safety at Work Act 1974
Construction (Design and Management) Regulations 1994
Management of Health and Safety at Work Regulations 1992
Provision and Use of Work Equipment Regulations 1992

Construction (Health, Safety & Welfare) Regulations 1996 - (CHSW Regulations 1996)
Manual Handling Operations 1992
Workplace (Health, Safety and Welfare) Regulations 1992

1.2 Unloading Trussed Rafters

(Information for the safe unloading of trussed rafters)

When the delivery of trussed rafters arrives on site the contractor(s) involved should be prepared and already allocated sufficient and suitable resources to ensure the trussed rafters are unloaded safely and in a manner so as not to overstress or damage the trusses. This operation will have been subject to a Contractors General Risk Assessment and then detailed in a safe working method statement that has been approved by the principal contractor or the person responsible for Health and Safety on site. Normally, trussed rafters will be delivered in tight bundles using steel bindings. This will often require mechanical handling equipment, such as a forklift or crane, to enable the safe manoeuvring of these large units. The safe working method statement should accommodate any special handling instructions or hazards specified by the designer in his risk assessment for the truss design.

1.3 Site Storage of Trussed Rafters

(Methods for the proper and safe storage of trussed rafters on site)

Trussed Rafters can be safely stored vertically or horizontally at ground level or on any other properly designed temporary storage platform above ground level. Whichever method and location is chosen the temporary support should be set out to ensure that the units do not make direct contact with the ground or any vegetation and be so arranged as to prevent any distortion. The delivery of trussed rafters should wherever possible be organised to minimise site storage time, however where longer periods of storage are anticipated then the trusses should be protected with covers fixed in such a way as to allow proper ventilation around the trusses.
When stored vertically, bearers should be positioned at the locations where support has been assumed to be provided in the design with stacking carried out against a firm and safe support or by using suitable props.

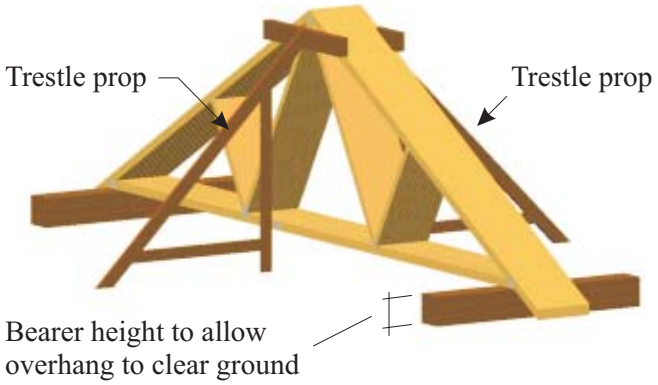


Fig.1 Safe Vertical Storage

When trusses are stored horizontally, level bearers should be positioned beneath each truss node (minimum) to prevent any deformation and distortion. (See Fig.2 below)

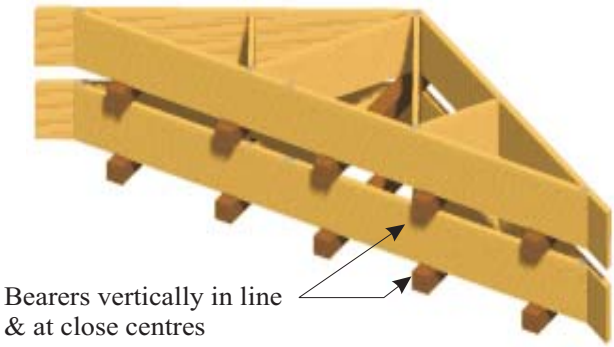


Fig.2 Safe Horizontal Storage

No other method of storing trussed rafters is considered to be suitable, except where specific provision has been made in the design for an alternative temporary support load case.
At such time when it is necessary to remove the pre-tensioned steel bindings from a bundle of trusses, extreme care should be exercised. As a precaution against destabilisation of the whole bundle of trusses, it is recommended that prior to the removal of the steel bands, timber battens are fixed across the bundle at several locations with a part driven nail into every truss. Such a simple precaution will allow the safe removal of single trusses once the steel bands are removed. A suggested arrangement of batten locations for a standard Fink truss is shown in Figure.3 below.

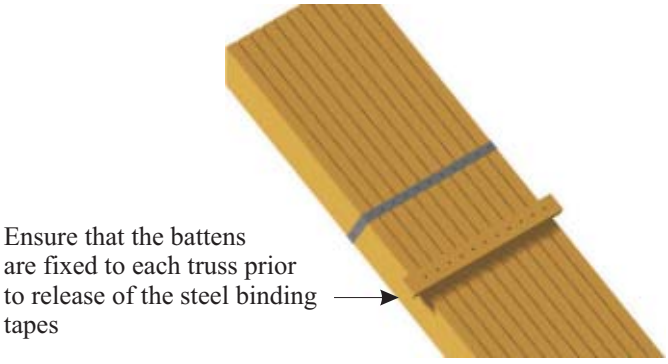


Fig.3 Diagram illustrating safe method of breaking a bundle of trusses.

Alternative details relating to this procedure and which involve the unbundling of the trusses whilst on the back of the lorry should be communicated by the contractor to the truss manufacturer prior to their delivery to site.

1.4 Manual Handling of Trussed Rafters

(Information relating to manoeuvring trussed rafters around the site using manual handling techniques)

With careful consideration manual handling methods can be safely employed to move trussed rafters around a construction site, although the choice of method will depend to a large extent on the particular circumstances of the lifting operation. Such an operation will generally be identified in a contractors safe working method statement that takes into account of all the assessed risks and which utilises and refers only to the resources which are available to the site. The preparation of this method statement should be undertaken sufficiently in advance to ensure the adequate planning and co-ordination of the task and sourcing of any special equipment that may be required. For example, a situation where the manual handling of trussed rafters may be appropriate might be the lifting of single trusses on to residential units not exceeding two storeys in height. A stage diagram illustrating a suitable technique for carrying out this procedure is outlined in Figure.6. The procedure so detailed overcomes all of the basic hazards of lifting trussed rafters by hand whilst ensuring the safety of the operatives involved at stages of the operation.
Whatever technique is adopted to manually manoeuvre trussed rafters it is vital that the technique takes full account of any special instructions issued by the designer to ensure that the structural integrity of the units is maintained and that there is no risk of damage to the trusses.

1.5 Mechanical Handling of Trussed Rafters

(Information relating to manoeuvring trussed rafters around the site using mechanical handling techniques)

Where it is not possible for reasons of safety or other practical considerations to implement manual handling techniques to manoeuvre trussed rafters, other means that involve the use of mechanical handling or lifting equipment will be necessary. Using such equipment gives the option of being able to move larger and heavier loads and consequently, the ability to raise completely or partially assembled sections of roof that have been pre-assembled at another location (for example, on the ground level superstructure of an adjacent plot). Similar considerations to those identified in the section relating to manual handling remain relevant, although as the size of the loads increase, issues of instability and potential distress/damage to the trussed rafters becomes more critical. For this reason, it is vital that trusses or sections of roof are only lifted at locations approved by the truss designer, such locations being preferably marked on the units at the time of their manufacture. Where appropriate, the use of spreader bars and strongbacks may be required to ensure an even distribution of lifting points.

An example of the use of a spreader bar is shown in Fig.4 below.

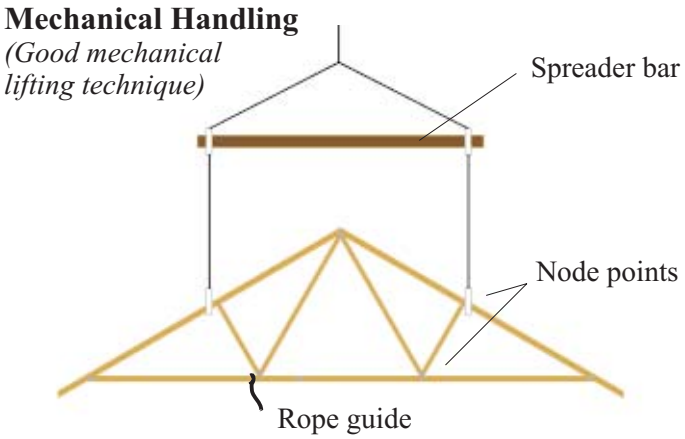


Fig.4 Lifting trusses using a spreader bar and mechanical handlings

Where bundles of trusses are raised to roof level, caution should be exercised in the removal of the restraining bands (see Section 1.3, Fig.3). Should these bundles of trusses be stored either on a temporary working platform or at eaves level, the contractor should take the necessary steps to ensure that the supporting structure has sufficient strength and that a storage system as illustrated in either Figs 1 or 2 is constructed.

Designated slewing areas should be cordoned off and the movement of operatives either restricted or prohibited within this area during all lifting operations.

At all times, strict adherence with the Contractors method statement should be observed.

Where circumstances and design considerations dictate that pre-assembled sections of roof, such as hips etc. (or indeed, complete roofs) are raised in one single lifting operation, particular attention should be given to the method of lifting the assembled sections. Such large and unwieldy loads require that checks should at least be made regarding the following :-

- Prevailing weather conditions, with particular reference to wind speed.
- A survey of obstacles in the slewing area, including scaffolds, towers and overhead services.
- A survey of the accuracy of construction and setting out of the pre-assembled roof structure.
- Underground services locations to avoid damage by the use of large cranes etc.

These sorts of techniques have the potential to save significant amounts of time and money on site whilst additionally offering significant Health and Safety benefits to all employees and personnel, although they generally require early design input and planning to ensure sufficient strength is inherent during the lifting procedure. Typical benefits which may be associated with improvements in matters relating to Health and Safety include :-

The immediate provision of stable sections of roof, away from which infill sections of roof can be constructed, rather than relying on temporary bracing.

- All assembly operations are carried out at ground level and therefore the risk of operatives falling is totally eliminated.
- The risk of operatives being struck by falling objects during an alternative roof level assembly is significantly reduced.

Clearly, there are many other benefits relating to speed, efficiency and the overall costs associated with the construction process.

Mechanical handling and lifting operations are totally essential where the scope of the works falls outside of simpler residential scale projects.

2.1 Assembly of trussed rafter roofs

(Information relating to the assembly of trussed rafter components and infill)

Once the trussed rafters have been safely raised to eaves level utilising either the methods or principles outlined previously and assuming that all necessary information has been forwarded by the roof designer to the contractor, then it is possible for the assembly of the trussed rafter roof construction to commence.
In similar fashion to the other work tasks associated with trussed rafter roof construction, the assembly of the roof components should be carried out in strict accordance with a contractor prepared safe working method statement *(See Section 12 for a typical example of a Contractors General Risk Assessment and supporting Method Statement).*
Whichever method of raising the trusses is utilised, the principal risks associated with assembling trussed rafter roofs in their final location are either falling, temporary instability and collapse of the partially complete structure or being struck by a falling truss/object. All of these issues need to be addressed to safely proceed with the operation. The manner in which any other residual site hazards should be dealt with should be based on the principle of a hierarchy of risk control. This principle states that the most desirable option is to design out the hazard and subsequent risk completely at the design stage and the least desirable option is to provide personal protection systems such as restraint harnesses (ie. protection after a fall).
With regard to assembling trussed rafter roof structures, the most desirable approach for standard storey height construction (up to 3.0m from floor to ceiling) is to provide both a perimeter working platform externally and either a full or partial working platform internally and erecting the trusses using the standard erection procedure as shown in Fig.6. A useful modification to the basic bracing procedure is to rigidly brace the first truss back to the external scaffold to allow roof assembly to proceed unencumbered in a direction away from that first truss.
Alternatives to this approach might involve the combination use of working platforms and safety nets or, in situations where the potential fall distances are sufficient to allow their safe use, the installation of larger nets and/or restraint harnesses.
At all times, the Designers and Contractors should undertake proper Risk Assessments of the tasks in hand and draft appropriate method statements accordingly. Where the trussed rafter designer/manufacturer is also engaged to erect the roof structure then the method statement would be prepared by him and approved by the Principal Contractor (who is responsible for the Health and Safety of all personnel, directly employed or otherwise, on the site). Some amendment or reassessment of the proposed working method may be necessary before the Principal Contractor allows the work to commence.

Preservative pre-treated timber

Where preservative pre-treated timber is cut to length on site, the cut ends must be re-treated by brush application of a suitable preservative, in accordance with the preservative manufacturers instructions.

Under building regulations pre-treatment of roofing timbers is required in certain parts of the country.

02 Handling & Erection

The builder should consider, in conjunction with the building designer, the erection procedures to be used and the provision of temporary bracing, rigging and any other specialized equipment required to erect the trusses safely and without damage, in accordance with the design requirements and having due regard to possible windy conditions.
Permanent bracing should be of minimum size 22 x 97 mm free of major defects and fixed with two 3.35 x 65 mm galvanised round wire nails at each cross over.
The following procedure is suggested for most domestic size roofs.

A. Mark the position of each truss along both wallplates.

B. Erect the first truss (truss A) at the point which will coincide with the uppermost point of the diagonal brace F when it is installed later.
Use the temporary raking braces B fixed to the rafter members and the wallplates to hold this truss in the correct position, straight and vertical. For clarity, only one raking brace is shown but they should be fixed to both rafter members and be of sufficient length to maintain the truss in position, during the erection of the remaining trusses.

C. Erect truss C and brace back to A with temporary battens D at suitable intervals along the rafter and ceiling tie members. Repeat this procedure until the last truss E is erected.

D. Fix the permanent diagonal braces F ensuring that each top end is as high up the last trussed rafter A as is possible and that each bottom-end extends over the wallplate to which it should be fixed. For clarity, only one permanent brace is shown, but they should be installed on both sides of the roof.

E. Fix the longitudinal members G, making sure that the ceiling ties are accurately spaced at the correct centres.

F. Fix all remaining longitudinal, diagonal and chevron bracing required on the internal members of the trusses as specified.

G. Additional trusses may be erected by temporarily "bracing-off" the completed end.

Immediately prior to the fixing of the permanent bracing and the tiling battens or sarking, all trussed rafters should be checked for straightness and vertical alignment. Whilst every effort should be made to erect trusses as near vertical as possible, the maximum deviations from the vertical shown in the table below.
After erection, a maximum bow of 10 mm may be permitted in any trussed rafter provided that it is adequately secured in the complete roof to prevent the bow from increasing. For rafter members, this maximum bow is measured from the line between the apex and the eaves joint.

Also see Fig.11 on page 9

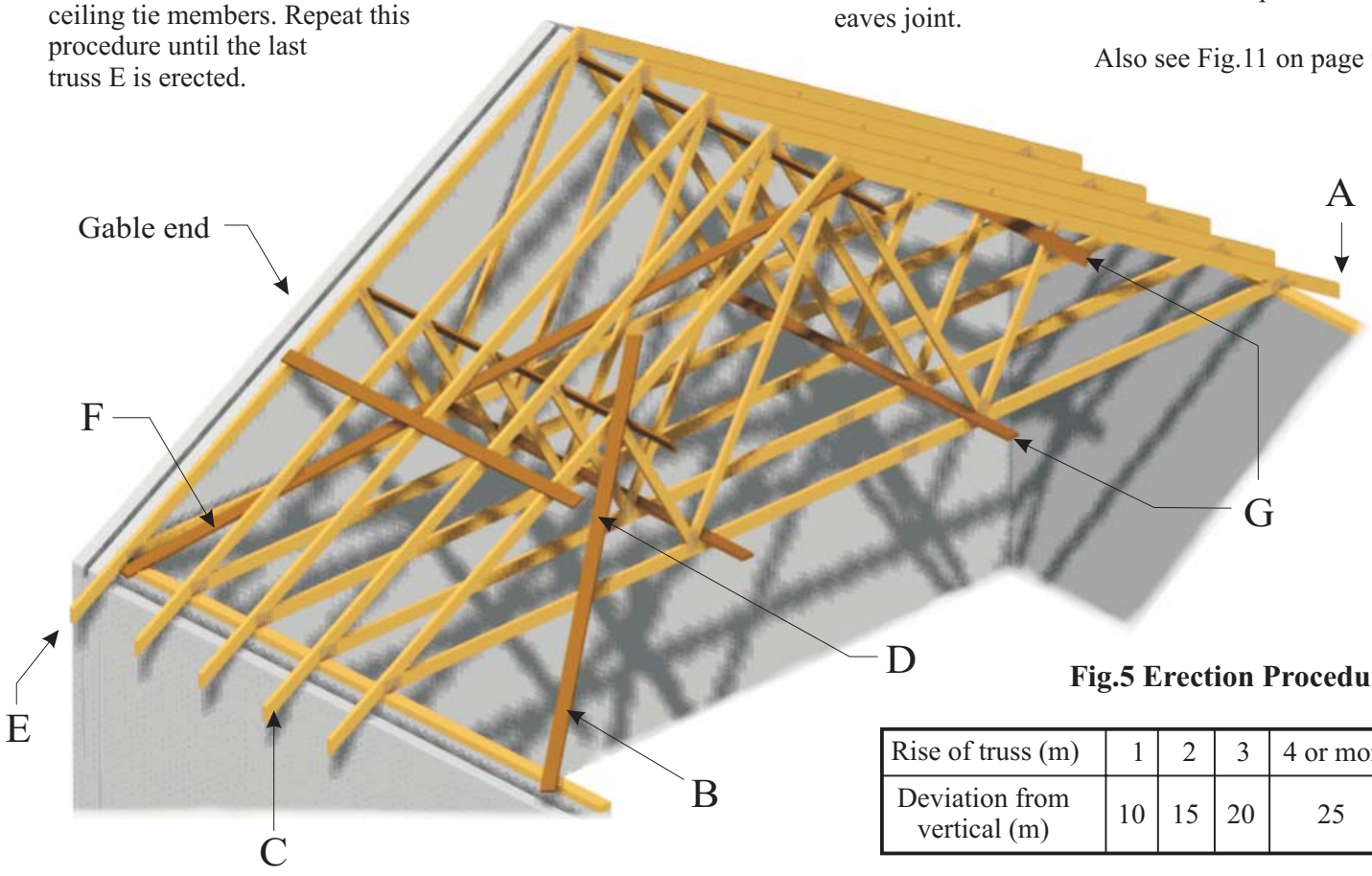
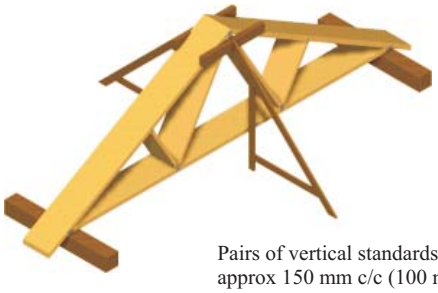


Fig.5 Erection Procedure

Rise of truss (m)	1	2	3	4 or more
Deviation from vertical (m)	10	15	20	25

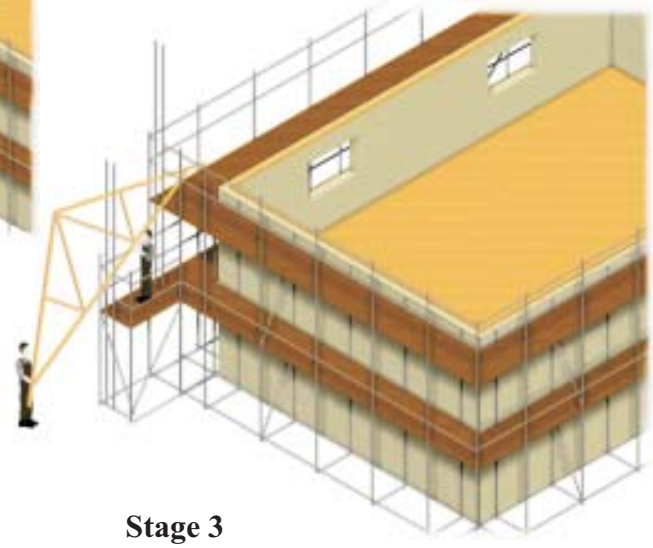
Fig.6 How to erect trussed rafter roofs using manual handling techniques.

[This diagram is intended to provide general guidance only, it remains the responsibility of the Principal Contractor or individual in charge of Health & Safety matters to ensure the safe undertaking of all site operations taking proper account of the specific risks identified in relation to those tasks]

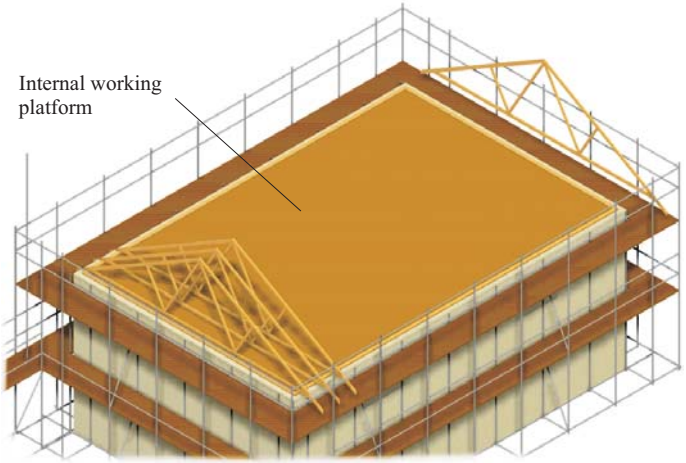


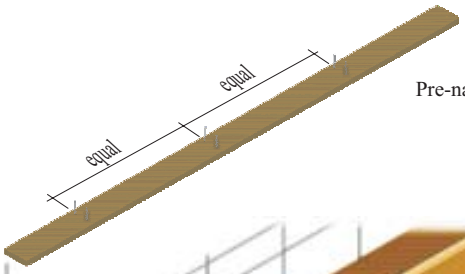
Stage 1
Safe truss storage.

Stage 2
After release from the bundle, (see Fig.3) individual trusses are carried to the scaffold.

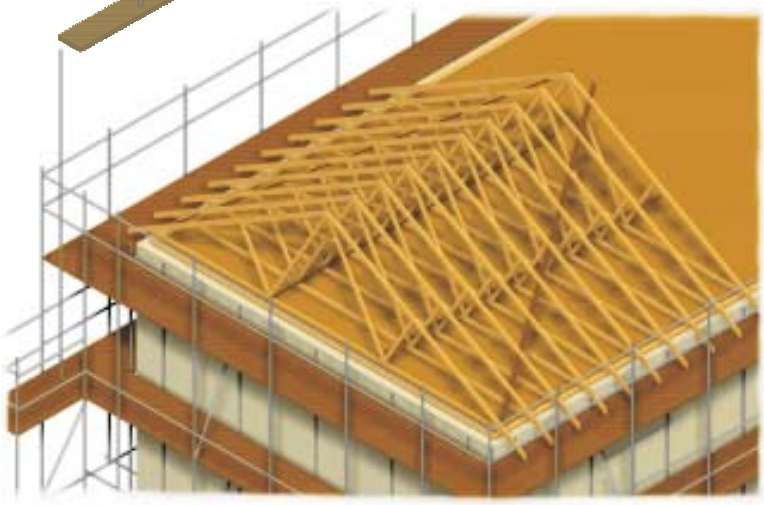


Stage 3
Raising of the individual trusses on to the scaffold vertically between the pairs of restraining standards making use of an adequate number of operatives.





Stage 4
Placing trusses in final position



Stage 5
As soon as the first pair of diagonal rafter braces have been installed, the raking rafter restraints that stabilised the first truss can be removed. This will then allow the construction of the first gable wall to commence. (Not all bracing is shown for reasons of clarity)

03 Standard Bracing Conditions

The Building Designer is responsible for all roof bracing. Bracing in roofs performs three distinct functions:

Temporary bracing - This is used to restrain the trusses during erection and is covered in section 2, page 6 “Handling & Erection".

Truss stability bracing - This is permanent bracing which holds the trusses upright, straight and prevents any out-of-plane buckling of the members.

Wind or wall bracing - This is bracing that is added into the roof in addition to the truss bracing that is used to stabilise the walls from the wind loads.

Truss Stability Bracing
For trusses up to 12m span and spaced at 600mm centres or less bracing must be a minimum size of 89mm wide and 22mm deep but have a minimum cross-sectional area of 2134mm^2. The bracing timber should be free of major strength reducing defects and fixed to every truss with two 3.35mm diameter galvanised wire nails having a minimum length of the brace depth plus 32mm. Where bracing members require to be spliced they are lap jointed over at least two trusses.

The different elements of truss stability bracing are:-

1. Longitudinal braces fixed at each unsupported joint and extending the length of the roof and finishing tight against a party or gable wall. The brace should be as close as possible to the joint and at the rafter joints fixed to the web to allow the rafter diagonal brace to run through.

NB other bracing omitted for reasons of clarity

Longitudinal brace located at all nodes (excluding support) and nailed to every truss using 2 No 3.35 mm x 65 mm galvanised wire nails as Fig.8.

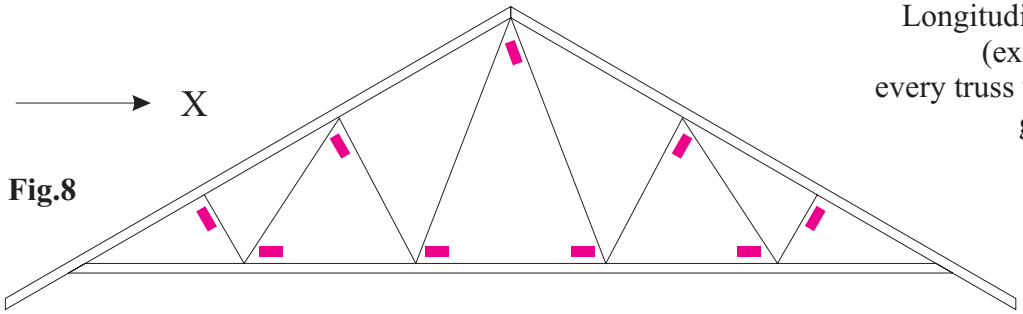


Fig.8

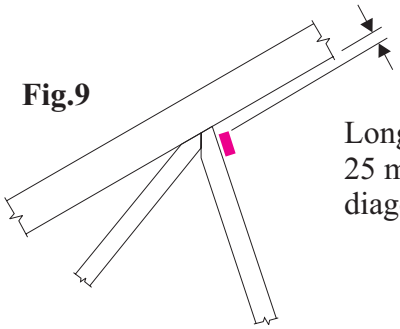


Fig.9

Longitudinal brace offset 25 mm from rafter to clear diagonal brace

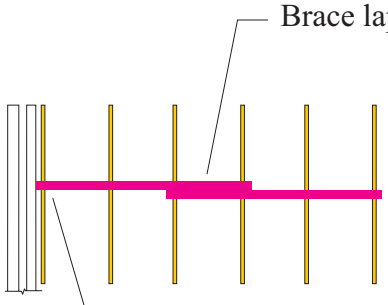


Fig.10 (View on X)

2. Tiling battens should be fixed to BS5534:Part 1 at 400mm maximum centres or in accordance with tile manufacturers instructions. They should be not less than 1.2m long and not more than 1 in 4 fixed on any rafter. The ends of the battens should be sawn square and butt jointed centrally on a rafter.

03 Standard Bracing Conditions

3. Rafter diagonal bracing is nailed to the underside of the rafters at an angle of approximately 45 deg and runs from the ridge to the wallplate to which it is fixed. It must extend over the whole length of the roof with a minimum of 4 braces used. It may be omitted from no more than 2 trusses between braces and one truss at a gable or party wall.

Plan of rafter diagonal bracing wide fronted roof

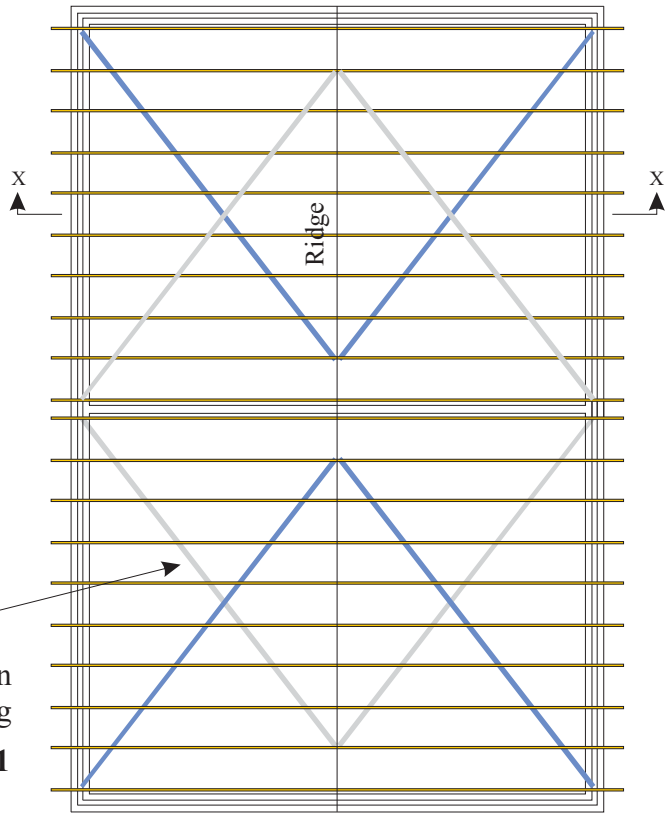


Fig.11

Fig.12 (Section X - X)

Diagonal brace nailed to every truss using 2 No 3.35 mm x 65 mm galvanised wire nails

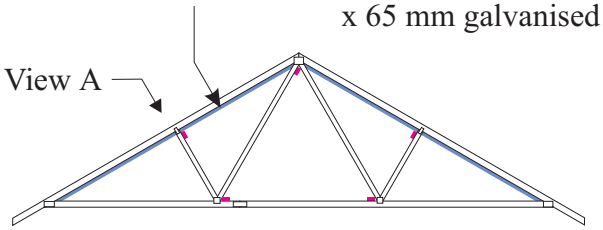
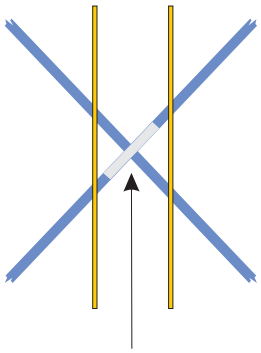


Fig.16 (Detail B)



22 x 97 x 600 mm long timber splice plate nailed using min of 4 No of 3.35 mm x 65 mm long galvanised wire nails each side driven through and clenched over

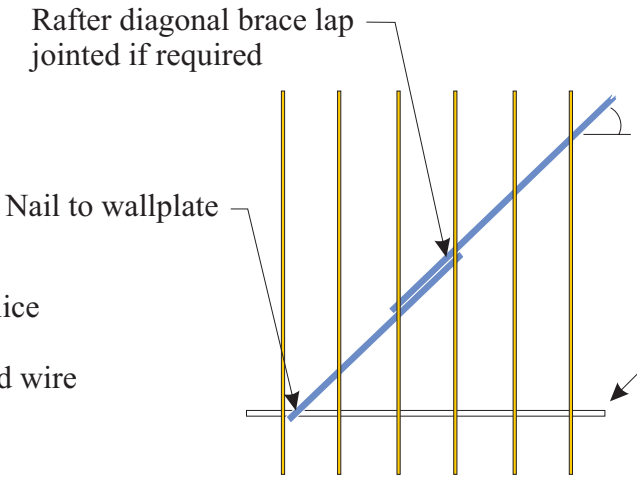


Fig.12a
Part view on arrow A

Plan of rafter diagonal bracing wide fronted roof

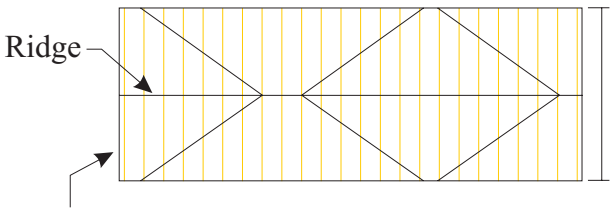


Fig.13

Plan of rafter diagonal bracing narrow fronted roof where frontage < span/1.4 (cos pitch)

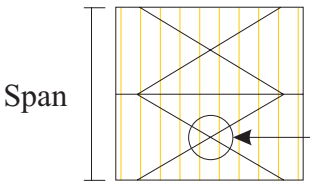


Fig.14

Plan of rafter diagonal bracing mono pitched roof

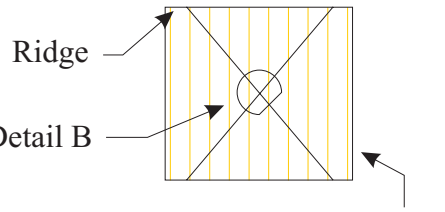


Fig.15

Diagonal bracing on mono pitch trussed rafters

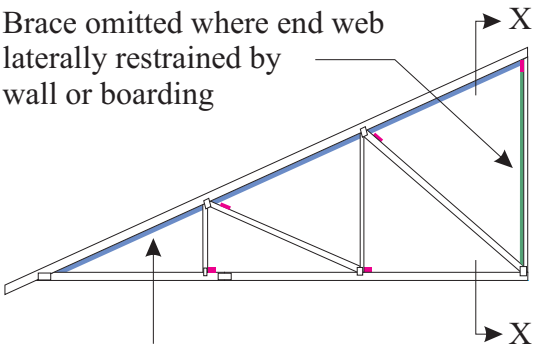
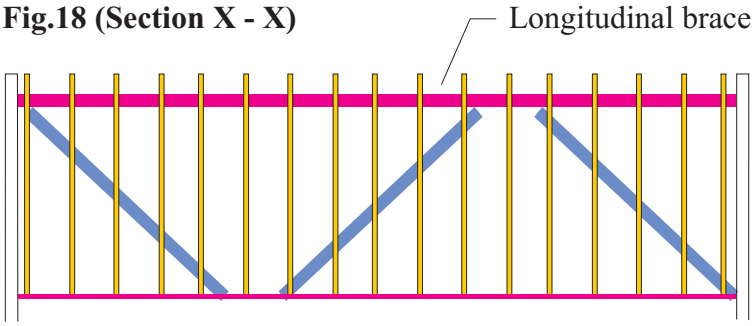


Fig.17

Fig.18 (Section X - X)



Diagonal bracing inclined at approximately 45 deg

4. Web chevron bracing is fixed to certain webs as shown at an angle of approximately 45 deg and must cover at least 3 trusses. It is continued along the whole length of the roof and may be omitted from 2 trusses between braces and one truss at a gable or party wall.

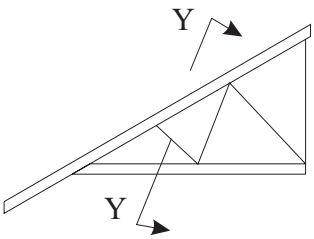


Fig.19

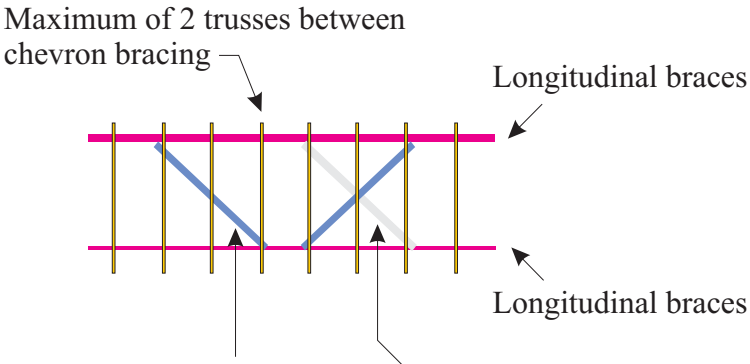
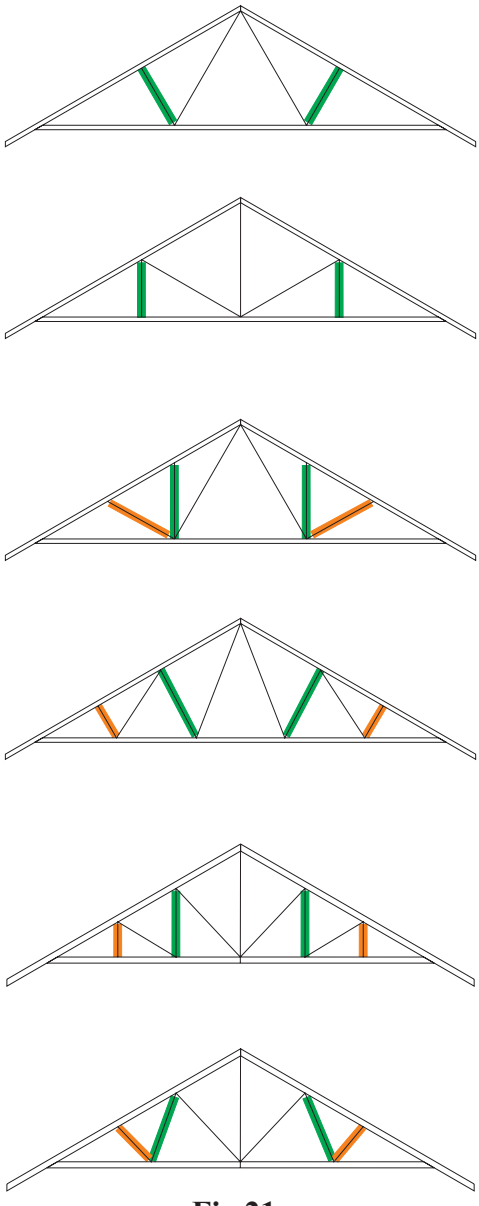


Fig.20 (Section Y - Y)

Chevron bracing for duopitch trussed rafters



Position of chevron bracing for spans over 8 m

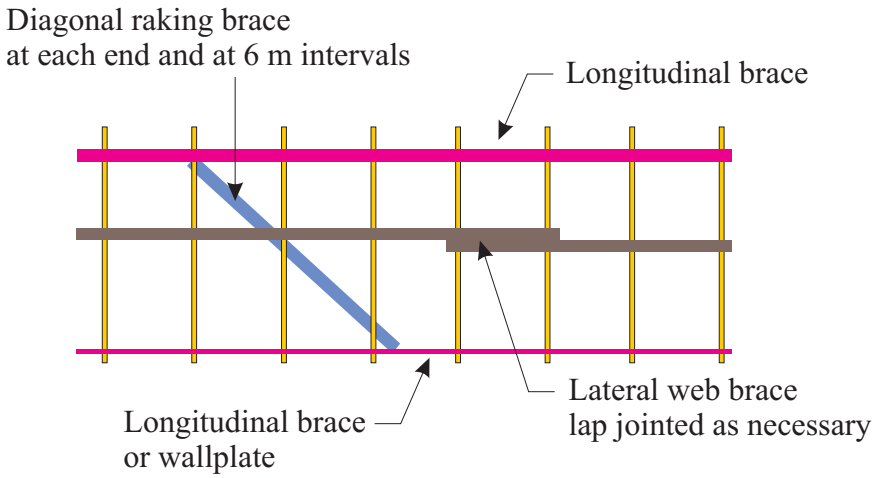
Position of chevron bracing strongly recommended for spans over 11 m

Fig.21

5. Web lateral braces are required as part of the truss design and are fixed on the centre of the member along the complete section of roof. They require an additional raking brace at each end of the web brace and at 6 m intervals along its length.

NB Raking brace can be omitted where chevron brace is fixed to web

Fig.23 Section X - X



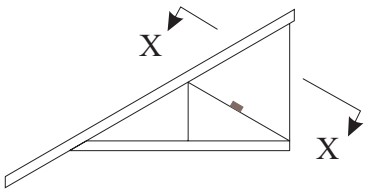
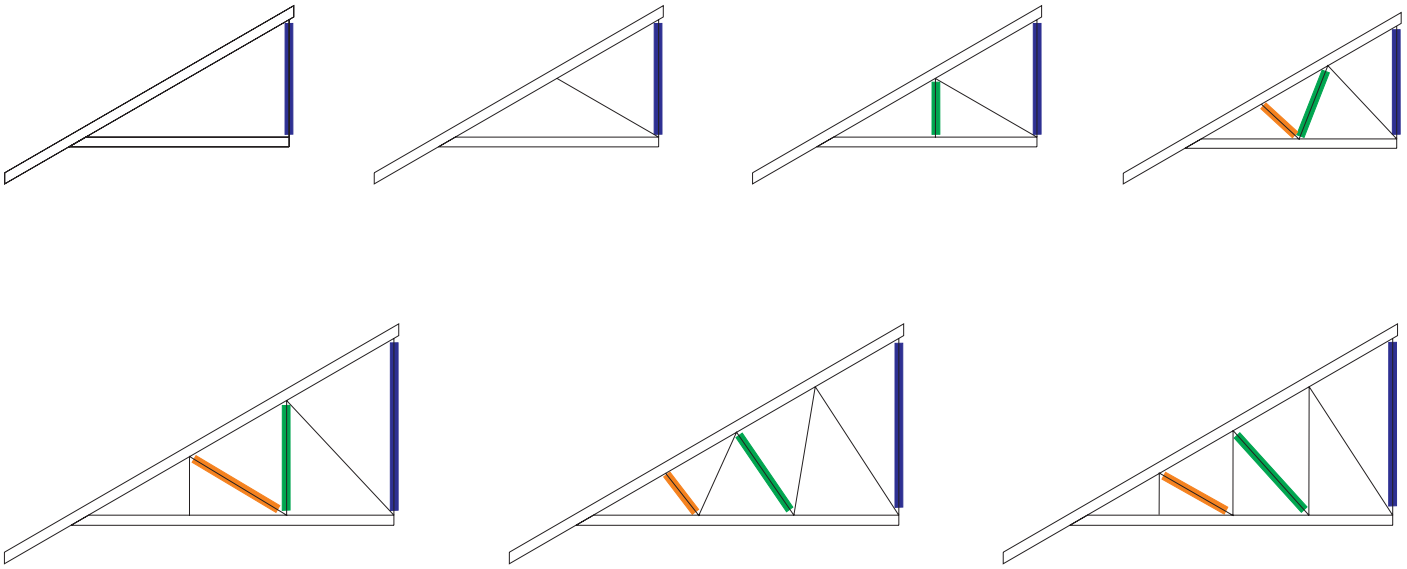


Fig.22



Chevron bracing for mono pitch trussed rafter

Position of chevron bracing for spans over 5 m

Position of extra chevron bracing required for spans over 8 m

Add extra bracing here if end of truss is not restrained by wall or cladding

Fig.24

04 Special Bracing Conditions

Attic and extended top chord trusses - There are 2 options for installing rafter diagonal bracing in trusses with a sloping ceiling area, the easiest way is to run the brace through this area in the normal way and batten out the rafters to allow for plasterboard fixing.

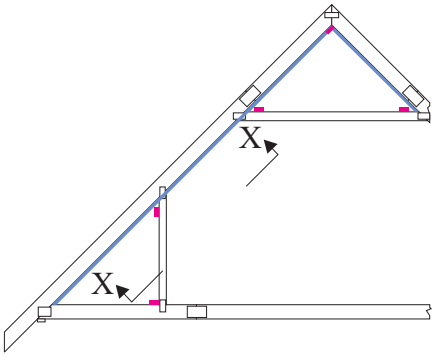


Fig.25

Run diagonal brace through room area and batten out underside of rafter to receive plasterboard

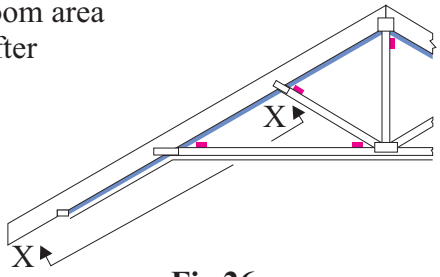


Fig.26

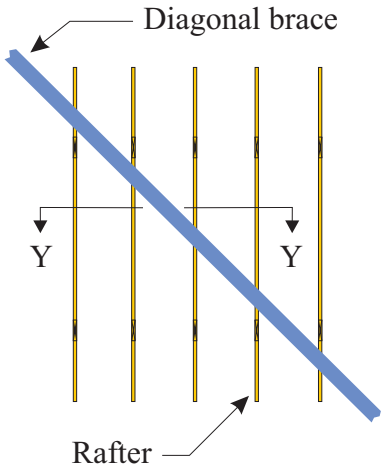
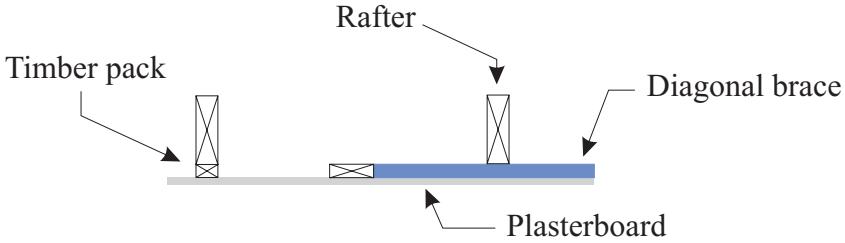


Fig.27 (Section X - X)

(Attic variation shown, raised tie similar)

Fig.28 (Section Y - Y)



The alternative is to fix plywood diaphragms between the rafters in the sloping ceiling area, this consists of 9mm plywood nailed to a 50 x 50 timber framework.

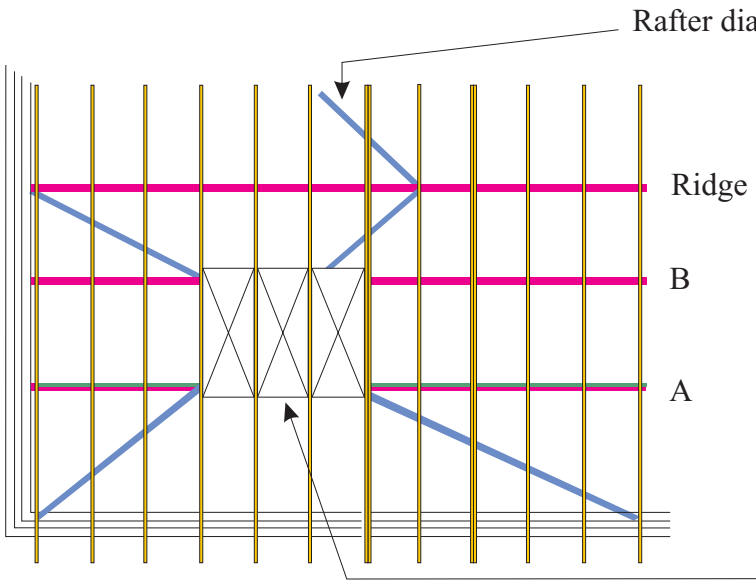


Fig.30 (View A)

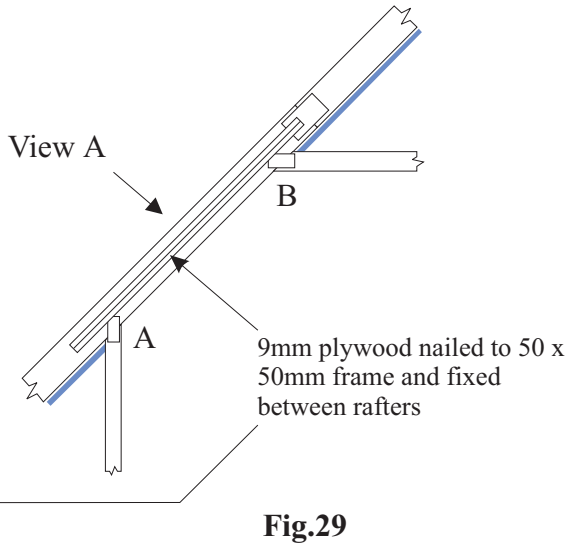


Fig.29

04 Special Bracing Conditions

Warm roof construction - if an insulation board is installed on top of the rafter this reduces the effect of the tiling battens to restrain the rafters. Additional bracing may therefore be required underneath the rafter as specified by the truss designer.

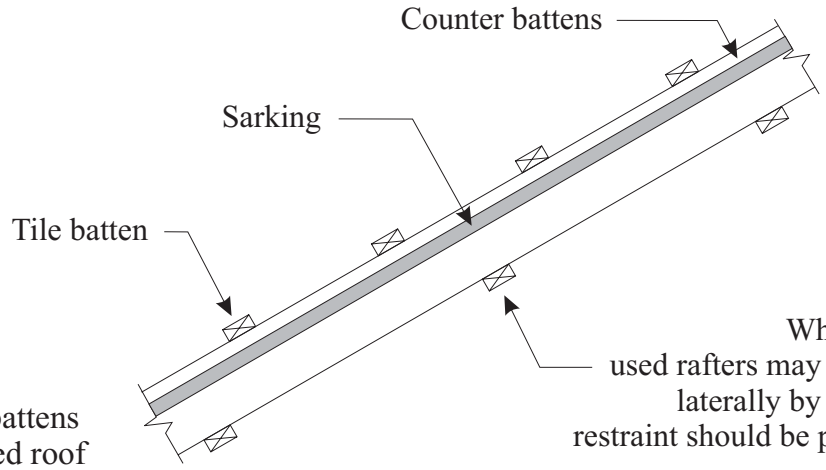


Fig.31 Counter battens on boarded roof

Sarking - if a rigid sarking material is used directly on top of the rafter the permanent rafter diagonal, web chevron and top chord longitudinal braces can be omitted. The sarking material and fixing must be in accordance with BS5268-3.

Nodes not in line - where different truss types are adjacent to each other on a roof and the node points are not in line the distance between the braces should be minimised by positioning them on the same side of the joints and they should be lapped over 2 trusses of each type i.e. 4 in total.

Longitudinal brace - varying node positions

Locate braces to minimise distance between them and continue over 2 trusses into adjacent section

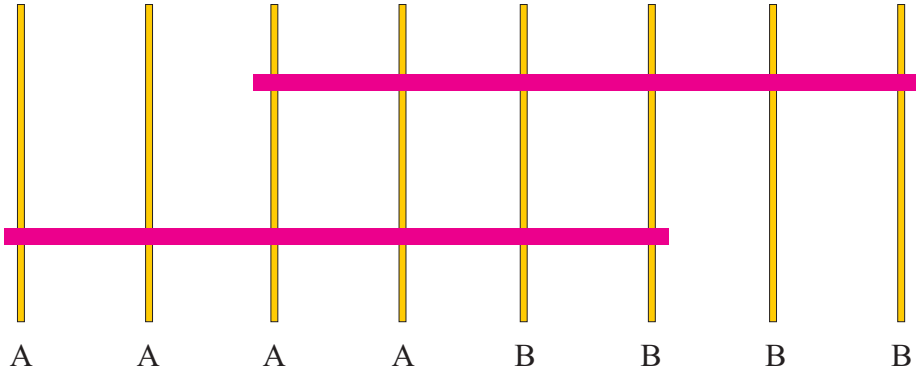


Fig.32

Varying chord depths - where adjacent truss types have different chord depths it is necessary to add timber packs to keep the bracing continuous. Use a 50mm x 1200mm pack with depth to suit and fix with 4 no. nails top and bottom.

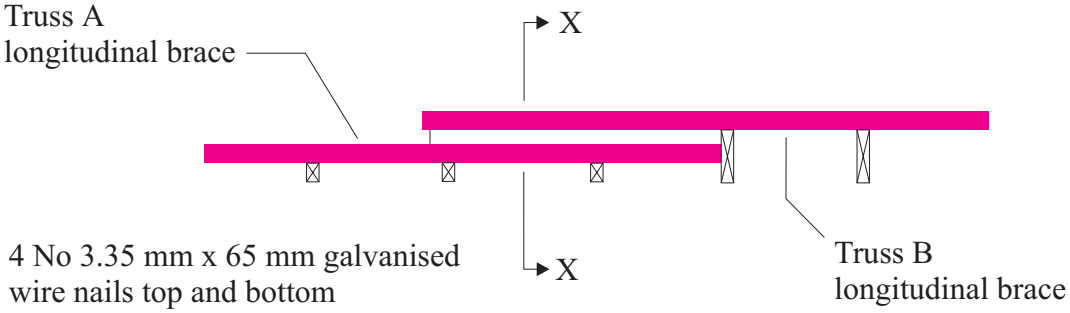


Fig.33

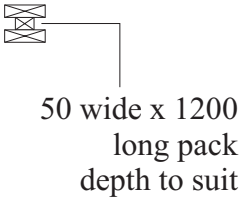
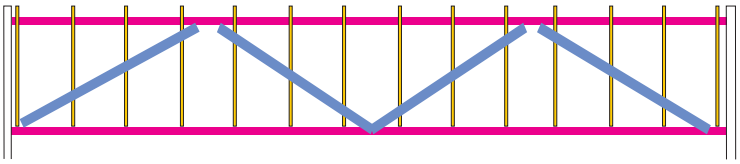


Fig.34 (Section X - X)

04 Special Bracing Conditions

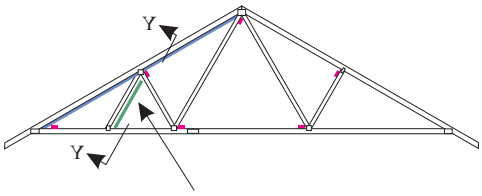
Cantilever trusses - to brace a cantilever truss the rafter diagonal brace should be installed in the usual way and an additional diagonal brace used on the cantilever web and fixed to the wallplate.

Fig.35 Section Y - Y



Diagonal bracing inclined at approximately 45 deg and continued through roof

Fig.36



Additional diagonal brace

Stub trusses - on stub trusses the end vertical web requires a diagonal brace the same as a rafter diagonal brace. If the web is not long enough to have a brace added use herringbone strutting to restrain it.

Brace omitted where end web laterally restrained by wall or boarding

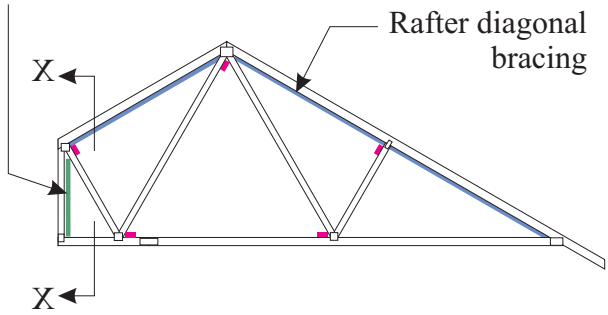


Fig.37

Diagonal bracing inclined at approximately 45 deg and continued through roof

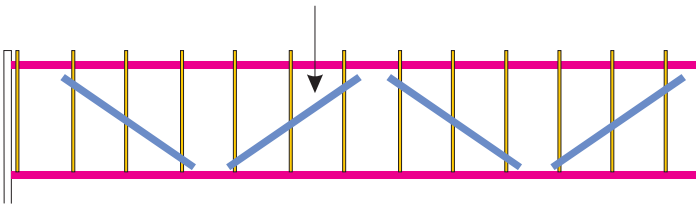
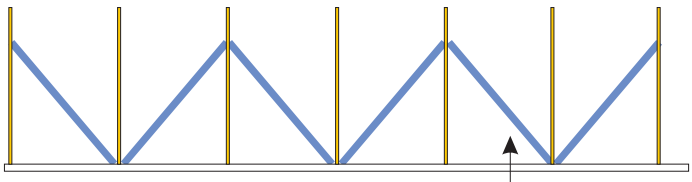


Fig.38 (Section X - X)

Alternative section X - X



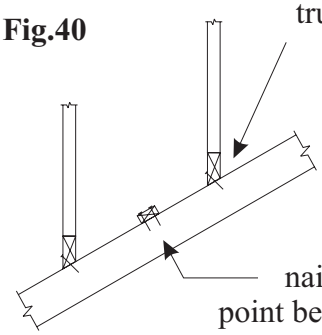
Wallplate

Fig.39 (Alternative section X - X)

Where web length is limited provide herringbone strutting in lieu of diagonal brace

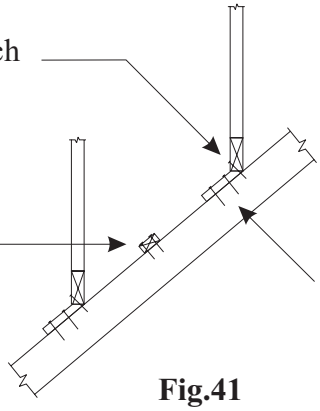
Valleys - as tiling battens are omitted in the valley area additional bracing may be required to the rafters depending on the truss design, this will be specified by the truss designer.

Fig.40



Valley frames fixed to each truss using 1 No nail

Bracing (e.g. Tiling batten) nailed to trusses at mid point between valley frames



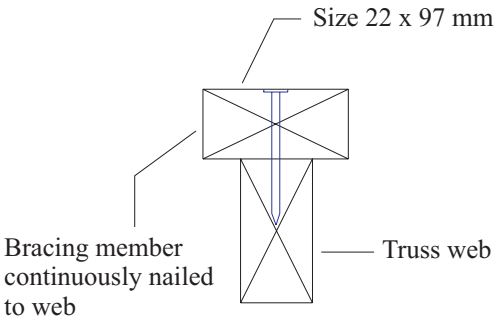
Valley frames may be supported on continuous binders fixed to rafter

Fig.41

04 Special Bracing Conditions

'T' web brace - if a web requires a lateral brace but this cannot be installed in the usual manner an additional timber can be nailed to the edge of the web to form a T-section.

'T' Web brace **Fig.42**



Wind bracing - if the building designer requires additional bracing within the roof to stabilise the walls this is usually provided in the form of wind girders. These comprise of parallel chord trusses positioned on top of or underneath the truss bottom chord and spanning between shear walls. The fixing to the wall needs to be detailed by the Building Designer.

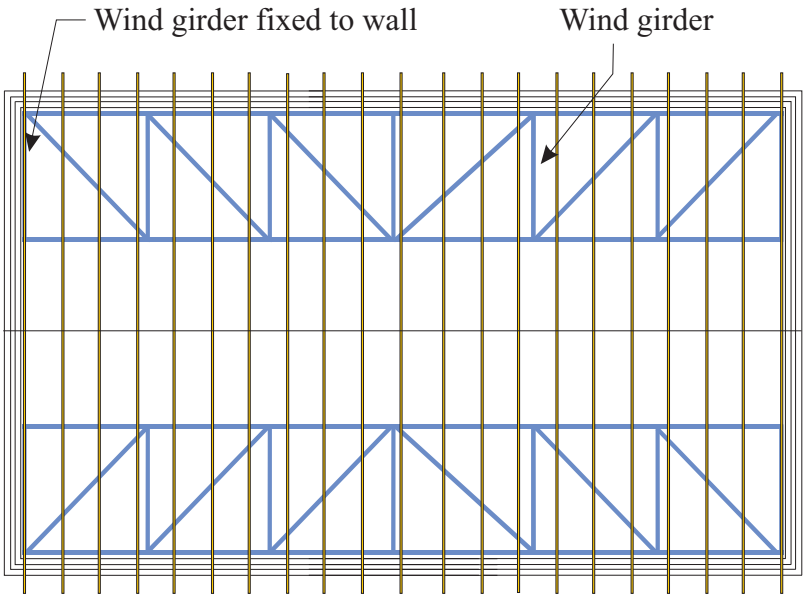
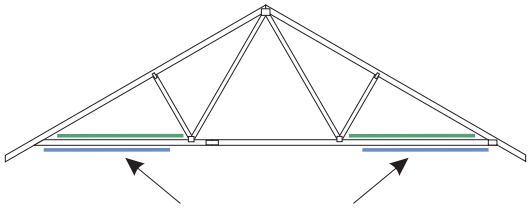


Fig.43



Wind girders laid on and nailed to bottom chord of truss
or
Wind girders may be fixed to underside of trusses using annular ring shanked nails.

Fig.44

No ceiling or suspended ceiling - when no plasterboard ceiling is fixed directly to the truss bottom chord additional diagonal bracing is required on the outer bays of the bottom chord at 45 deg and extending the length of the building.

Spans above 12m - a special bracing design may be required as specified by the Building Designer. This may include additional bracing or larger size bracing timbers.

Truss spacing above 600mm - this will require a special bracing design specified by the Building Designer and will include larger size bracing timbers.

Wind stress reversal bracing - if wind stress reversal occurs on a truss additional longitudinal bracing may be required to the centre of bottom chord bays and long webs. This bracing should be specified by the truss designer.

04 Special Bracing Conditions

Purlin roofs - when purlins are used to carry lightweight sheeting materials in place of tile battens and tiles this will affect the top chord restraint on the rafter as well as the loading and may require additional longitudinal bracing on the top chord.

Hip trusses - the flat section of a hip truss will have no tiling battens and will therefore require additional bracing that should be specified by the truss designer.

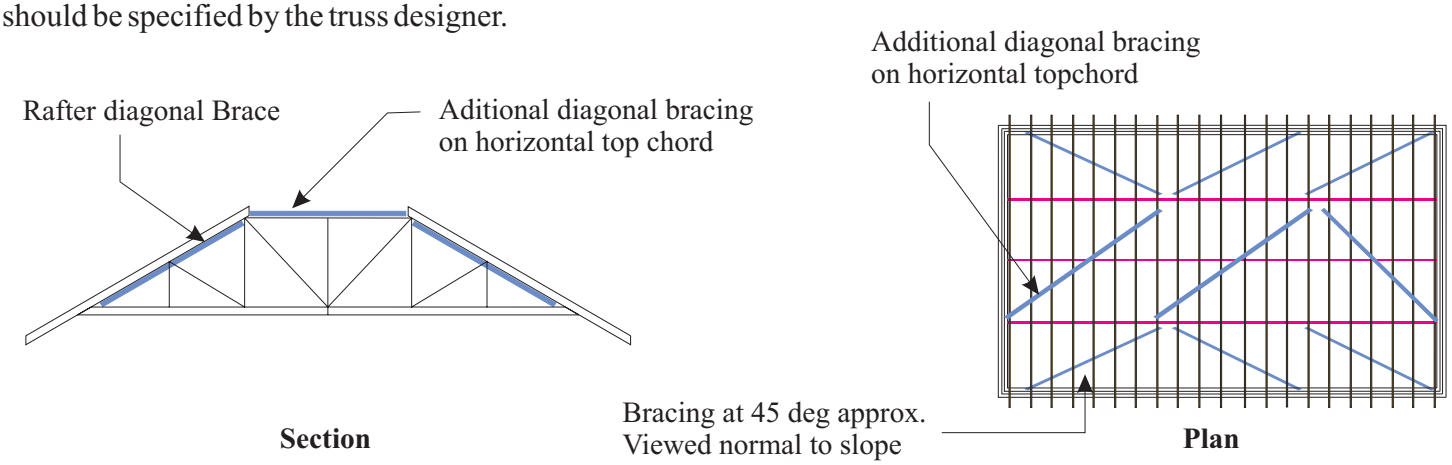


Fig. 45 Diagonal bracing on hip trusses

Top hat trusses - when a truss is split into 2 sections due to height limits the base hip type truss should be fully braced before the top truss is installed and braced.

Supplementary top chord - when a supplementary top chord is used either at a cantilever or extended top chord it is necessary to lap the rafter diagonal bracing using a blocking detail to keep the brace continuous.

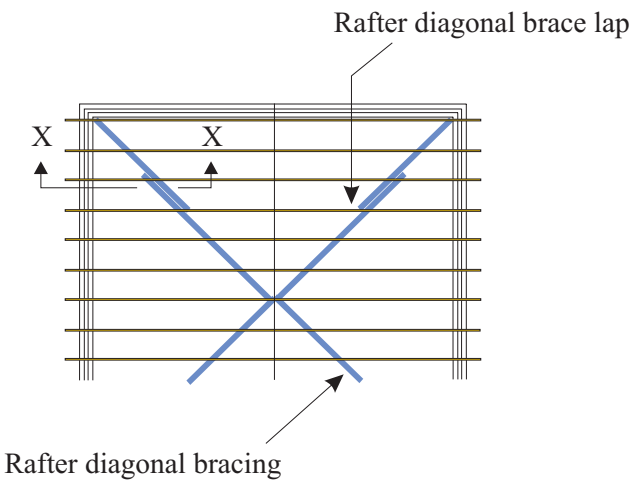


Fig.46

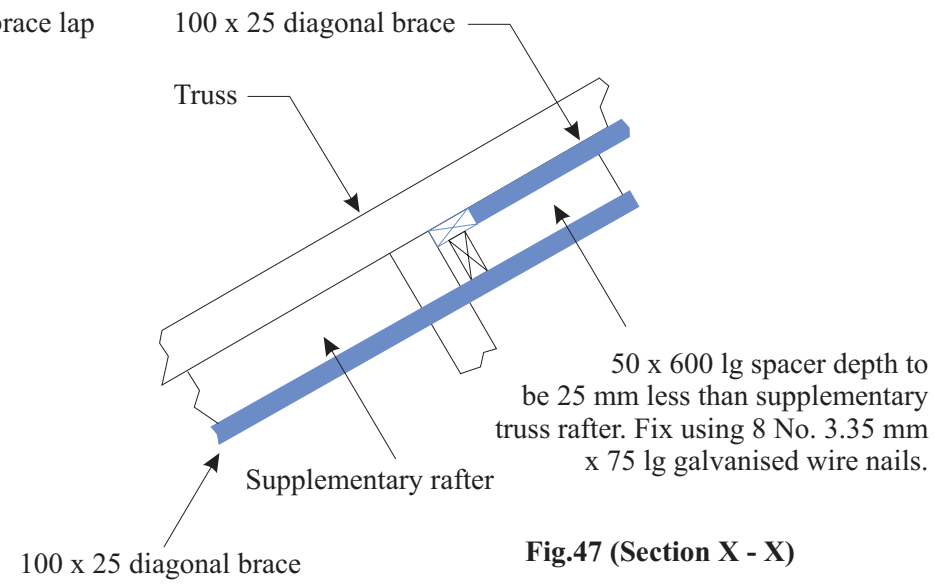


Fig.47 (Section X - X)

Metal strip bracing - it is possible to replace the rafter diagonal timber bracing with a specialist metal strip brace that must be used in accordance with the manufacturers instructions.

Prefabricated bracing systems - it may be feasible to replace the rafter diagonal bracing system with a series of prefabricated bracing frames laid on slope between the truss rafters. This type of construction would require a specialist design.

05 Tank Support Details

Water Tank Support for Standard Fink Trusses

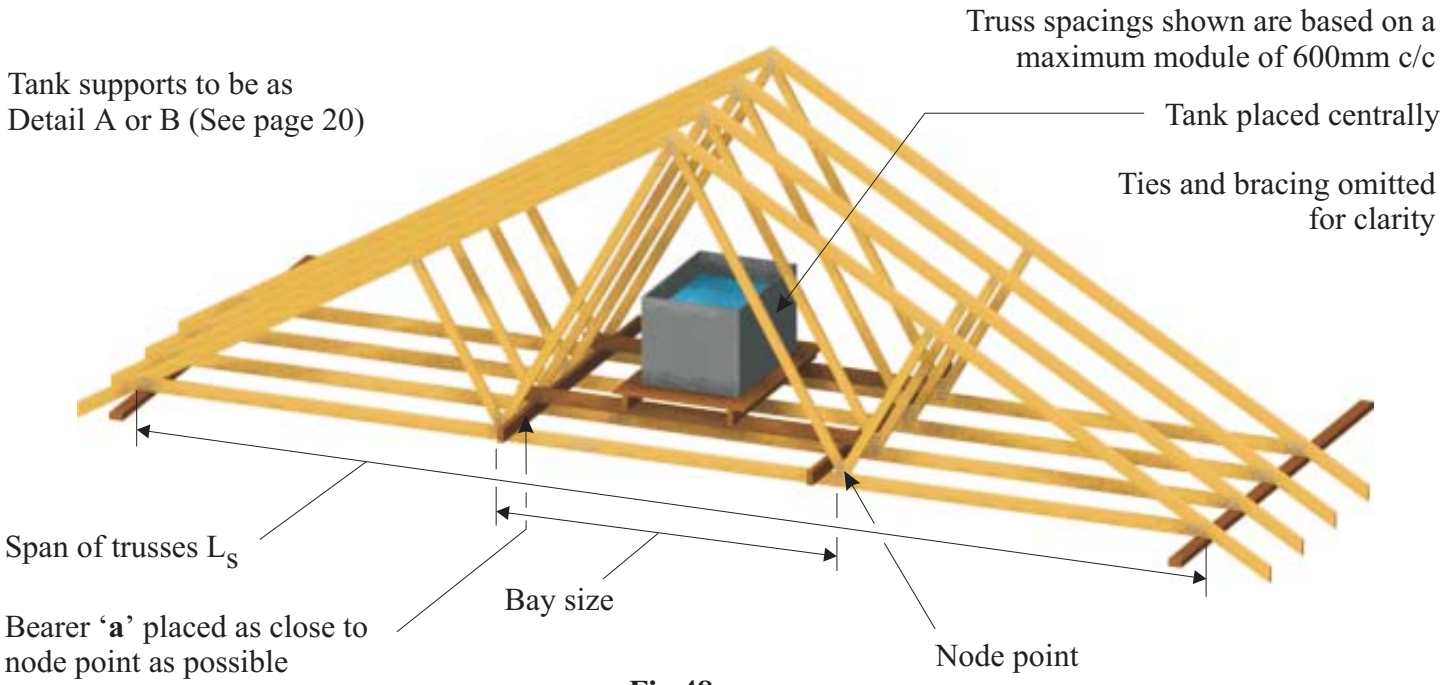


Fig.48a

Raised Water Tank Support Platform

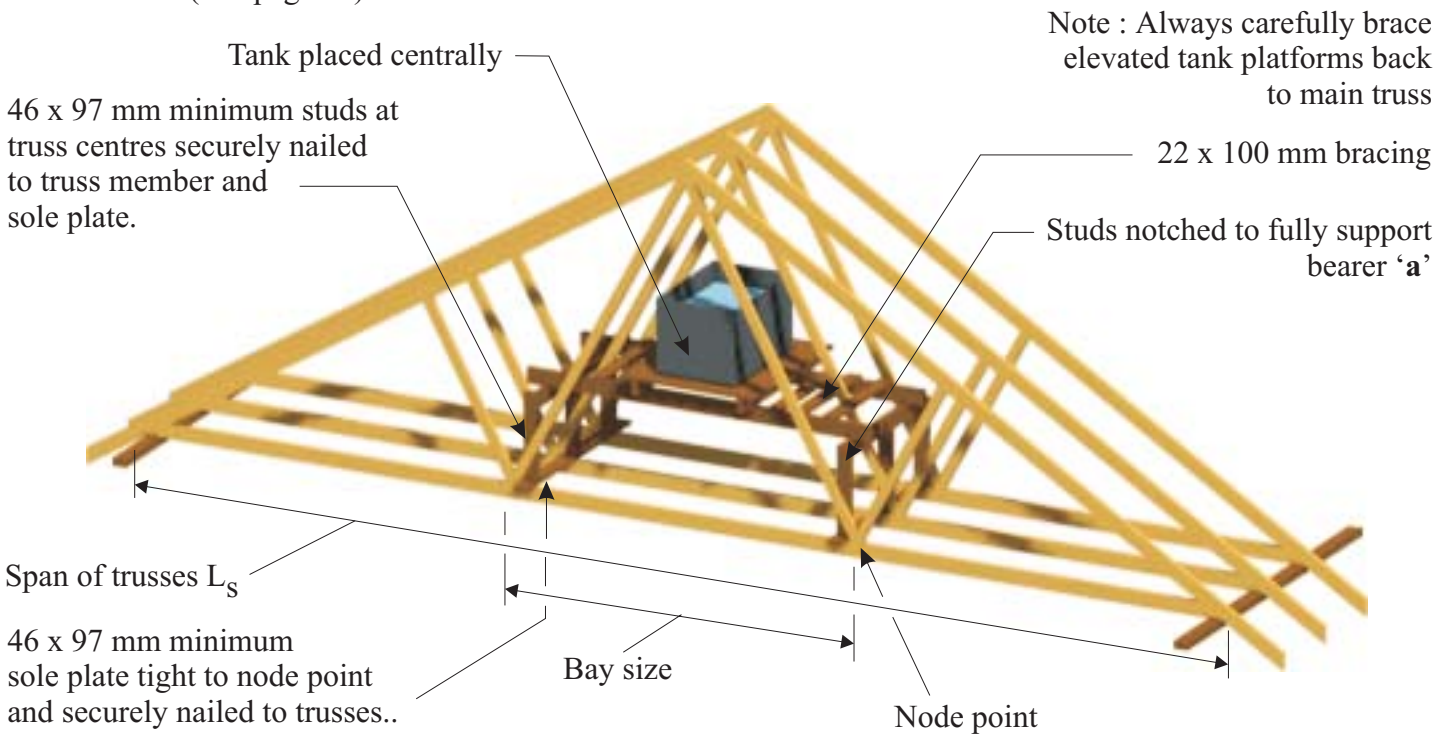


Fig.48b

Water Tank Support for Mono Pitch Trusses

Tank supports to be as
Detail A or B (See page 20)

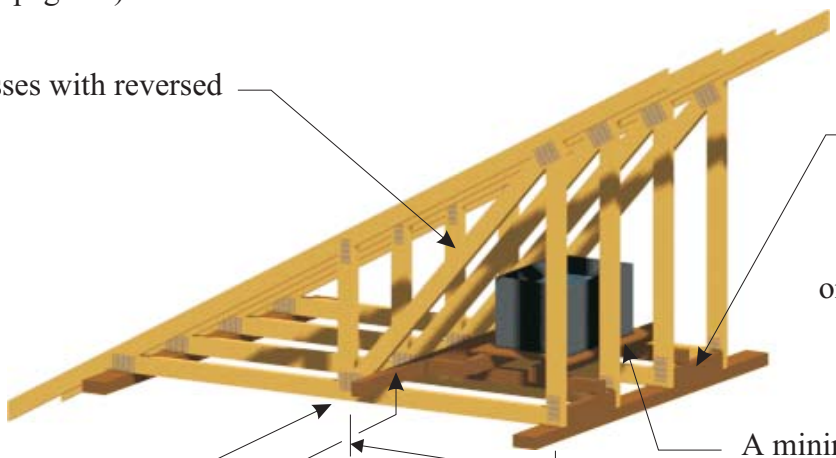


Fig.49a

Raised Water Tank Support Platform for Mono Pitch Trusses

Tank supports to be as
Detail A or B (see page 20)

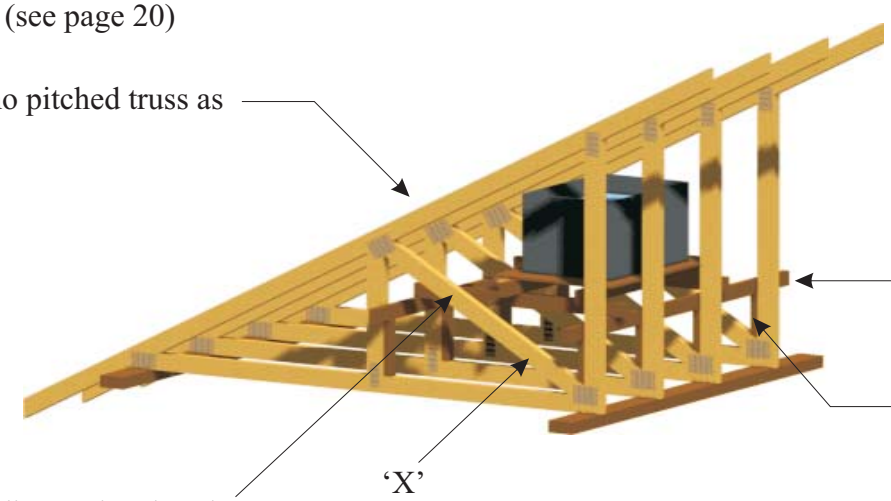


Fig.49b

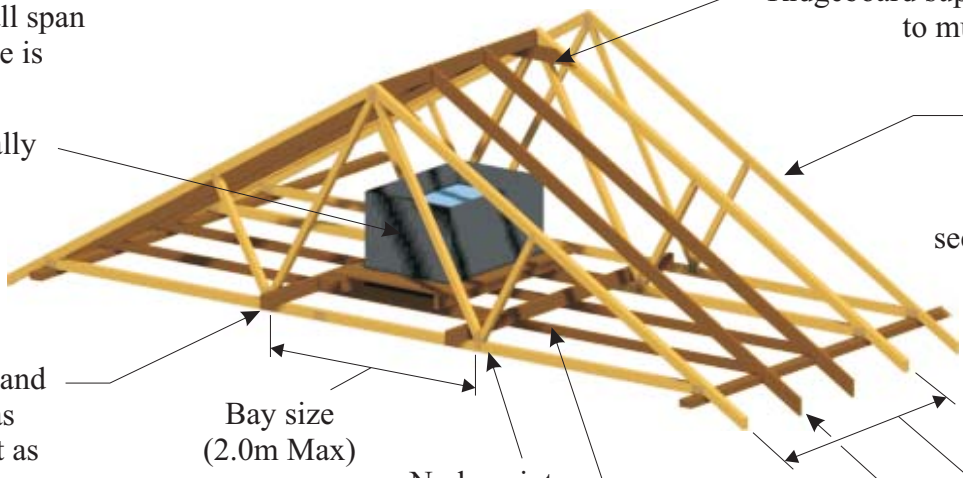
05 Tank Support Details

Water Tank Support for Small Span Trusses

Tank supports to be as Detail C (see page 20)

This method of support should be adopted on small span trusses where space is limited

Tank placed centrally



Ridgeboard support ledger (nailed to multiple girder truss)

Standard truss to main roof

Multiple truss see TRA information sheet No.9804

Compound bearer and binder **'a'** placed as close to node point as possible

Bay size (2.0m Max)

Node point

Infill ceiling joist

1.8m Max

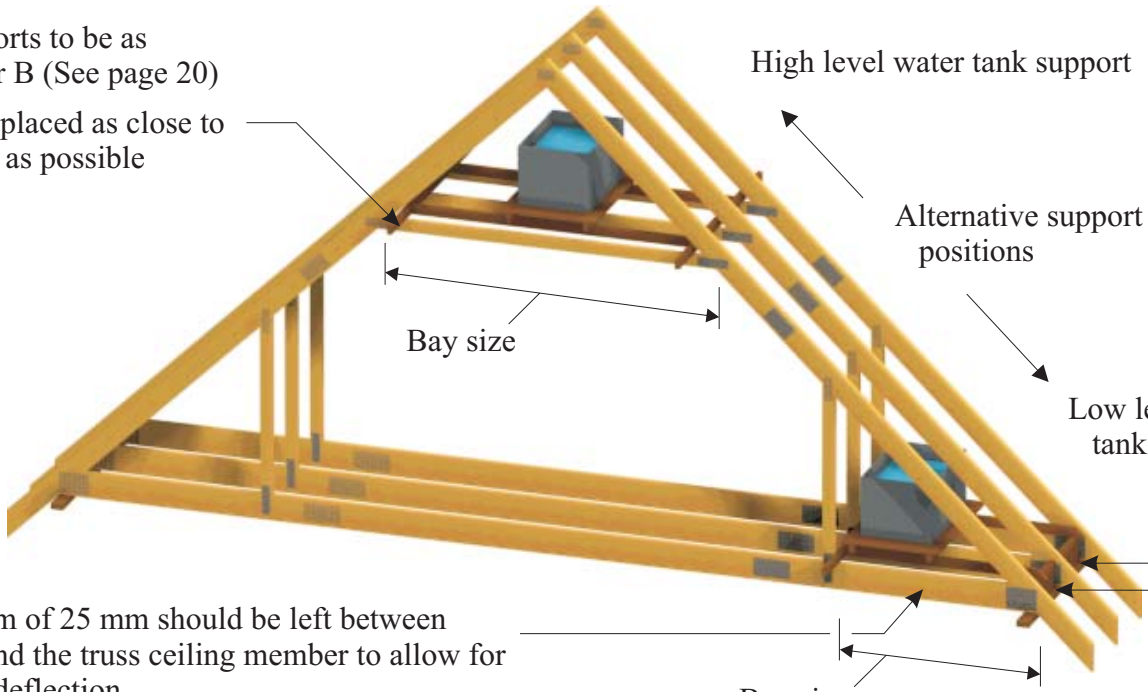
Infill rafters (To be minimum 25mm deeper than trussed rafter member to allow for birdsmouthing at wallplate.

Fig.50a

Water Tank Support for Open Plan Attic Trusses

Tank supports to be as Detail A or B (See page 20)

Bearer **'a'** placed as close to node point as possible



High level water tank support

Alternative support positions

Bay size

Low level water tank support

Packs

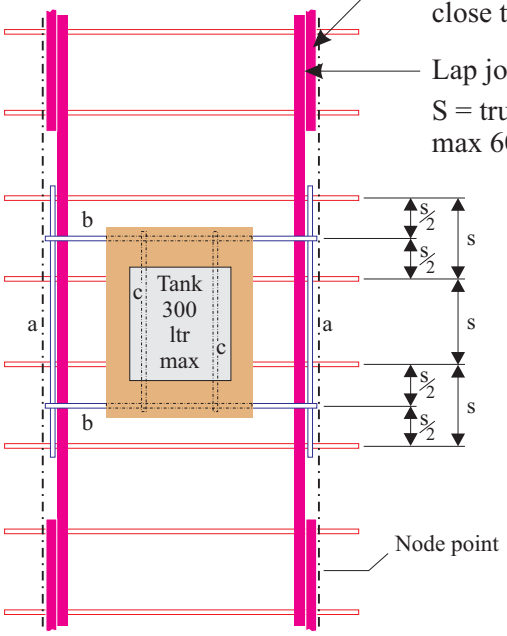
A minimum of 25 mm should be left between bearer C and the truss ceiling member to allow for long term deflection.

Bay size

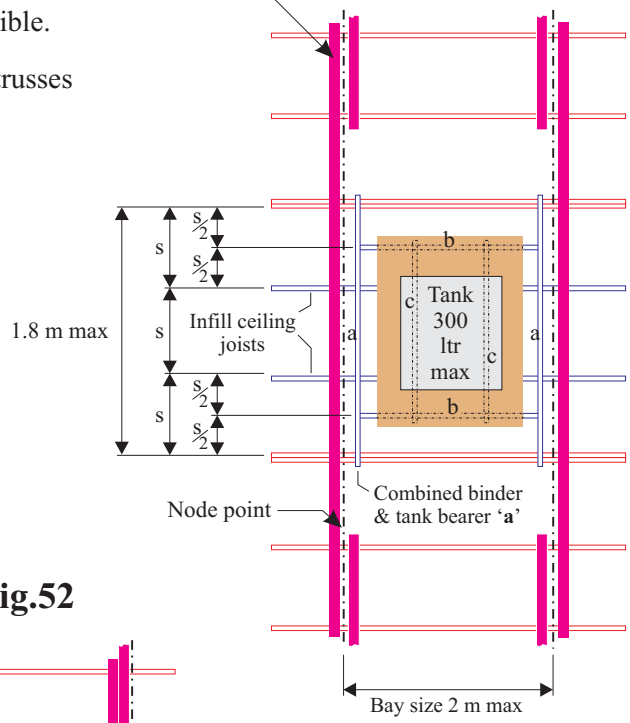
Fig.50b

05 Tank Support Details

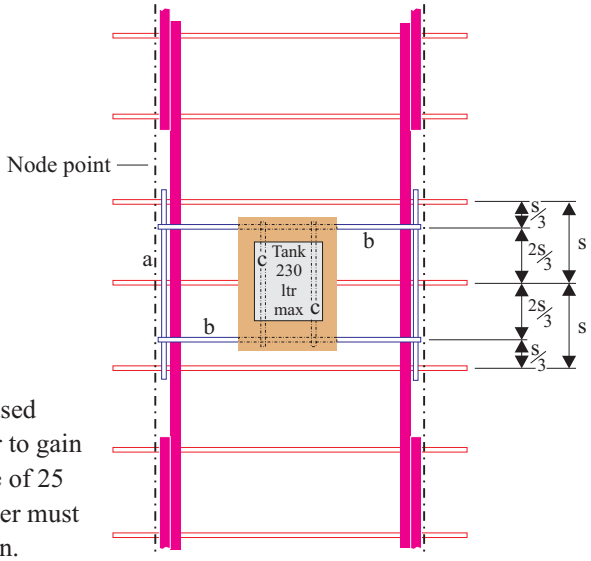
Detail "A" Fig.51



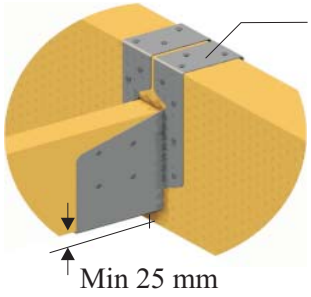
Detail "C" Fig.53



Detail "B" Fig.52



Alternative support between members for detail "A" & "B"



Where space is limited this detail may be used between members a & b and b & c in order to gain head room. However a minimum clearance of 25 mm above the ceiling lining or truss member must be allowed for possible long term deflection.

If water tanks are to be supported on the trussed rafters in accordance with the details shown then the provision for these must be taken into account at the design stage.
Otherwise, the additional loads imposed by the water tanks must be supported independent of the trussed rafters.

Sizes for support member Table 1

Tank capacity to marked water line	Minimum member size (mm) a and c	b	Max span Ls for fink trussed rafters (m)	Max bay size for other configurations (m)
Detail "A" not more than 300 litres on 4 trussed rafters	47 x 72	2/35 x 97 or 1/47 x 120	6.50	2.20
	47 x 72	2/35 x 120 or 1/47 x 145	9.00	2.80
	47 x 72	2/35 x 145	12.00	3.80
Detail "B" not more than 230 litres on 3 trussed rafters	47 x 72	1/47 x 97	6.50	2.20
	47 x 72	2/35 x 97 or 1/47 x 120	9.00	2.80
	47 x 72	2/35 x 120 or 1/47 x 145	12.00	3.80
Detail "C" not more than 300 litres on 2 multiple trusses as shown	1/72 x 145 or 2/35 x 145	1/72 x 145 or 2/35 x 145	6.00	2.00

Note: Support members may be of any species with a permissible bending stress not less than that of European redwood/whitewood of C16 strength class or better.

06 Chimney & Trap Hatch Trimming Details

The position and size of openings should be determined when the building is designed and every effort should be made to accommodate such openings within the trussed rafter design spacing. Where this cannot be achieved, the spacing of the trussed rafters near the opening may be increased as shown, provided that the spacing between the centres of the triming trussed rafters does not exceed twice the design spacing of the trussed rafters.

Chimney Opening

All timber must be at least 50 mm clear of the flue

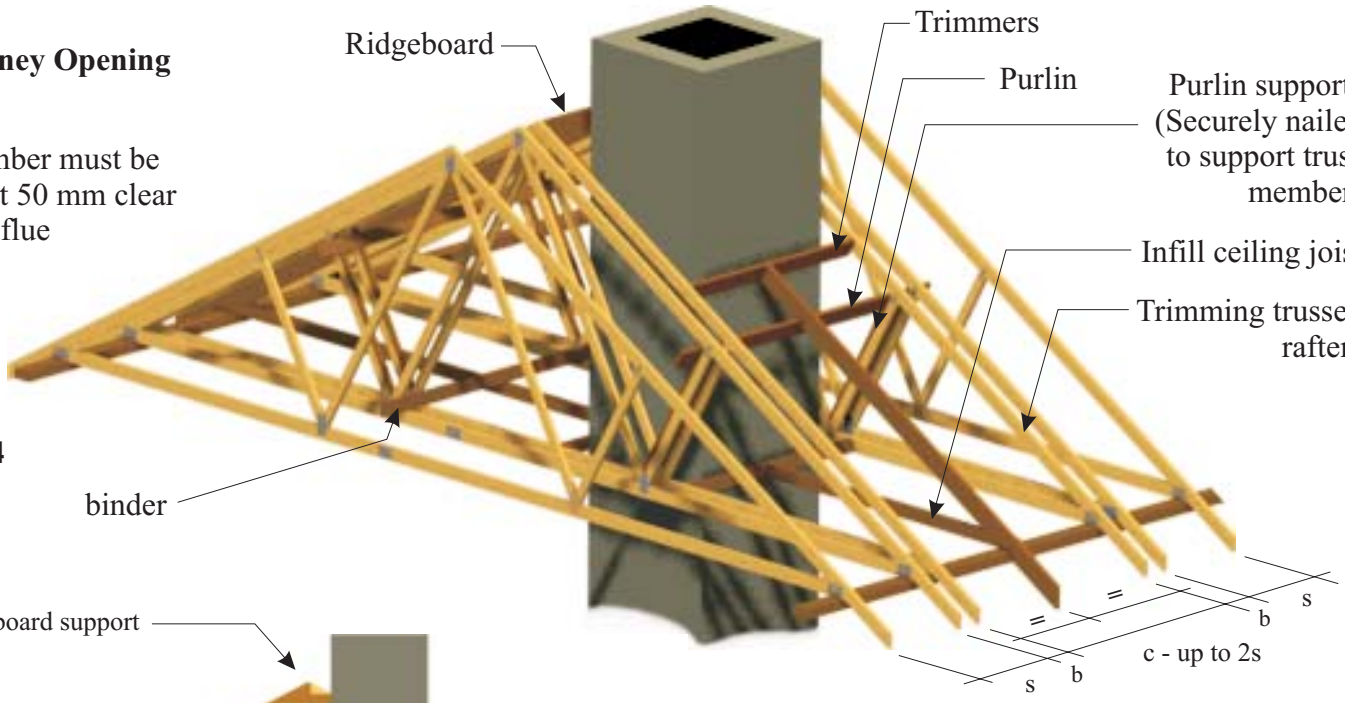


Fig.54

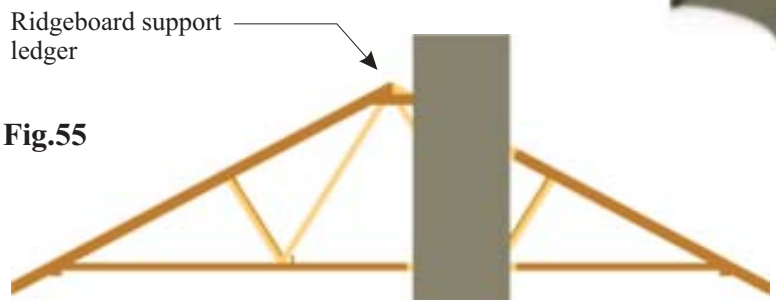


Fig.55

"S" is the design spacing of the trussed rafters;
"b" is the distance between the centres of the trimming trussed rafters and the adjacent trussed rafter;
"c" is the normal width of the required opening;

Chimney and trap hatch openings in excess of 2 spacings can be achieved by grouping trusses to form compound trusses each side of the opening. Common rafters and ceiling joists can then be supported by purlins and binders spanning between the compound trusses.

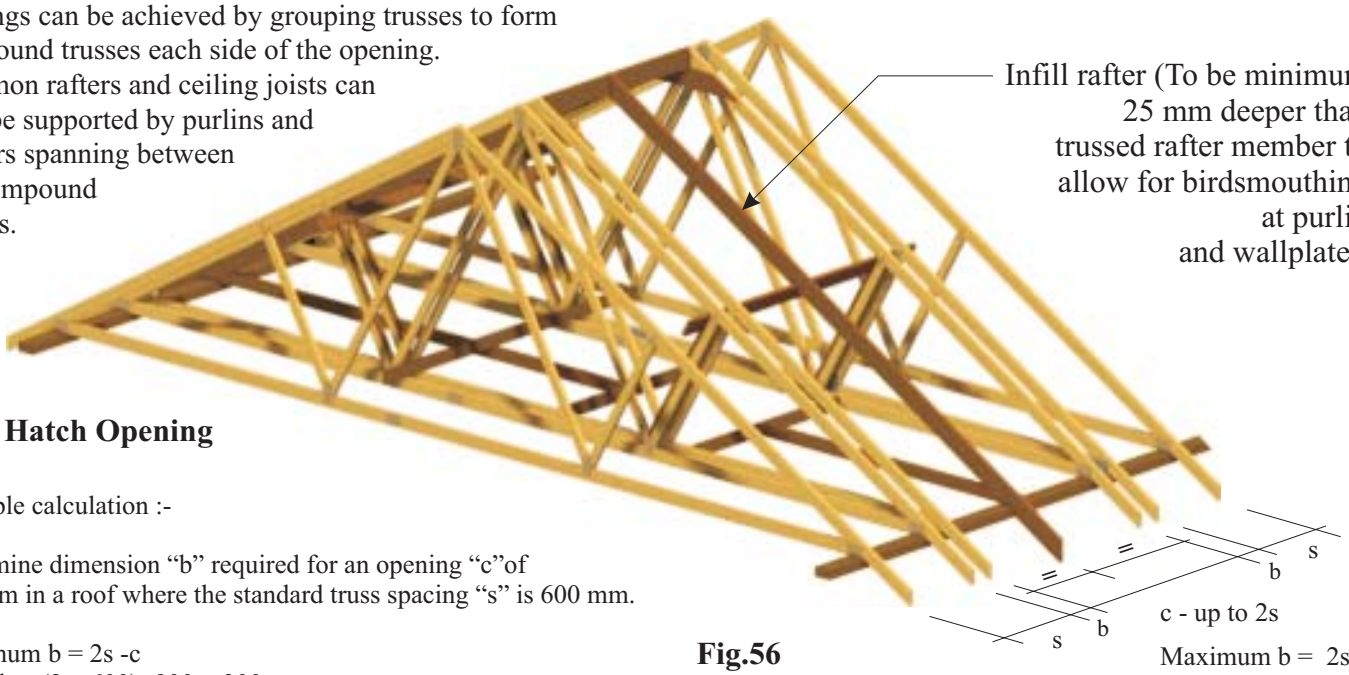


Fig.56

Trap Hatch Opening

Example calculation :-

Determine dimension "b" required for an opening "c"of 900 mm in a roof where the standard truss spacing "s" is 600 mm.

Maximum b = 2s -c
hence b = (2 x 600) -900 = 300 mm

Maximum b = 2s -c

General

Trussed rafters are designed to service class 1 & 2 as defined in BS 5268:Part 2 & 3. Guidance on the prevention of condensation in roofs is given in BS 5250.
Trussed rafters should not be used where there is likely to be aggressive chemical pollution unless special precautions are taken by the Building Designer to ensure the durability of the roof timbers and metal fasteners.
Reasonable access to the roof space should be provided to allow for periodic inspection of the structure.

Thermal Insulation

In the majority of trussed rafter roofs, the insulation required to comply with the statutory regulations for thermal transmittance (U value) is provided by placing the insulation material between the ceiling tie members on top of the ceiling board. This results in a cold roof space. A warm roof space is normally constructed where habitable rooms are provided within the roof.
In this situation it is recommended that insulation boards are not fixed to the top of the rafters as this reduces the amount of lateral restraint provided to the top chords, see section 3 & 4 on bracing.

Ventilation

It is essential that cold roof spaces are effectively ventilated to the outside air to prevent condensation which may form in the roof void.
The location and size of the ventilation openings should be determined by the Building Designer, taking particular account of possible blockages by insulation materials etc.
Openings should be located near ceiling level in the eaves or external walls enclosing the roof space, or both, and should be equally distributed between at least two opposite sides of the roof. Additional ventilators may also be placed at the ridge.
The size and number of openings may either be calculated taking into account all the relative factors or they may be specified in accordance with the recommended minimum openings given in the Table opposite..
These are expressed as a minimum width of continuous gap, but alternatively, a series of discrete openings of an equivalent total area may be specified, provided the least dimension of any opening, gap or mesh is not less than 4 mm.
Monopitch roofs will require high level or ridge ventilation as well as ceiling level ventilation.
In attic and raised tie / extended rafter construction where the insulation follows the roof pitch, there should be a minimum 50mm air gap above the insulation. This gap should allow uninterrupted air flow by a 25mm opening at the eaves and 5mm opening at the ridge.

Roof pitch	0 - 15 deg	Above 15 deg
Low level ventilation at ceiling level. Min width of continuous gap on at least two opposite sides of roof	mm 25	mm 10
High level ventilation for monopitch roofs at or near the ridge. Min width of continuous gap	5	5

Roof insulation materials, fixed to the top surface of rafters, that is between tiling battens and trusses, are not recommended

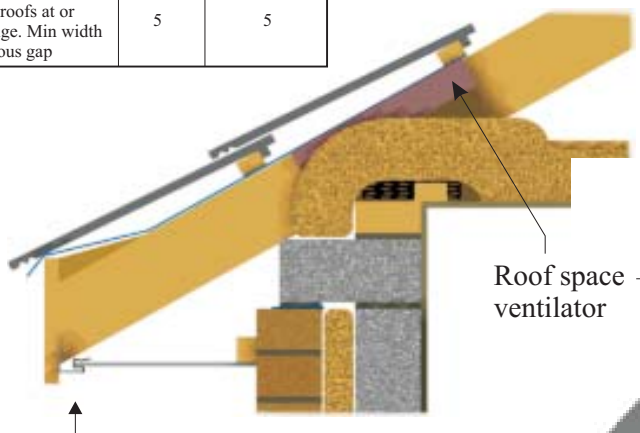
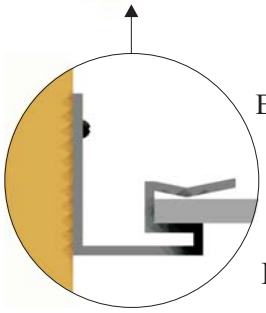


Fig. 57



Eaves soffit ventilator

Fig.59

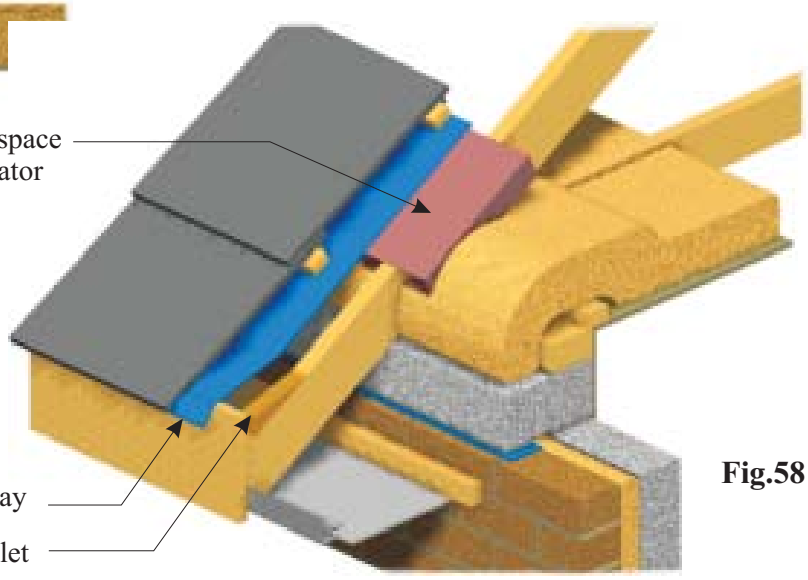


Fig.58

Barge boards and soffits are nailed directly onto the gable ladder

Truss bracing omitted for clarity

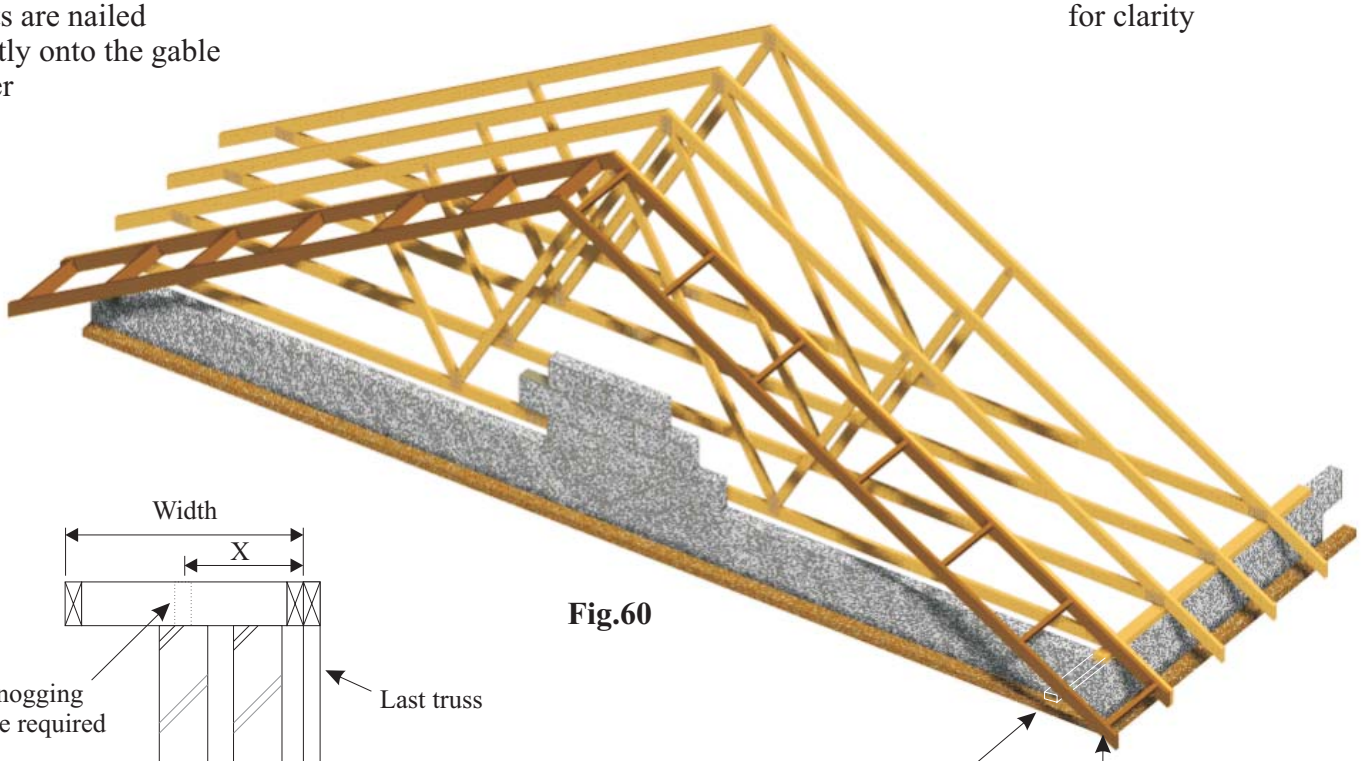


Fig.60

Fig.61

The wallplate may be extended over the gable ladder width for added support if required.

Gable ladders to be fixed directly to last truss with nails at 400 mm centres.

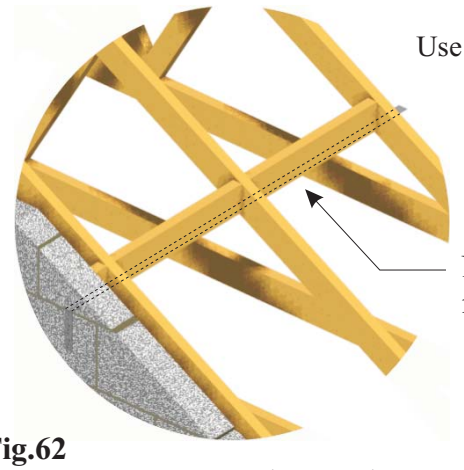
Gable ladders

The gable ladder width should not exceed 2 times X or 1200mm. When the width required is greater than the truss spacing, internogging should be built into the ladder.
In cases of large width and in areas of high wind speeds, the Building Designer should consider the effect of wind loading on the gable overhang which could require holding down straps to prevent uplift.

Restraining straps

Restraining straps must be installed to transmit wind loads on walls into the roof structure.
In the absence of any specific guidance from the Building Designer, connections should be made with 30 x 5 mm thick or approved, profile galvanised steel straps fixed to at least three trusses and noggings with 3.35 x 65mm long corrosion resistant nails. Install straps at a maximum of 2m centres at rafter and ceiling tie level.

In addition to the normal strapping to walls, additional straps may have been specified to provide longitudinal bracing between roofs, these should be run over the top of the separating wall and fixed to the specified number of trusses on each side. Include nogging and packing to transmit loads properly.



Use corrosion-resistant nails (3.35 x 65 mm)

Nail strap to each nogging piece.

Fig.62

Straps to have at least 100 mm down-turn, tight against gable wall.

In general, it is preferable to use one of the proprietary types of fixings, 'A', between the ends of the trussed rafters and the wall plates or bearings as shown in Fig 65.

Where proprietary fixings are not used, the minimum fixing at each bearing position should consist of two 4.5 x 100mm long galvanised round wire nails, which are skew nailed from each side of the trussed rafter into the wallplate or bearing. Where nailing through the punched metal plate cannot be avoided, the nails should be driven through the holes in the fasteners. This method of fixing should not be used with stainless steel metal plate fasteners or where the workmanship on site is not of a sufficiently high standard to ensure that the fasteners, joints, timber members and bearings will not be damaged by careless positioning or overdriving of nails.

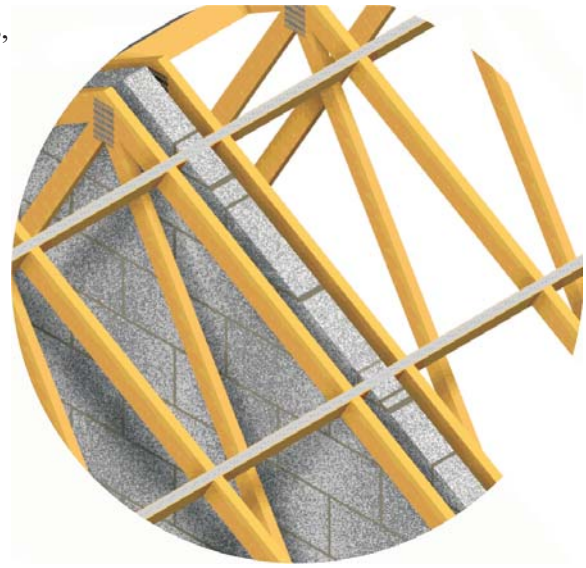


Fig.63

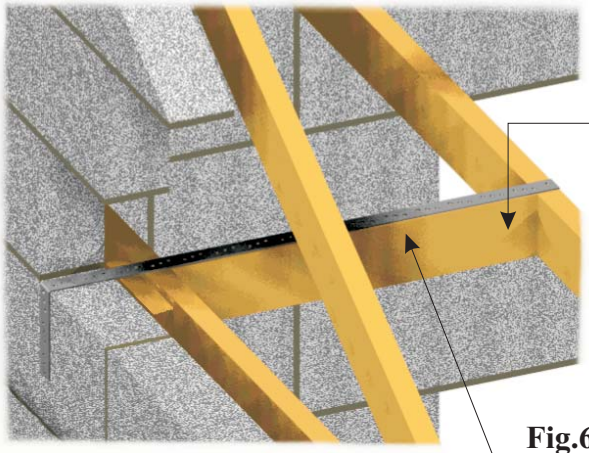


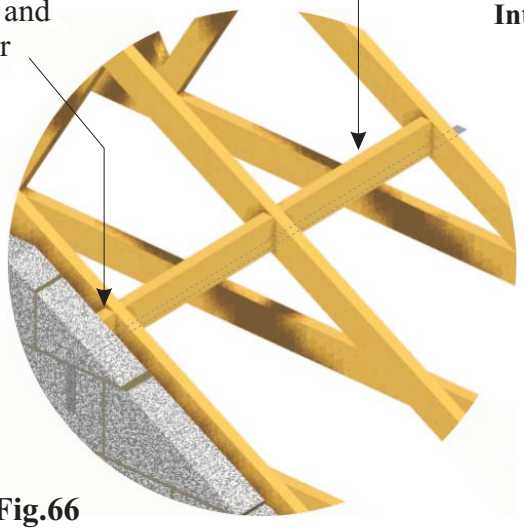
Fig.64

Restraint strap at ceiling level

Strap fixed to solid noggings with a minimum of four fixings of which at least one is to be in the third joist/rafter or in a nogging beyond the third joist/rafter.

Restraint strap at rafter level

Packing piece between inner leaf and First rafter



Strap bedded under a cut block

Fig.66

The Building Designer should ensure that, when required, adequate holding down fixings, 'C', are specified for both the trussed rafter and the wall plates or bearings.

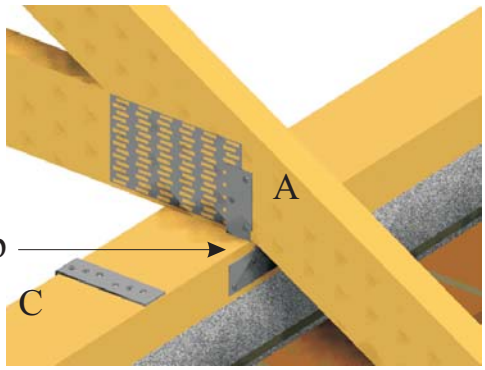


Fig.65

Internal non-loadbearing walls

It is advisable to erect non-load bearing walls after the tiling has been completed thus allowing deflection to take place under the dead load, thereby reducing the risk of cracking appearing in the ceiling finishes. If partitions are of brick or block, then as an alternative the final course may be omitted until tiling has been completed.

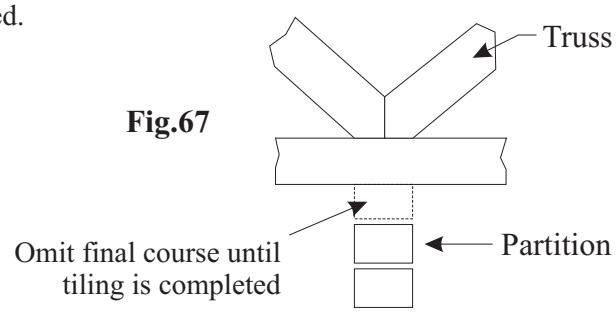


Fig.67

Hogging over party walls

Party walls should be stopped 25mm below the tops of rafters. During construction layers of non-combustible compressible fill such as 50mm mineral wool should be pressed onto the locations shown to provide a fire stop as Fig 68.

Continuity across party walls

If the tiling battens are required to be discontinued over a party wall, then lateral restraint must be provided in addition to that required to transfer longitudinal bracing forces.
This should consist of straps adequately protected against corrosion.These straps should be spaced at not more than 1.5m centres and be fixed to two rafter members and noggins on each side of the party wall by 3.35mm diameter nails with a minimum penetration into the timber of 32mm.

Hipboards
Fixing over flat-top girder

Where hipboards pass over and are supported on flat top girder trusses, the hipboard must be notched in order to achieve the correct height for the hipboard and to provide horizontal bearing. The flying rafter of the truss may need to be trimmed but in no circumstances should the flat chord or the rafter below the joint be cut. In most cases the hipboard is supplied in two parts which can be joined over the flat top truss, one method of providing the necessary fixing is illustrated in Fig 70.

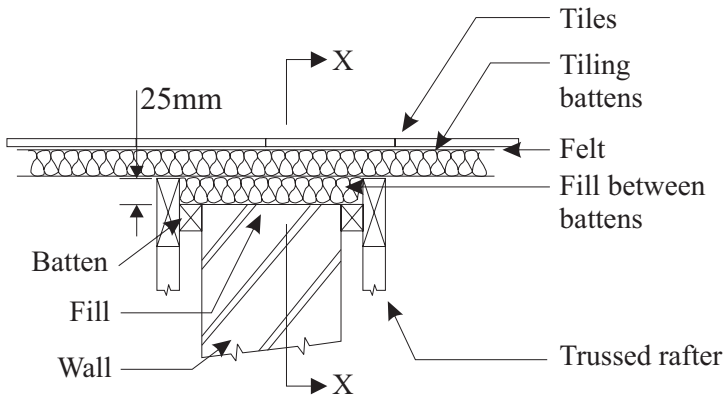


Fig.68

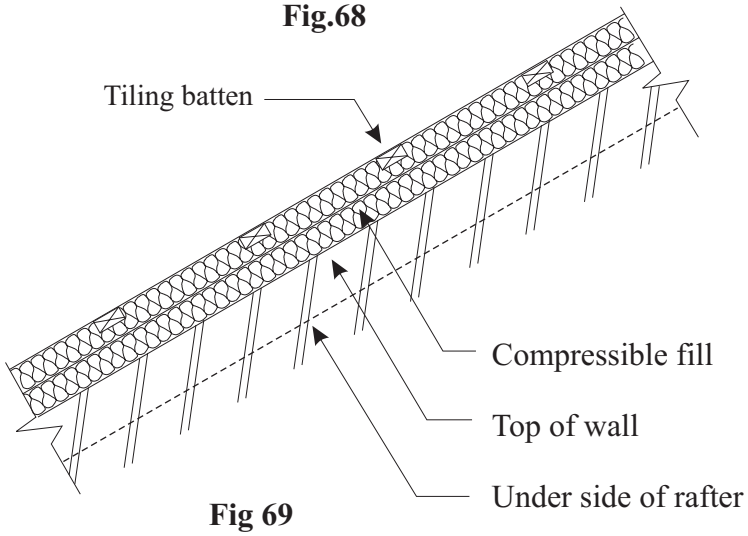


Fig 69
(Section XX)

Support at apex

50 x 150 ledger nailed to truss using 3.75 x 90 mm galvanised round wire nails.

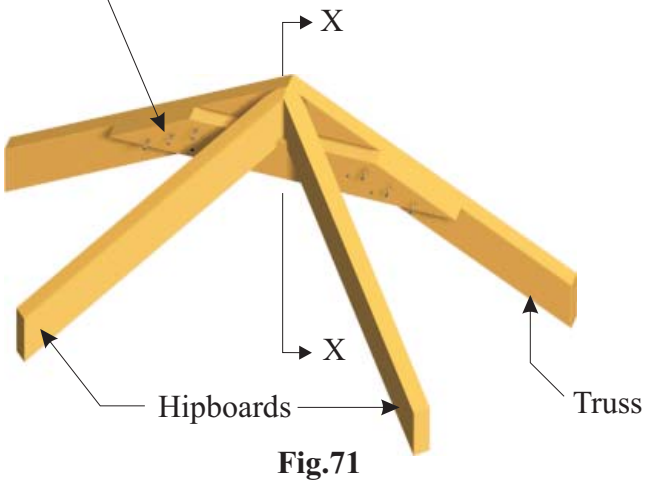


Fig.71

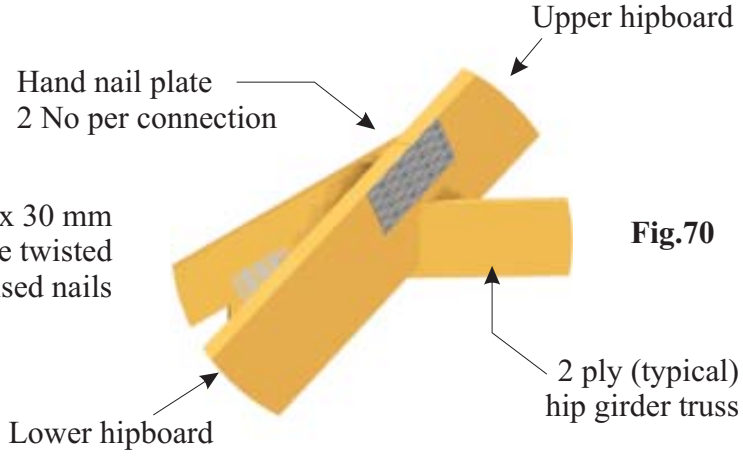
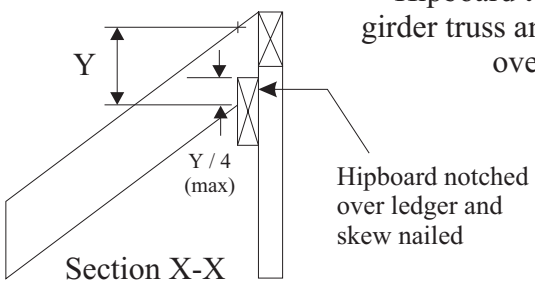


Fig.70

Hipboard to be notched over girder truss and butted together over centre of girder.



09 Construction Check List

Job No		**Contactor**	
Site		**Block**	
Inspector		**Date**	

OK ✓
NOT OK ✗

	Yes	No
Trussed Rafters		
Correct quantity, positions and orientation		
Centres not greater than that specified		
Verticality and bow after erection within code limits		
No damage or unauthorised modifications		
Girders / Multiple trusses connected together in accordance with specification		
Properly seated on wallplates, hangers, etc.		
Bracing correct size and in correct position		
Bracing connected to each truss as specified		
Bracing laps extend over a minimum of 2 trusses		
Bracing of truss rafter compression members are installed as specified		
Valley set is correctly set out and braced as specified		
Valley set is supported on bevelled bottom chord or supported on fillet		
Loose Timbers		
Correct sizes, position and grade		
Centres not greater than that specified		
Birdsmouth, joints, scarfs etc., accurately and correctly made		
Properly seated on wallplates, hangers, etc.		
Fixings are to specification		
Structural Metalwork		
Truss clips, framing anchors and other vertical restraints present and fully nailed		
Hangers correct to specification and fixed as specified		
Gable restraint straps present and correctly fixed including pack between members		
Tank Platform		
Correctly positioned and constructed as specified		
Loads applied to trusses as allowed for in design		
Special Items		
Services in position specified and do not clash with webs		
Roof ventilated as specified		
Trap hatch formed to specification		
Sarking if applicable, is to specification		
Tiles fixed are correct weight as specified in design		

Comments

Scab Members

Rafter sizes in raised tie trusses often need to be increased, since the entire weight of the roof structure is supported on the extended rafters resulting in large bending forces. Even then, timber scabs or reinforcing members are often necessary and it is essential that they are correctly fitted whenever specified. Scabs may be required on one or both faces of the extended rafter and may also be required on multiple trusses. The truss manufacturer may fix the scabs in the factory prior to delivery or may provide the scabs loose, with a fixing detail to allow them to be secured on site. Scabs on multiple trusses will invariably require bolting - large plate washers should be used with all bolts.

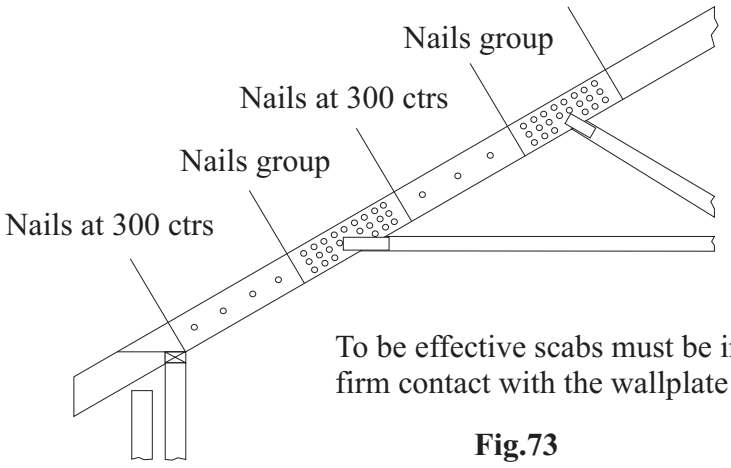
Washers must be used under the head and nut of each bolt

Bolt diameter	Washer size	
	Diameter	Thickness
M8	24 mm	2 mm
M12	36 mm	3 mm
M16	48 mm	4 mm
M20	60 mm	5 mm
M24	72 mm	6 mm

Table 2

Typical scab nailing positions

Scabs may be fixed by the manufacturer or on site using a nailing or bolting detail provided by the manufacturer.

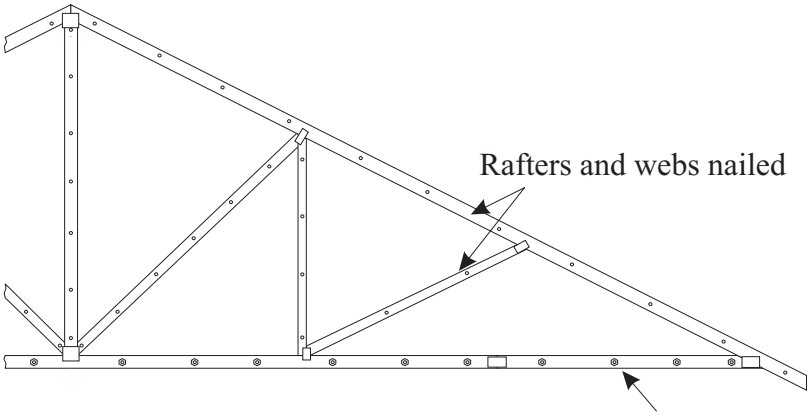


To be effective scabs must be in firm contact with the wallplate

Fig.73

Girder Trusses

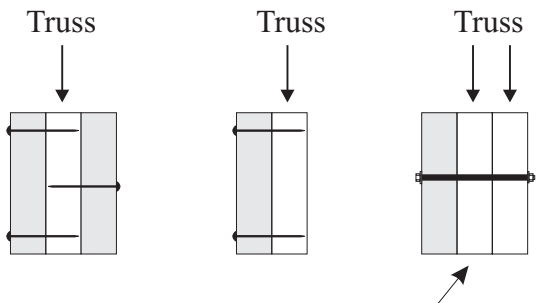
Girder trusses are designed to carry more load than that from the standard trussed rafter spacing. They consist of two or more trussed rafters fastened together. Typically, girder trusses carry other trussed rafters or infill timbers on shoes attached to the ceiling tie of the girder.
Girders are fastened together by nails or bolts. When fastened together on site, bolts must be used for at least the ceiling tie members, in positions marked by the truss manufacturer. In all cases, the nails or bolt must be positioned strictly in accordance with the manufacturer's instructions.
See TRA Information Sheet 9804
"Girder Trusses (Principal Trusses)
Definitions & Connecting Together On Site"



Bolts spaced to avoid incoming truss fixings

Ceiling members bolted together

Fig.72



Multiple trusses may also require scabs. These will be invariably bolted into place.

Fig.74

Nails and bolts should either be inherently corrosion resistant or protected by a corrosion resistant coating.

11 Fixings & Fasteners

Careful erection, fixing and strapping is essential if a trussed rafter roof is to provide a sound platform for roof coverings and contribute effectively to the stability of the roof and gable ends.

Strapping gables to ceiling ties

Ceiling tie straps may be excluded from the specification for roof pitches below 20 deg. Check with the building designer. If they are needed, fix as shown for rafter straps, but attach to upper edge of the ceiling tie. Use a twisted strap to engage a vertical joint if horizontal courses do not coincide.

Strapping at the separating wall

In addition to the normal strapping to walls, additional straps may have been specified to provide longitudinal bracing between roofs, these should be run over the top of the separating wall and fixed to the specified number of trusses on each side. Include noggings and packing to transmit loads properly.

Holding down roofs to walls

Roof to wall (vertical) strapping is not required unless the location of building construction is known to be wind stressed, then it is essential to carry out the roof designer's specifications. Lighter roof coverings in areas of higher wind load, require holding down straps as may be specified for brick/block construction. In extreme cases, the design may call for direct strapping of rafters to the walls (see Fig 76)..

Straps are normally 30 x 2.5mm section galvanised steel but any higher specification should be followed. The tops of the straps should be nailed (three 30x3.75mm nails or more) to the wall plate, or the rafter in the case of a rafter to wall strap. When fixing to the wall, it is critical that the straps are long enough to run over the specified number of blocks, and that at least two of the fixings engage the last full block at the base of the strap (Fig 76).

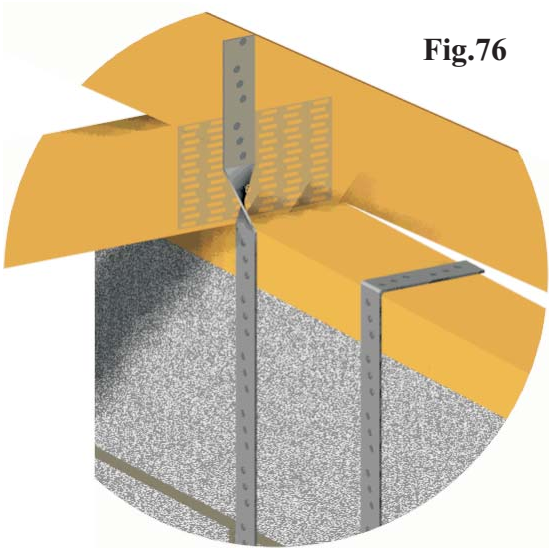
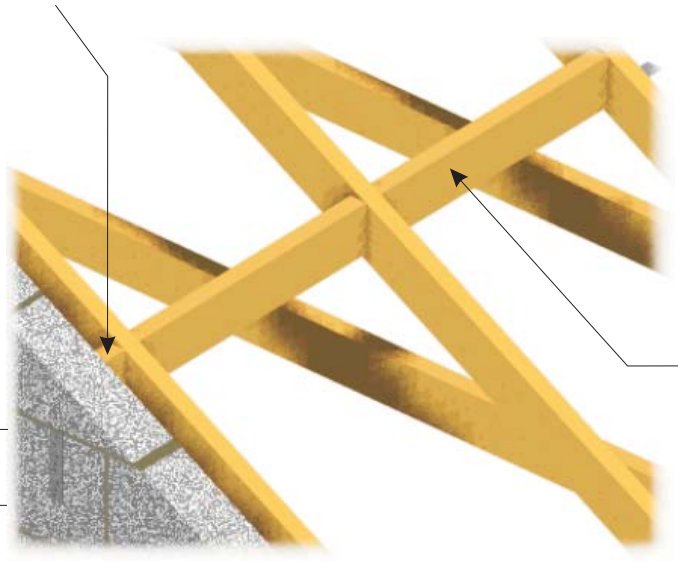


Fig.76

How to fix rafter straps

Engage at least three trusses with each strap.
Use galvanised steel straps 30 x 5 mm or approved profile galvanised steel straps.

Packing piece between inner leaf and first rafter



100 mm min

Strap fixed to solid nogging with a minimum of four fixings of which at least one is to be in the third rafter or in a nogging beyond the third rafter

Use only corrosion resistant nails (65 x 3.35 mm)

Noggings to be provided and set horizontal unless the strap has a twist to line it up with the roof slope

Strap bedded under a cut block

Fig.75

Heavy-duty joist hanger to BS6178 Part 1

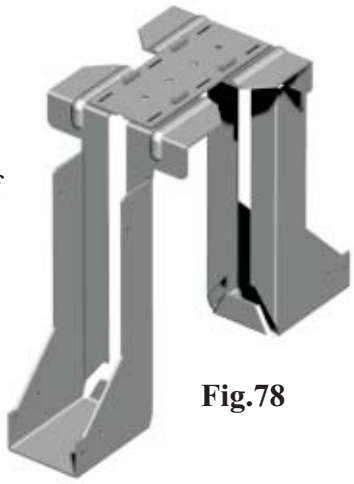
These are generally used to carry trusses or joists at masonry load bearing or fire break walls. Careful consideration must always be given to the method of support. We would recommend that advice is obtained from the responsible Building Designer or Structural Engineer since in a number of cases special hangers may have to be manufactured. The Building Designer may also specify high density brick courses above and below the hangers to avoid crushing of blocks. The bearing length for these joist hangers is approx. 90 mm. See Figs 77 & 78.

Hanger for building into brick or block walls

Fig.77

Heavy-duty girder to girder truss shoes

These are designed to support a secondary girder off the main girder ensuring that the loads are transferred efficiently. The shoe is usually fixed to the main girder (A) by means of bolts as specified by the manufacturer with washers under the bolt heads and nuts. The bearing length for these shoes is approx. 120 mm. See Fig 79.
NB. refer to manufacturers instructions for the correct application and procedure.



Straddle hanger for supporting joists either side of a wall or beam

Fig.78

Girder truss shoe and long legged hangers

Girder truss shoes are used to fix single trusses to compound girders or for other truss to truss connections. The bearing length is approx. 95 mm.

The shoe or hanger must have side flanges of a size which suits the depth of the girder chord to which it is fixed. Some joist hangers are suitable only for timber to timber or timber to truss connections not for truss to truss connections, always use the appropriate hanger. See Fig 80.

Metal fixings used in timber roof structures should have safe working loads which can be substantiated by freely available reports in accordance with BS6178 and TRADA recommendations. They should always have a manufacturer's mark and show the certified safe working load.

It is strongly recommended that timber to timber fixings and timber to brick fixings should be supplied by the Roof Truss Fabricator, and delivered to site with the trusses.

Incoming trusses supported by bolted heavy duty shoes and hangers, should be notched to provide a smooth ceiling line.

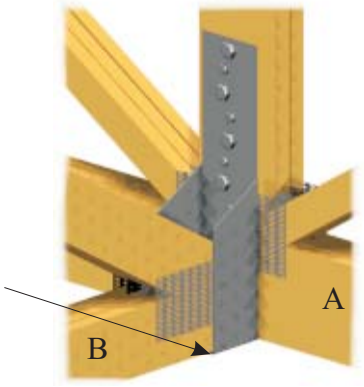


Fig.79

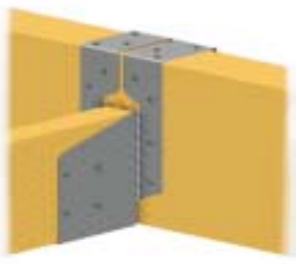


Fig.80

NB. For all the hangers and shoes described above, every fixing hole requires a 30 x 3.75mm square twisted sheradised nail unless otherwise specified by the manufacturer.

Raised Tie Support Clip (Glide Shoe)

A special application fixing that has been specifically designed to allow horizontal movement at a truss bearing without affecting the overall stability of the truss whilst continuing to provide resistance to lateral and uplift forces.

Used in trussed rafter roof construction the (medium term/long term) deflection should be restricted to a maximum of 6mm per side (truss bearing).
A minimum 100mm horizontal seat cut must be made to fix the upper bearing plate. The lower bearing plate is fixed to the inner (or inner and outer) edge of the wallplate using 3.75 x 30mm square twisted sherardised nails.

The truss is temporarily secured by single nailing into the centre slots to allow lateral spread between the bearing plates after the roof structure is completed. The longer the period of construction last together with the absolute stiffness of the truss configuration, the greater the lateral movement will be (up to the design limit). Finally additional nails should be inserted (3.75 x 30mm long square twisted sherardised) for stability or uplift resistance in the remaining fixing holes.

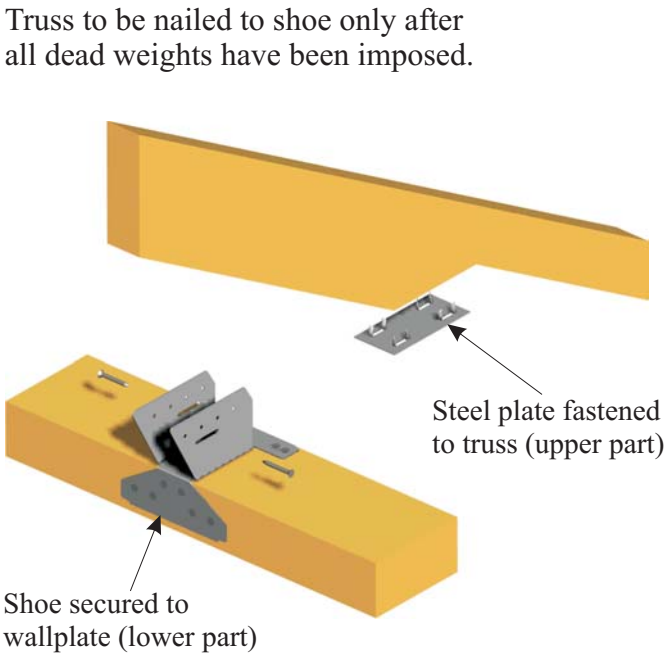


Fig.81

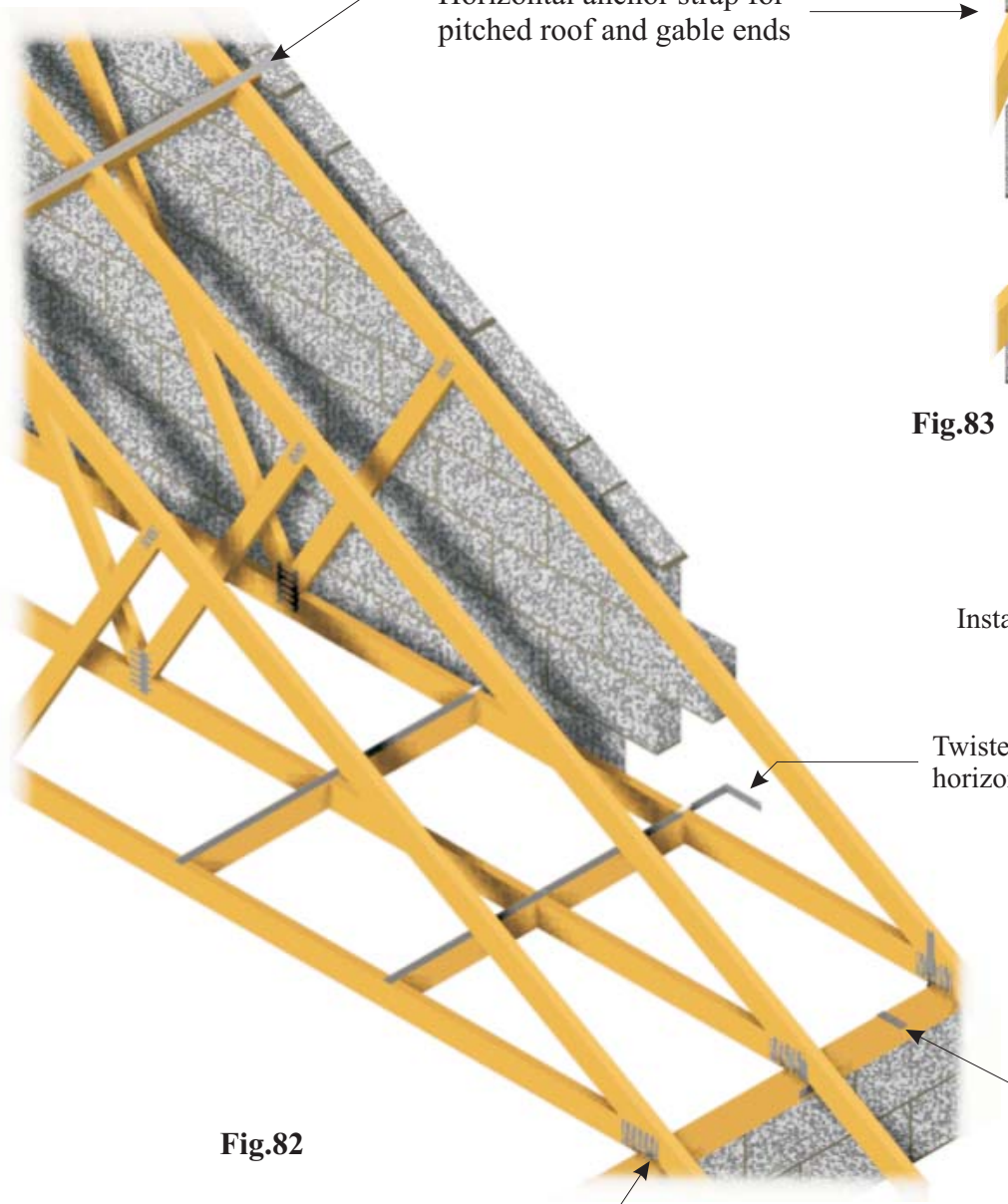


Fig.82

Fig.83

Install straps at a max of 2m centres or as designed

Truss Clips

Truss clips are for fixing timber trusses to wallplates. They avoid the damage often caused by skew nailing.
Follow the manufacturer's recommendations for safe application of truss clips

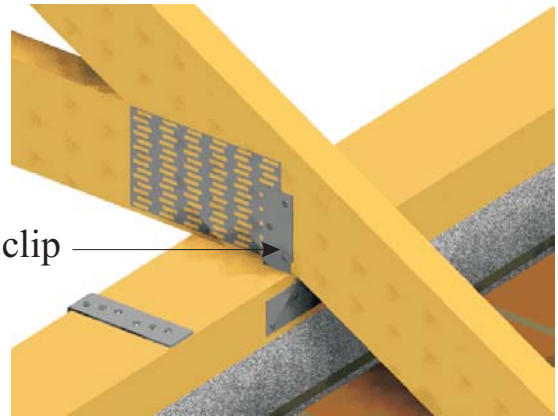


Fig.84

12 Risk Assessments & Method Statements

(This section is intended to give general guidance to Contractors regarding appropriate controls for assessing and documenting the risks associated with a construction task)

Perhaps it is appropriate under this section to note that the undertaking of Risk Assessments and compilation of Method Statements (where appropriate) is the LEGAL DUTY OF ALL CONTRACTORS as it is for Designers under the Construction (Design and Management) Regulations 1994. Such Assessments are necessary to appraise hazards and their associated risks in order that these risks may be either minimised or controlled.

The responsibilities and obligations of Contractors are primarily laid down in the following Regulations:

Health and Safety at work Act 1974

Construction (Design and Management) Regulations 1994

Management of Health and Safety at Work Regulations 1992

Provision and Use of Work Equipment Regulations 1992

Construction (Health, Safety & Welfare) Regulations 1996 - (CHSW Regulations 1996)

Manual Handling Operations 1992

Workplace (Health, Safety and Welfare) Regulations 1992

Examples of a typical Risk Assessment and supporting Method Statement are given on pages 33 & 34. These are presented to illustrate the difference between a Contractors Standard Health and Safety Policy which should include provision for all "Standard" risks - as documented in the Contractors General Risk Assessment (which may simply be an amended sheet from the Company Health and Safety Policy Manual) and PPE/Manual Handling Risk Assessments and/or detailed Method Statements which are custom written to deal with specific, non-standard or particularly risky aspects of work.

Contractors General Risk Assessment for the Erection and Assembly of Roof Trusses

Under the Management of Health and Safety at Work Regulations 1992 contractors are required to undertake and record risk assessments for site specific tasks and locations of work. These Risk Assessments can be used to i) identify provision within tender / contract documents regarding matters relating to Health & Safety, ii) check Health & Safety conditions on site, iii) developing safe systems of work and Method Statements where required and iv) provide information on hazards to operatives / personnel at the place of work.

By way of an example which illustrates typical criteria for assessing the risks associated with a particular work task the following example assessment has been prepared :-

Project Title:	Housing Estate, Anywhere	Document Reference No:	RA/Gen/05A
Client:	J Blogge & Co	Date:	**/**/**
Description of Works:	General Roof Activities	Author:	BABE

Hazards: (This list should also refer to those hazards identified in the Roof Designers Risk Assessment and also those contained in the site Health and Safety Plan). Eg.	Risk Ratings	
	Without Controls	With Controls
Persons Falling -	High	Low
Falling Objects -	Medium	Low

Harm:
Significant Injuries or Fatalities without Controls

Persons in Danger:
Roof Operatives, other Operatives in the vicinity, general public as passers by

Controls:
This section should typically include information relating to the design and use of the following :- Ladders, Scaffolds, Working Platforms, Storage Areas, Edge Protection and Barriers, Lifting Equipment, Disposal of waste, PPE, Warning Notices, Checking Procedures, Adverse weather, Plant Maintenance etc.

PPE:
Safety Helmets, Protective Footwear and Gloves should be worn

Additional Assessments Required ? *Manual Handling (where appropriate) activities and PPE*

Method Statement Required ? Yes - See Method Statement Ref. MS/ Gen/ 05

Can the Work Task be adequately controlled ? Yes

Specific Legislation and other Informative Guidance Documents:
CHSW Regs 1996; CDM Regs 1994; Manual Handling Regs 1992 etc

Information, Instruction and Training:
See Company Training Information - No operatives shall carry out any activity without proper training as noted therein

Emergency Procedures:
Display Procedure in site Offices, Ensure personnel know how to raise alarm, Provide Adequate First Aid Kit

Monitoring Procedures:

This shall be the responsibility of the Site Manager to organise and implement according to established procedure

Any other Items:

As appropriate

Signed: Date:

Task Description:	Project Title:	Ref:	MS/Gen/05
Erection of Trussed Rafter Roof Structure using Manual Handling Method Ref 01.	Housing Development at Muddy Lane, Newtown, Smoke City	No:	01 of 01
		Date:	**/**/**
		Author:	BABE

This Safe Working Method Statement has been prepared for the following work. No other work than that referred to must be carried out.

Location of Work Task:
House Type A (South Facing only) on Muddy Close
Description of Work:
Erection and Installation of Trussed Rafter Roof Structure to House Type A
Safe Working Method:

*For additional reference regarding this method statement refer to Contractors sketch ref. ***/** as illustrated on page (?) of this site installation guide. At all times this method statement assumes that all appropriate design considerations have been incorporated and allowed for within he design and layout of the temporary working platforms. Additionally, it should be noted that this method statement refers only to those operations which have been designated as having a higher level of risk, for all matters associated with this operation reference shall be made and working practices adopted which comply with the Contractors general Risk Assessment for roof work.*

Part 1:
1. Construct external perimeter scaffold as per detail in a manner to ensure sufficient manoeuvring space around loading platform. Locate vertical truss restraint standards at position to allow unobstructed lifting to eaves level working platform. All edge protection to both the eaves level and the loading level platforms must be constructed and fixed before any lifting operations take place. Similarly, erect internal working platforms at a level (typically) 300mm below ceiling tie level. Under no circumstances whatsoever shall any edge protection be removed to facilitate these operations.

2. According to the recommendations of the Manual Handling Risk Assessment use x No. Personnel to manually lift individual trusses via the truss restraint standards to the eaves level working platform. Move trusses along the length of the roof to their final position (where they shall immediately be fixed by carpenters using temporary / permanent bracing - see Part 2 of this method statement). NB. Girder trusses shall be raised as single component plies and then the ceiling tie members (min) bolted together according to the details provided by the truss manufacturer and in locations marked by him on the trusses; rafter and web members may be nailed according to further details provided by the truss manufacturer.

NB. Roof Bracing Details which will include sizes and location of Rafter and Chevron Bracing etc, shall be installed in accordance with the roof designers layout drawing.

Part 2:
3. When the first truss has been raised and located in its final position by the truss handling team, the carpenters shall immediately provide temporary diagonal restraints at a minimum of three locations to hold the truss vertical and so as to act as a rigid start point for the erection of the remainder of the trusses. This temporary restraint shall preferably be located outside of the roof structure ie. Fixed to the external perimeter scaffold. The positioning of the temporary braces in this way will then allow unobstructed passage to the truss handling team as further trusses are raised and located in their final position.

NB. Wherever possible, Carpenters should use pre-nailed bracing members (accurately marked out to coincide with the truss centres) to ensure that truss erection progresses smoothly and quickly.

4. As soon as sufficient trusses have been temporary positioned, the carpenters shall commence the fixing of internal permanent bracing to create fully stable sections of roof. Where it is necessary for carpenters to work at higher levels than the main internal working platform then either stepladders or temporary trestles shall be used between trusses constructed or positioned on the main platform. Under no circumstances shall operatives be allowed to climb within the temporarily braced roof structure.

5. As soon as permanently braced sections of roof have been completed, it shall be allowed for operatives to locate working platforms within the roof structure by positioning suitable boards directly on top of the ceiling ties. These platforms can then be used for the installation of services etc. Similarly, at this time it is appropriate to allow the removal of the external temporary props in order to allow any gable masonry construction to be commenced. Gable construction should not have been allowed to commence prior to this stage as it is the stability of the roof construction which provides restraint to the gable masonry construction.

NB. The dismantling of the internal working platform shall only be allowed to commence below completed areas of roof construction at such time when no work is being carried out overhead.

6.Further areas of roof construction (if appropriate) shall be carried out according to the identical principles outlined above.

13 Glossary Of Terms Used In Trussed Rafter Construction.

Apex/Peak
The uppermost point of a truss.

Attic truss/room-in-the-roof.
A truss which forms the top storey of a dwelling but allows the area to be habitable by leaving it free of internal WEB members. This will be compensated by larger timber sizes elsewhere.

Bargeboard
Board fitted to conceal roof timbers at GABLE END.

Battens
Small timber members spanning over trusses to support tiles, slates etc.

Bearer
A member designed to distribute loads over a number of trusses.

Bearing
The part of a truss receiving structural support. This is usually a WALLPLATE but can be an internal wall etc.

Binder
A longitudinal member nailed to trusses to restrain and maintain correct spacing.

Birdsmouth
A notch in the underside of a RAFTER to allow a horizontal seating at the point of support (usually used with RAISED TIE TRUSSES).

Blocking
Short timbers fixed between chords to laterally rstrain them. They should be at least 70% of the depth of the chords..

Bobtail
A truss type formed by truncating a normal triangular truss.

Bottom chord
See CEILING TIE.

Bracing
This can be Temporary, Stability or Wind Bracing which are described under these headings.

Building Designer
The person responsible for the structural stability and integrity of the building as a whole.

Camber
An upward vertical displacement built into a truss in order to compensate for deflection which might be caused by the loadings.

Cantilever
The part of a structural member of TRUSS which extends beyond its bearing.

Ceiling Tie
The lowest member of a truss, usually horizontal which carries the ceiling construction, storage loads and water tank.

Chevron Bracing
Diagonal bracing nailed to the truss in the plane of the specified webs to add stability.

Connector plate/fastener.
See nailplate.

Cripple Rafter
See JACK RAFTER.

Dead Load
The load produced by the fabric of the building, always long term (see DESIGN LOADS).

Deflection
The deformation caused by the loads

Design Loads
The loads for which the unit is designed. These consider the duration of the loads long term, medium term, short term and very short term.

Duo/dual pitch truss
A truss with two rafters meeting at the APEX but not necessarily having the same PITCH on both sides.

Dwangs
See NOGGINGS.

Eaves
The line where the rafter meets the wall.

Eaves joint
The part of the truss where the rafter and the ceiling tie intersect. This is usually where the truss is supported.

Extended Rafter.
See RAISED TIE TRUSS.

Fascia
Horizontal board fitted along the length of the building to the edge of the truss overhangs.

Fastener
See NAILPLATE.

Fink Truss
The most common type of truss used for dwellings. It is duo-pitch, the rafter having the same pitch. The webs form a letter W.

Firring Piece.
A tapered timber member used to give a fall to flat roof areas.

French Heel.
An EAVES joint where the rafter sits on the ceiling tie.

Gable End
The end wall which is parallel to the trusses and which extends upwards vertically to the rafters.

13 Glossary Of Terms Used In Trussed Rafter Construction.

Hip End
An alternative to a GABLE END where the end wall finishes at the same height as the adjacent walls. The roof inclines from the end wall, usually (but not always) at the same PITCH as the main trusses.

Hip Set
The trusses, girders and loose timbers required to form a hip end.

Horn/nib
An extension of the ceiling tie of a truss (usually monos or bobtailed trusses) which is built into masonry as a bearing.

Imposed Load
The load produced by occupancy and use including storage, inhabitants, moveable partitions and snow but not wind. Can be long, medium or short term.

Internal Member
See WEB.

Intersection
The area where roofs meet.

Jack Rafter
An infill rafter completing the roof surface in areas such as corners of HIP ENDS or around chimneys.

Live Load
Term sometimes used for IMPOSED LOADS.

Longitudinal Bracing.
Component of STABILITY BRACING.

Loose Timber
Timbers not part of a truss but added to form the roof in areas where trusses cannot be used.

Mono-pitch truss.
A truss in the form of a right-angled triangle with a single rafter.

Nailplate
Metal PLATE having integral teeth punched from the plate material. It is used for joining timber in one plane with no overlap. It will have an accreditation certificate and will be manufactured, usually, from galvanised steel. It is also available in stainless steel.

Nib
See HORN.

Node
Point on a truss where the members intersect.

Noggings
Timber pieces fitted at right angles between the rafters and ceiling ties to form fixing points.

Overhang
The extension of a rafter or ceiling tie of a truss beyond its support or bearing.

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Part Profile
See Bobtail.

Peak
See APEX.

Permissible Stresses
Design Stresses for grades of timber published in BS5268: Part 2: 1996.

Pitch
The angle of the rafter to the horizontal, measured in degrees.

Plate
See NAILPLATE.

Purlins
Timber members spanning over trusses to support cladding or between trusses to support loose timbers.

Quarter Point
The point on a rafter where the strut intersects in a FINK TRUSS.

Queen
Internal member (WEB) which connects the APEX to a third point on a FINK TRUSS.

Rafter
The uppermost member of a truss which normally carries the roof covering.

Rafter Diagonal Bracing
Component of STABILITY BRACING.

Raised Tie Truss
A truss which is supported at a point on the rafter which is beyond the point where the rafter meets the ceiling tie.

Reducing Trusses
See VALLEY FRAMES.

Remedial Detail.
A modification produced by the TRUSSED RAFTER DESIGNER to overcome a problem with the truss after its manufacture.

Return Span
The span of a truss being supported by a girder.

Ridge
The line formed by the truss apexes.

Ridgeboard
Timber running along a ridge and sandwiched between loose rafters.

Roof Designer
The person responsible for the roof structure as a whole and who takes into account its stability and capability of transmitting wind forces on the roof to suitable load-bearing walls.

13 Glossary Of Terms Used In Trussed Rafter Construction.

Room-in-the-roof
See ATTIC TRUSS.

Scab
Additional timber fitted to the side of a truss to effect a local reinforcement, particularly in RAISED TIE TRUSSES.

Setting out Point
The point on a truss where the undersides of the rafter and ceiling tie meet.

Skew nailing
A method of fixing trusses to the WALLPLATE by driving nails at an angle through the truss into the wallplate which is generally not recommended. (See TRUSS CLIP).

Soffit
Board fixed underneath EAVES overhang along the length of the building to conceal timbers.

Span
Span over wallplates is the distance between the outside edges of the two supporting wallplates. This is usually the overall length of the ceiling tie.

Spandrel Panel
A timber frame, triangular panel forming gable wall above ceiling line.

Splice
A joint between two members in line using a NAILPLATE or glued finger joint.

Spreader Beam
See BEARER

Strap
Metal component designed to fix trusses and wallplates to walls.

Strut
Internal member connecting the third point and the quarter point on a FINK TRUSSS.

Stub End
See BOBTAIL.

Temporary Bracing
An arrangement of diagonal loose timbers installed for safety during erection. Often incorporated with permanent STABILITY and WIND BRACING structures.

Third Point
Point on the ceiling tie where the internal webs meet in a FINK TRUSS.

Timber Stress Grading
The classification of timber into different structural qualities based on strength (see BS4978: 1996).

Top Chord
See RAFTER.

TRADA Quality Assurance Scheme.
Quality control method in truss manufacture administered by the BM TRADA Certification..

Trimmer
A piece of timber used to frame around openings.

Truss/Trussed Rafter
A lightweight framework, generally but not always triangulated, placed at intervals of 600 mm to support the roof. It is made from timber members of the same thickness, fastened together in one plane using nailplates or plywood gussets.

Trussed Rafter Designer
The person responsible for the design of the TRUSSED RAFTER as a component and for specifying the points where bracing is required.

Truss clip
A metal component designed to provide a safe structural connection of trusses to wallplates. Also to resist wind uplift and to remove the damage caused by SKEW NAILING.

Truss Shoe
A metal component designed to provide a structural connection and support for a truss to a girder or beam.

Uniformly distributed load
A load that is uniformly spread over the full length of the member.

Valley Board
A member raking from incoming RIDGE to corner in a valley construction.

Valley Frames/Set
Infill frames used to continue the roofline when roofs intersect.

Verge
The line where the trussed rafters meet the gable wall.

Wallplate
A timber member laid along the length of the load bearing walls to support the trusses.

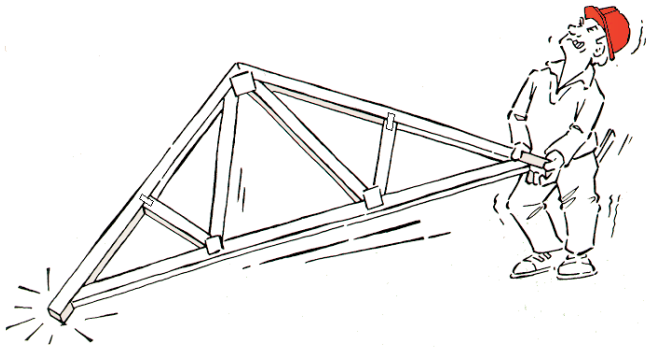
Webs
Timber members that connect the rafters and the ceiling tie together forming triangular patterns which transmit the forces between them.

Wind bracing
An arrangement of additional timbers or other structural elements in the roof space, specially designed to transmit wind forces to suitable load-bearing walls.

14 Do's & Don'ts on Site

DO STORE ON SITE CAREFULLY

DO HANDLE WITH CARE



DO FIX IT RIGHT

TRUSSES DO NEED BRACING

DON'T CUT

DO SUPPORT YOUR TANK

I F I N D O U B T - A S K

Trussed Rafter Association

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