



The Buyers' Guide to:

Trussed Rafters



Introduction

Trussed rafters are a specific type of roof truss, providing an offsite manufactured structural framework to support the roof fabric, ceilings and often floors of buildings in both the domestic and commercial sectors.

These highly engineered products, manufactured in factory-controlled conditions, offer a range of benefits:

- Suitable for a wide range of roof structures and shapes
- Can be used with masonry, timber frame or steel frame construction
- Prefabricated components mean reduced labour costs
- Speed of construction allows just-in-time delivery to site
- Made of timber, the only truly renewable building resource
- Minimal environmental impact for manufacturing and installation
- Manufactured using the latest software to meet the requirements of Eurocode design

Trussed Rafter Association (TRA) members create bespoke designs for all types of home builders, from major

volume housebuilders to individual self and custom builders and community self-build projects. Many members can also help with supply and fit, or supply, fit and finish services according to your needs and budget.

A number of TRA members specialise in commercial trussed rafters, supplying roofs for hospitals, supermarkets, schools and many other large public projects, and designed to Eurocode 5 for best practice structural integrity.

We've produced this buyers' guide to outline the wide range of roof types that can be built with trussed rafters and to highlight the key considerations when choosing trussed rafters to create your chosen roofscape.

To find out more, visit www.tra.org.uk or www.traireland.ie to find a TRA member

near you who will be happy to advise you on the next steps for your trussed rafter roof.

About the TRA

The TRA is the respected voice of the trussed rafter and metal web joist industry in the UK and Ireland. We are committed to stringent standards of quality and service and set a professional benchmark for the industry.

Members include the principal manufacturers and suppliers of trussed rafters and metal web joists, and professionals involved in roof and floor design and construction.

The TRA requires all its manufacturing members to have third-party supervised quality assurance and professional indemnity insurance, helping to ensure quality and peace of mind for the customer.



Images courtesy of Pasquill, Wolf Systems, MiTek and Scotts of Thrapston

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Responsibilities in roof design

Getting the design right on any part of a building is key and for roofing it's essential that all involved with the design, manufacture and installation of the components to build a trussed rafter roof are working together effectively.

The roles of the Building Designer and Trussed Rafter Designer

All TRA members use the latest software to design trussed rafters to comply with EN 1995-1-1 (Eurocode 5) and fabricate them in accordance with EN 14250: "Timber structures - Product requirements for prefabricated structural members assembled with punched metal plate fasteners".

A third document PD 6693, or SR 70 in Ireland, sets out how this process takes place, by identifying the two critical people involved in the design stage, who are the building designer and the trussed rafter designer:

"On every project it is essential that one person assumes overall responsibility as building designer and is clearly defined as such."

The building designer is usually an architect or structural engineer appointed by the client. For smaller projects, the building designer may be the main contractor. There is a clear definition of responsibilities within the standards, with the building designer being responsible for:

"...ensuring adequate provision is made for the stability of the building as a whole as distinct from, and in addition to the stability of individual components."

As a trussed rafter design is two-dimensional, it is the building designer's responsibility to ensure the stability of the three-dimensional roof as a whole. This means the trussed rafter designer details the individual trusses, but not the overall roof structure unless specifically engaged to do so.

Information sharing is key to the process and the responsibilities for designers can be found in sections 10.2 and 10.3 in SR 70.



Examples of key design responsibilities

(Check the standards PD 6693 and SR 70 for full details)

Building Designer

Responsible for ensuring:

- Stability bracing to hold trusses in place
- Wind bracing to ensure roof acts as rigid structure
- Horizontal lateral support for vertical load bearing elements
- Resist wind uplift of trussed rafters and wall plates
- A check takes place on the information supplied by the trussed rafter designer to confirm trussed rafters supplied are suitable for their intended use

The building designer should provide the trussed rafter designer with the following information, preferably in the form of detailed technical drawings:

- a The service use of the building with reference to any unusual environmental conditions, or preservative treatments required.
- b The height and location of the building with reference to snow load and any unusual wind conditions.
- c The pitch of the roof, plus spacing, span and profile of the trussed rafters.
- d The method of support and position of load-bearing supports.
- e The type or weights of roof tiles or covering, including sarking, insulation and ceiling materials.
- f Details of specific ancillary loads such as tanks, hoist tracks, electrical equipment and dormer construction.
- g The overhang of rafters at eaves and other eaves details.
- h The positions and dimensions of hatches, chimneys and other openings.
- i Any special requirement for minimum member thickness (e.g. for the purposes of fixing ceiling boards).

Trussed Rafter Designer

Responsible for ensuring:

- Roof load sustained and transmitted to supports
- Individual members resist buckling

The trussed rafter designer should provide the building designer with the following information, preferably in the form of detailed technical drawings:

- 1 The loadings and other conditions for which the trussed rafters are designed.
- 2 The positions and sizes of all bearings.
- 3 The position and spacing of all trussed rafters.
- 4 The sizes and strength classes of timber members.
- 5 The type, size and positions of all punched metal plate fasteners.
- 6 Details of any preservative treatments applied to timber members.
- 7 The positions, fixings and sizes of any lateral supports necessary to prevent buckling of compression members of the trussed rafters.
- 8 The location and method of support for tanks or ancillary equipment.
- 9 The range of reactions (including for wind uplift) to be accommodated at the support positions.
- 10 Any special precautions for handling, storage or installation.

To help meet the responsibilities set out above, detailed drawings and written instructions are always provided by TRA members as part of the truss delivery package. In addition to this specific technical information, TRA members can also provide guidance on the transport, handling, storage and installation of our products. Therefore, contractors and designers should always work closely from as early a stage as possible with their chosen TRA member.

Glossary of terms

Apex/Peak

The uppermost point of a truss.

Attic truss

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 with raised tie trusses).

Blocking

Short timbers fixed between chords or between a chord and gable wall to prevent lateral movement. 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 in this glossary.

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 a truss which extends beyond its bearing.

Ceiling tie

The lowest member of a truss, usually horizontal, which carries the ceiling construction, and to which storage loads and water tanks are applied.

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 extends upwards vertically to the rafters.

Girder truss

Two or more trussed rafters fixed together, designed to act as a single structural unit carrying exceptional loads such as those imposed by other trussed rafters fixed to it.

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

An extension of the ceiling tie of a truss (usually mono pitch 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 webs.

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.

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.

Part profile

See bobtail.

Peak

See apex.

Permissible stresses

Design stresses for grades of timber.

Pitch

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

Plate

See nailplate.

Purlins

Timber members spanning over trusses to support roof covering or between trusses to support loose timber members.

Quality Assurance Scheme

Essential quality control method in truss manufacture administered by a UKAS registered notified body.

Quarter point

The point on a rafter where the strut intersects in a fink truss.

Queen

Internal member or 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 that 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.

Room in Roof (RIR)

See attic truss.

Scab

Additional timber fitted to the side of a truss to affect 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 a wall above ceiling line. Either as a party wall to provide fire compartmentalisation between dwellings or as a gable end wall.

Splice

A joint between two members in line using a nailplate.

Spreader beam

See bearer.

Stability bracing

Arrangement of additional timbers fixed in the roof space to provide lateral support for trussed rafters.

Strap

Metal component designed to fix trusses and wallplates to walls.

Glossary of terms (cont.)

- Strut**
Internal member connecting the third point and the quarter point on a fink truss.
- Stub end**
See bobtail.
- Temporary bracing**
Essential support installed for safety during initial stages of truss installation. Failure to correctly install effective temporary bracing creates a significant safety risk.
- 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.
- Top chord**
See rafter.
- Trimmer**
A piece of timber used to frame around openings.
- Trussed rafter**
A lightweight framework, generally but not always triangulated, placed at regular intervals to support the roof. It is made from timber members of the same thickness, fastened together in one plane using nailplates.
- 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, in order to resist wind uplift and to prevent the damage often seen with 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 truss 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.





1 Creating roofscapes with trussed rafters

Around 95% of all new house roofs are constructed using trussed rafters. This is in addition to an increasing proportion of offices, retail outlets, hospitals and leisure developments.

Trussed rafters can be used to construct a wide variety of roof shapes as outlined below.

However, this is by no means an exhaustive list. Every case is unique and you are advised to contact a TRA member as early as possible in a project to discuss a detailed solution.

Commonly constructed roof shapes
The most commonly constructed roof shapes are the flat top hip, 'T' intersection, 'L' return, overlaid hip and dogleg intersection. The following pages show

how these roof shapes can be achieved with trussed rafters, either as an unoccupied roof space or as a Room in Roof configuration where maximum living space is the goal.

There are many other ways of framing hips, corners and intersections etc. with trussed rafters. Please contact your TRA trussed rafter supplier for details.

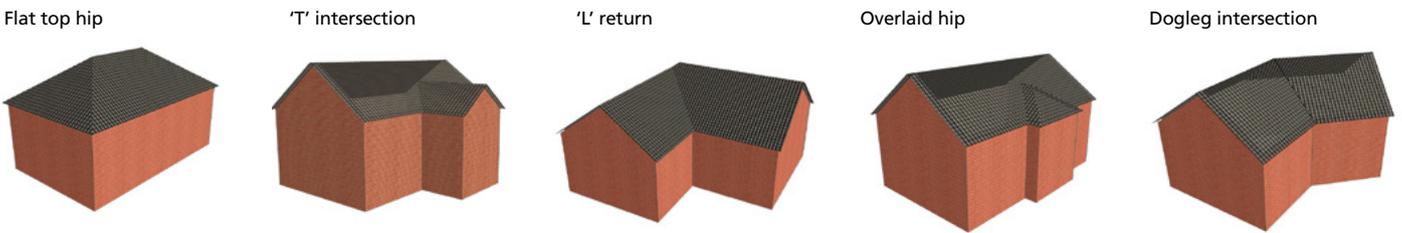


Figure 1: Different roofscapes

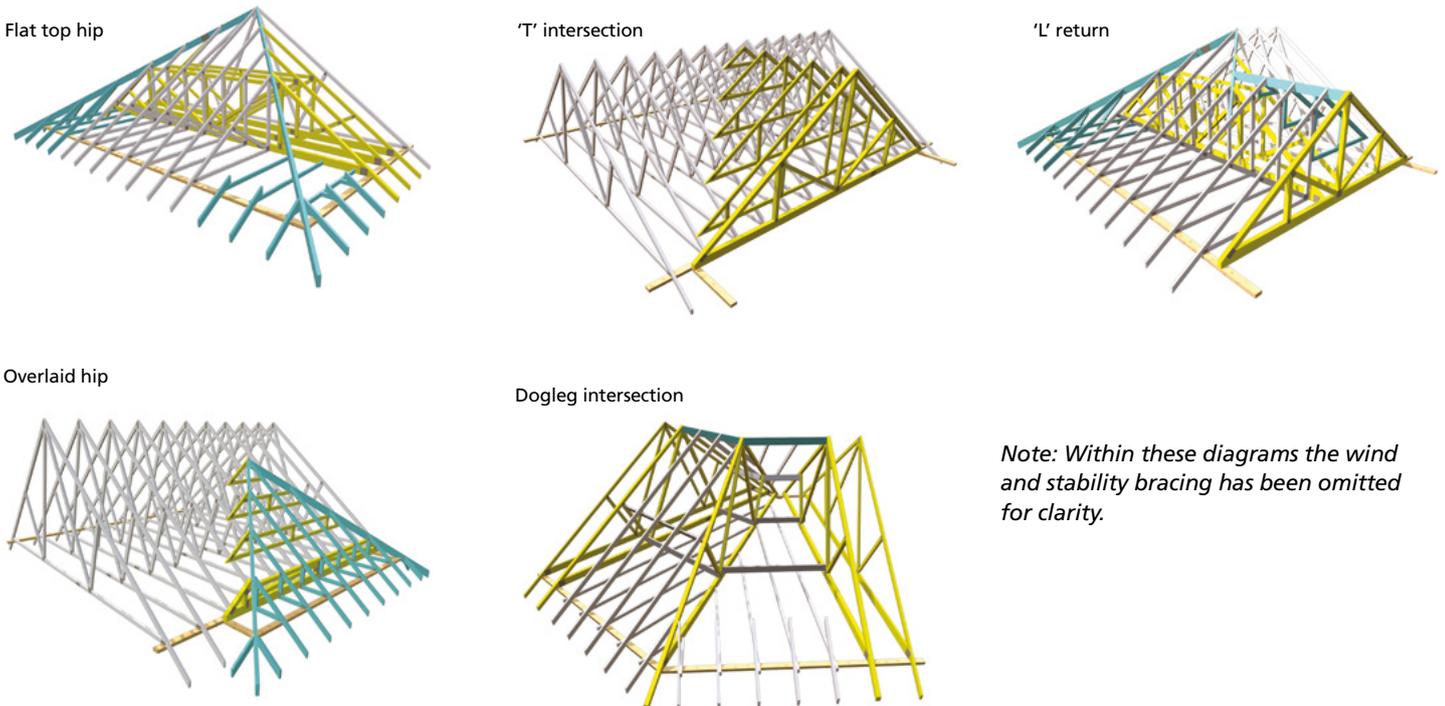


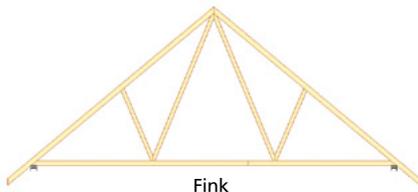
Figure 2: The five most common roof shapes

Note: Within these diagrams the wind and stability bracing has been omitted for clarity.

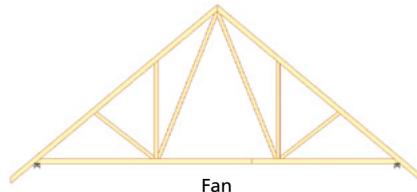
2 Examples of basic trussed rafter profiles

The following illustrations show the wide range of trussed rafter profiles that are possible.

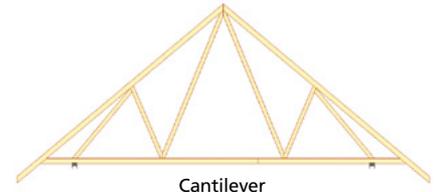
These examples are not solutions for specific design requirements and may be unsuitable for some span conditions. You should discuss your specific requirements with your TRA trussed rafter supplier.



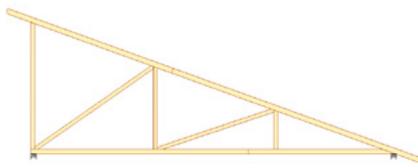
Fink



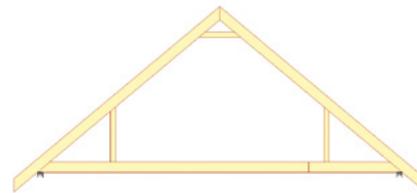
Fan



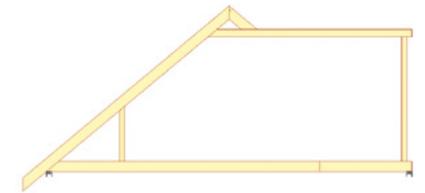
Cantilever



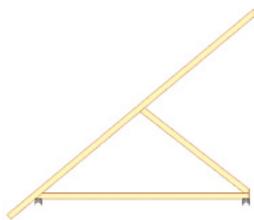
Mono Pitch



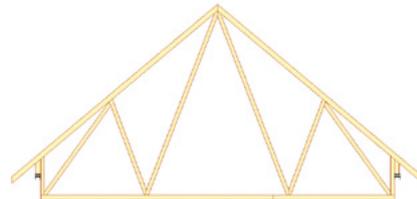
Attic



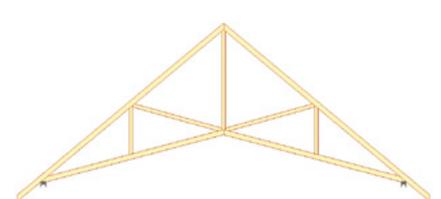
Dormer attic



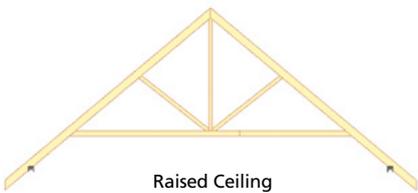
Open Jack



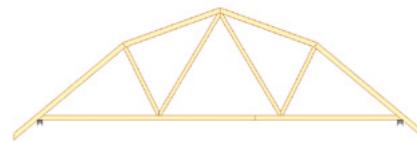
Raised Support



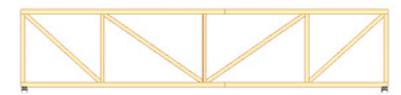
Scissor



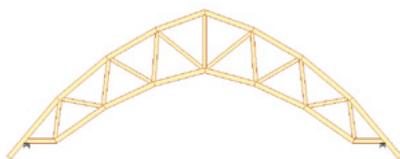
Raised Ceiling



Gambrel or Mansard



Parallel Chord



Vaulted



Portal Frame

Figure 1: Examples of basic trussed rafter profiles and more complex trussed rafter profiles

3 Room in Roof trussed rafters

The Room in Roof (RIR) or attic trussed rafter provides the structural roof and floor in a single component. There are many advantages:

- RIR trussed rafters are computer-designed and factory-assembled, resulting in better quality control
- Complex, labour-intensive site joints are not required
- They can be constructed very quickly, making the structure weather tight much sooner and resulting in cost savings
- Customers have freedom to plan the room layout within the roof space
- A complete structure is provided, ready to receive roof finishes, plaster board and floorboarding

The diagrams below (Figures 1 and 2) compare an eight-metre span standard trussed rafter with an equivalent eight-metre span RIR trussed rafter.

Typical Room in Roof configurations

Room in Roof trussed rafters can usually be designed to clear span between the

front and rear walls of a dwelling without the need for building loadbearing walls and foundations on lower storeys. If internal loadbearing walls exist or can easily be built, they can be used to provide additional support.

Figure 4 shows the size of loft rooms that can be achieved.

Transportation

Room in Roof trussed rafters should be kept small enough for safe transportation. In general, a height of up to four metres is easy to transport. If greater height is required, trusses may be constructed in two parts as shown in Figure 3 (below).

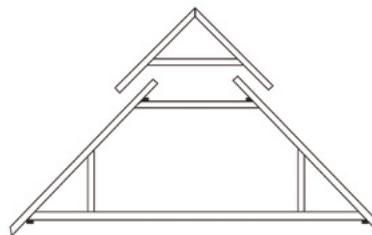


Figure 3: Two-part RIR trussed rafters

Services in Room in Roof trussed rafters

Figure 5 shows the ideal location for services in trussed rafter roofs.

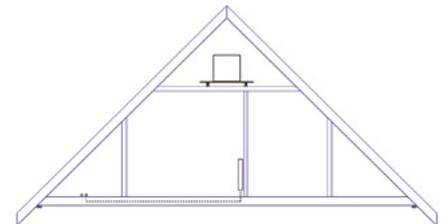


Figure 5: Services in trussed rafter roofs

Note: Under no circumstances should the floor joist of a RIR trussed rafter be notched or drilled to accommodate services, as this will affect the stability of the whole roof. If services are required to run through the floor zone at right angles to the RIR trussed rafters, it may be possible to replace bottom chords with metal web joists to provide access. Contact a TRA trussed rafter supplier for more details.

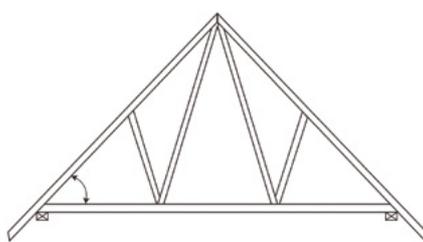


Figure 1:

Weight of truss approx. 55kg - 35 x 97 chords

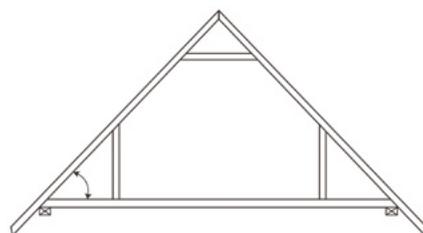


Figure 2:

Weight of truss approx. 125kg - 47 x 197 chords

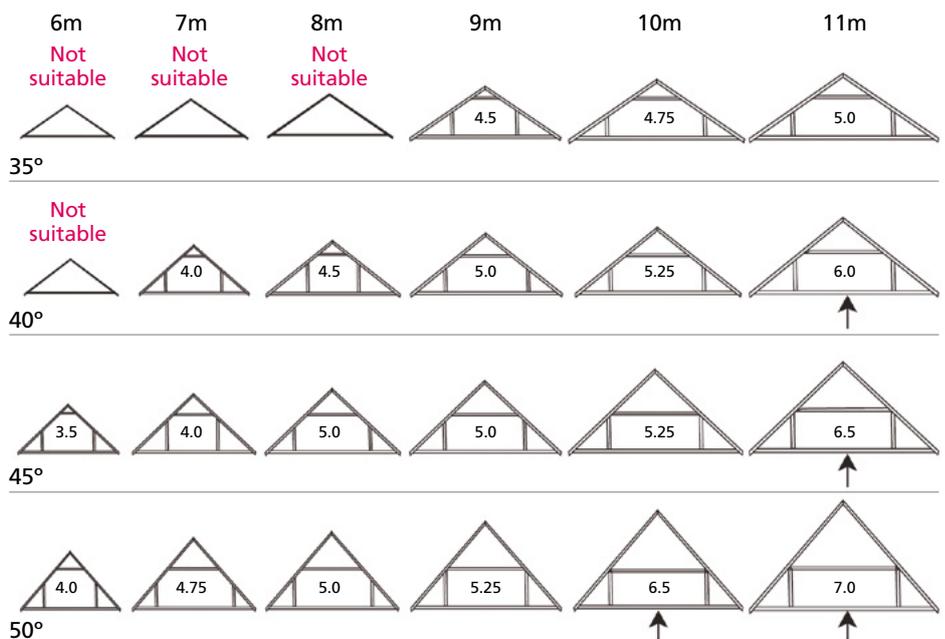


Figure 4: Basic configurations

Layout of Room in Roof trussed rafters

Openings for windows and stairs should be located within the normal spacing of RIR trussed rafters (usually 600mm) where possible. This will also help to keep the overall number of trussed rafters required to a minimum. See Figure 6.

Windows and stairwell openings should be opposite each other to make the overall design simpler and cheaper, as illustrated in Figures 7 and 8.

Thermal insulation

Consideration should be given at an early stage to the type and position of thermal insulation as this could affect the size of rafter required. Figures 9 and 10 show two different arrangements for insulation in a Room in Roof.

Fire resistance

Room in Roof trussed rafters make up the floor of the upper storey and must comply with building regulations to provide a modified 30-minute fire resistance where the RIR forms a second storey of a dwelling. Where the roof space forms a third storey, the floor must provide a full 30-minute fire resistance. In most circumstances, these requirements can be achieved through correct specification and installation of wall linings and the ceiling below. Your TRA trussed rafter supplier can provide more details where required.

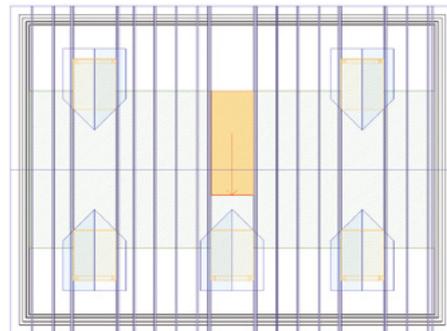


Figure 7: Typical layout

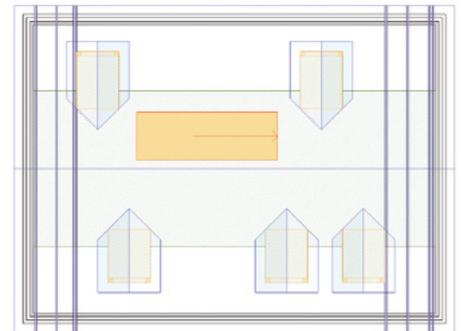


Figure 8: Less effective layout

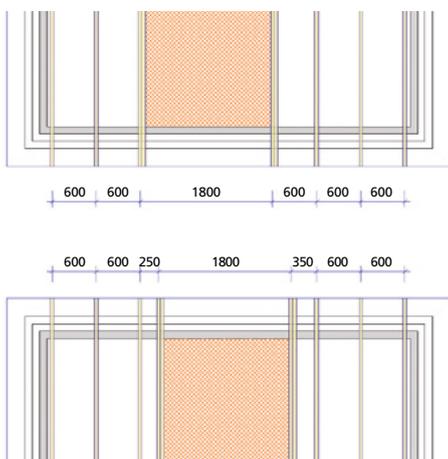


Figure 6: Positioning of rafters

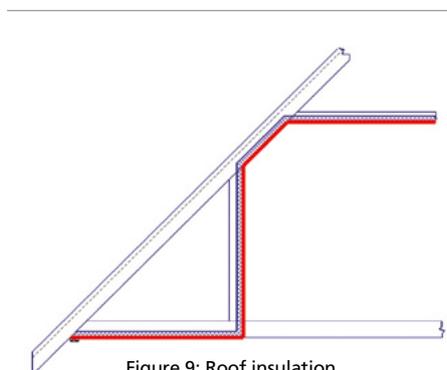


Figure 9: Roof insulation

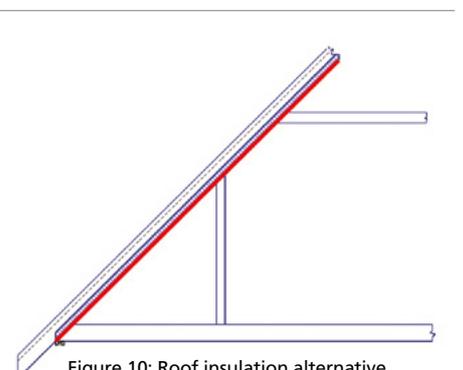


Figure 10: Roof insulation alternative

The information on these pages provides a brief introduction to the use of Room in Roof trussed rafters. It is not intended to be comprehensive and you are advised to discuss your design with a specialist trussed rafter supplier.



4 Storage of trussed rafters on site

Unloading trussed rafters

The Construction (Design and Management) Regulations 2015 place specific responsibilities on all those involved in the supply and construction process to contribute towards the safe delivery, handling and installation of all construction components.

To address these responsibilities, TRA members provide buyers with information about the size, shape and weights of the trussed rafters they supply, along with any special handling instructions or hazards that are specified by the designer in the risk assessment.

Before site delivery, contractors should use this information to carry out a risk assessment and produce a site-specific safe working method statement for the unloading, storage and installation of the trussed rafters. In the case of sub-contract installation, this will need to be approved by the main contractor.

Trussed rafters must be unloaded safely and in a way that does not overstress the trusses. Normally, trussed rafters are delivered in tight bundles using bindings. Mechanical handling equipment, such as a forklift or crane, is the recommended method to move these units.

Site storage of trussed rafters

Trussed rafters can be safely stored vertically or horizontally at ground level, or on a properly designed storage platform above ground level. Whichever



method is used, the units must not make direct contact with the ground or any vegetation. They must be arranged to avoid distortion, and securely restrained to prevent collapse.

The delivery of trussed rafters should be arranged to minimise onsite storage time. However, if longer periods of time are necessary, the trusses should be protected with covers and fixed to allow proper ventilation. When stored vertically, bearers should be positioned to provide a firm and safe support with suitable props as illustrated in Figure 1.

When stored horizontally, level bearers should be positioned between each truss node to prevent any distortion as shown in Figure 2.

No other method of storing trussed rafters is suitable, unless specific provision has been made in the design for an alternative temporary support load case.

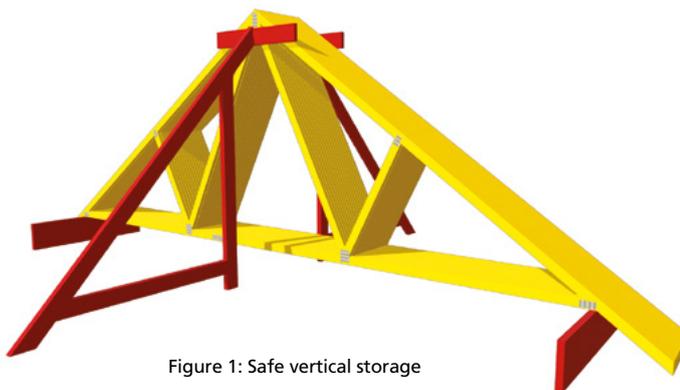


Figure 1: Safe vertical storage

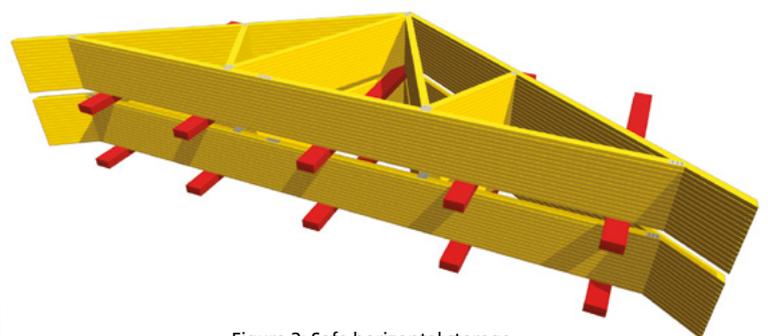


Figure 2: Safe horizontal storage

5 Standard bracing of trussed rafter roofs

The following guidelines apply to both standard trussed rafter roofs for dwellings and Room in Roof (Attic) trussed rafter roofs

Why brace trussed rafter roofs?

Trussed rafters must be braced to create a rigid and stable roof structure. If the bracing is omitted, wrongly positioned or badly fixed, individual trusses may distort or fail and in some cases, the whole roof may fail.

Responsibility for bracing

The building designer is responsible for designing and detailing all elements of roof bracing, including that for trusses. The trussed rafter designer will inform the building designer of any truss integrity bracing required.

The functions of roof bracing

Roof bracing performs three distinct functions:

Temporary bracing – restrains the trusses during construction.

Truss stability bracing – permanent bracing, which holds the trusses upright and prevents buckling.

Wind or wall bracing – permanent bracing in addition to truss stability bracing, which stabilises the gable walls under wind load.

Application of standard bracing

To assist building designers, the supporting documents to Eurocode 5, PD 6693 for the UK and SR 70 for Ireland, provide examples and guidance on standard methods of bracing for domestic scale trussed rafter and RIR roofs up to 12m in span.

Such standard methods of bracing are dependent on wind loads and building height. The table below provides some examples of allowable duo pitch truss spans in different wind zones in the UK. For Ireland wind speed is used to designate the wind zones and the alternative table overleaf provides some examples of allowable duo pitch truss spans.

Note: This method of bracing is not suitable for buildings on open stretches of country such as flat coastal fringes, fens, airfields or large open areas of fen, moor

or farmland, where additional calculations may be required.

Standard methods of bracing require certain conditions to be met, with the list below providing the main examples of the criteria. Buyers and Building Designers should always refer to PD 6693 for the UK and SR 70 for Ireland for full details of standard bracing methods.

- The maximum trussed rafter spacing is 600mm.
- Floor to ceiling height no greater than 2.6m
- 12.5mm plasterboard or similar rigid material ceilings fixed directly, or to continuous counter battens which are fixed directly to the bottom chords of the trussed rafters.
- At least four rafter diagonal braces, two at each gable end, are laid at approx. 45° and fixed to the underside of rafters and the wall plate.
- Further diagonal bracing to be added at intervals along the roof to ensure each truss is braced.
- Longitudinal bracing is located at all node points including the apex but excluding support points (see Figures 2 and 3).
- Chevron bracing should be included for duo-pitch spans over 8m.

- Bracing members to be nominal 25 x100mm with a minimum cross-sectional area of 2,134mm² and a minimum target thickness of 22 mm.
- All bracing members are nailed to every trussed rafter they cross with two 3.35mm diameter galvanized wire nails with a minimum length equal to the bracing thickness plus 32mm (36mm in Ireland). In all details 3.1mm diameter mechanically driven gun nails may be substituted.
- Bracing members may be joined by overlapping at least two trussed rafters.
- For masonry walls the maximum unsupported length must not exceed 9m between returns, buttresses or chimneys.

Other considerations

If an insulation material is installed on top of the rafters, it may reduce the effect of the tiling batten restraint. In this case, additional bracing may be required underneath as specified by the trussed rafter designer.

Where there is no plasterboard, the ceiling tie members need to be braced at all nodes, and additional longitudinal braces may be required.

Maximum Duo-pitched Truss Spans (m) – UK

Pitch Degrees	Wind Zone			
	A	B	C	D
Single Storey - 3.0m max height from ground to eaves				
30.0	12.0	11.6	10.3	9.1
35.0	11.3	9.4	8.7	7.7
40.0	9.2	7.9	6.8	6.3
45.0	7.7	6.6	5.6	5.2
Two-Storey – 5.7m max height from ground to eaves				
30.0	11.6	10.2	8.9	7.8
35.0	9.3	8.1	6.9	6.4
40.0	7.9	6.7	5.6	5.2
45.0	6.6	5.5	5.1	4.2
Three-Storey – 8.4m max height from ground to eaves				
30.0	10.5	9.1	7.8	6.7
35.0	8.9	7.6	6.4	5.4
40.0	6.9	6.3	5.2	4.3
45.0	5.6	5.2	4.2	3.9

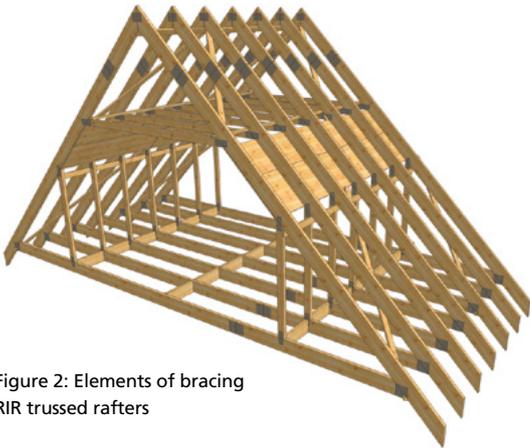


Figure 2: Elements of bracing RIR trussed rafters

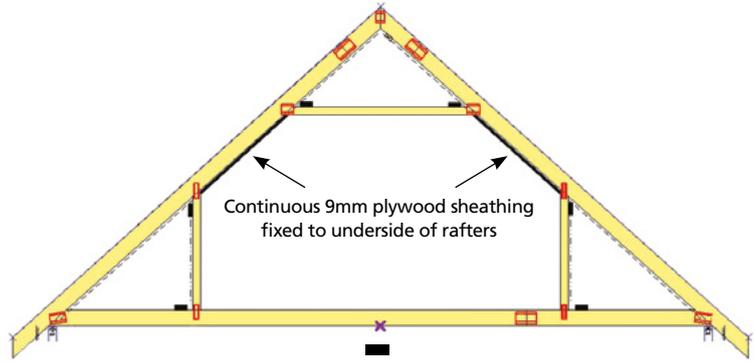


Figure 3: General arrangement for bracing for RIR

Longitudinal bracing place

Diagonal bracing in the outer ceiling tie bays should also be fixed at 45° and extend the length of the building.

Room in Roof Trusses

The elements of bracing for Room in Roof trussed rafters are outlined in Figures 2 and 3. Longitudinal bracing is required at the seven node points illustrated in fig 3. Diagonal bracing is required as with standard trusses and where it passes through the room space ceiling boards should be raised on battens. Alternatively, Structural Plywood or OSB sheathing (minimum 9mm thick by 900mm wide) may be face fixed to the underside of the rafters for the full length of the roof as shown in fig 2.

Diaphragm bracing of minimum 9mm thick x 1,200mm long Structural Plywood or OSB tightly fitted between rafters and fixed to a 50x50mm frame provides a further alternative.

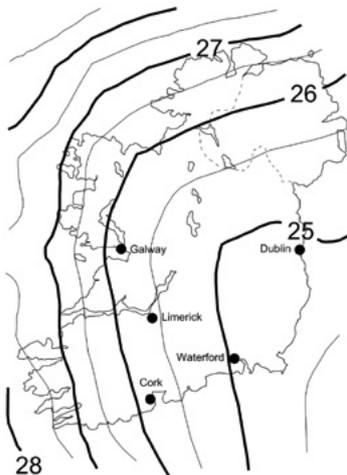
Roof sarking

If approved sarking materials are directly fixed to the top face of the rafter members, you may omit the rafter diagonal bracing, chevron bracing on webs and longitudinal bracing at rafter level. Sarking/sheathing material must be moisture resistant and provide an adequate level of restraint to out-of-plane buckling and wind forces. See Eurocode 5 for more information on suitable materials.

This information comes from current TRA guidance which is based on PD6693-1. NHBC guidance gives the option that bracing should "be in accordance with Chapter (7.2) or PD6693-1."

Maximum Truss Spans (m) – Ireland

Pitch Degrees	Wind Zone		
	< 25 m/s	< 26 m/s	< 27 m/s
Single Storey -3.0m max height from ground to eaves			
30.0	12.0	12.0	11.6
35.0	12.0	10.6	9.8
40.0	10.3	8.9	7.6
45.0	8.7	7.4	6.3
Two-Storey – 5.7m max height from ground to eaves			
30.0	12.0	11.5	11.6
35.0	10.5	9.1	9.8
40.0	8.9	7.5	7.6
45.0	7.4	6.2	6.3
Three-Storey – 8.4m max height from ground to eaves			
30.0	11.8	10.2	8.8
35.0	10.0	8.5	7.2
40.0	7.7	7.1	5.9
45.0	6.3	5.8	4.7



Ireland wind zone map - Courtesy: Department of Housing, Planning and Local Government



UK basic wind zone map - site altitude up to 150m

6 Loft hatch and chimney openings in trussed rafter roofs

Loft hatches and chimneys should be positioned in the standard spacing between trussed rafters, unless otherwise specified in the design.

Trussed rafters must never be cut or trimmed, unless specified by a trussed rafter designer.

In the diagrams below, we show how trussed rafters can be re-positioned to accommodate loft hatches or chimneys in the roof without cutting.

Figures 1, 2 and 3 show how to trim around loft hatches or chimneys to close up the spacing to ensure no individual trussed rafter carries additional load.

Note: TRA recommends using kiln-dried timber of at least strength class C16 for site-installed infill members.

For 2 x normal spacing, purlins, binders and ridgeboards should be at least 47 x 125mm and trimmers should be 47 x 100mm.

For 3 x normal spacing: purlins, ridgeboards and binders should be increased to 47 x 175mm and 47 x 125mm. In both cases, loose rafters should be 35mm deeper than trussed rafter members to enable notching over purlins and binders.

Traditional chimney construction is increasingly being replaced by decorative alternatives such as glass reinforced plastic (GRP) or brick slip construction. These bespoke products often impose additional, unbalanced and sometimes significant loads to the roof construction. It is important that the trussed rafter designer is made aware of these features at the initial stages of design.

Similarly, prefabricated dormer products manufactured from materials, such as GRP, also need to be highlighted at the design stage. In both cases, it is critical to provide exact details of the product to be used so that correct loadings and fixing requirements can be taken into account.

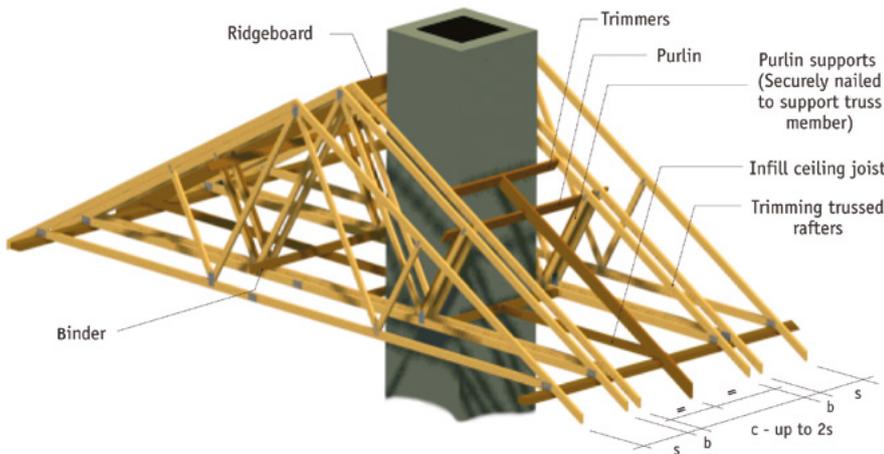


Figure 1: Framing around chimney

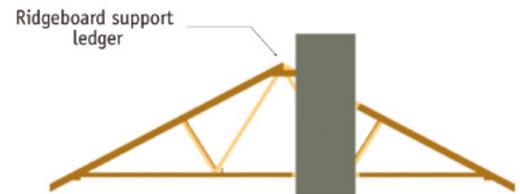


Figure 2: Cross-section through chimney

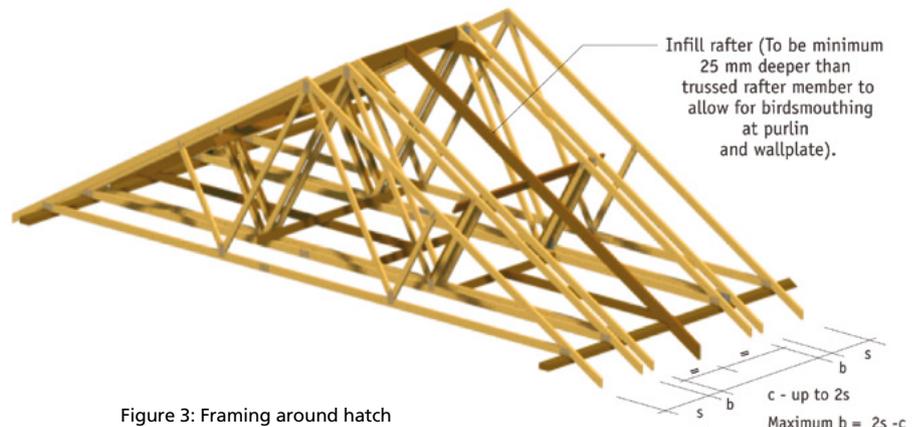


Figure 3: Framing around hatch

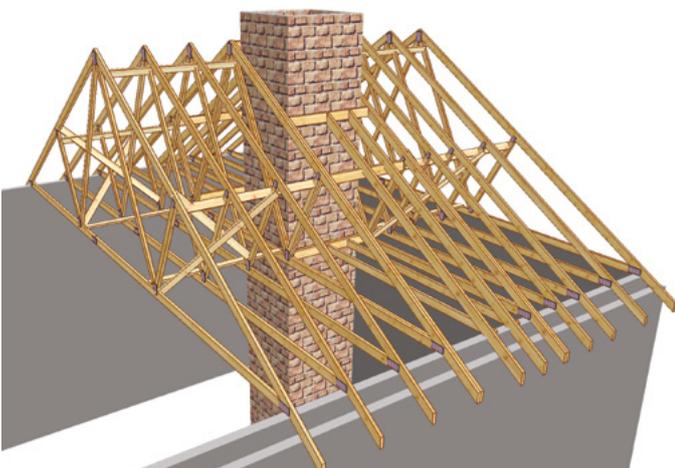


Figure 4a: Cross-section through chimney



Figure 4b: Cross-section through chimney

How to buy

When you buy trussed rafters from a TRA member, you can be confident your supplier has been vetted and approved by the industry's leading professional association.

We advise that you always speak to a TRA member to talk about your specific needs as early as possible in the project. They will be happy to discuss your requirements and to advise on the best approach for your project.

TRA members offer a range of services to suit your requirements. These are categorised as follows and you can choose the service(s) according to your project needs:

- Supply only
- Supply and fit
- Full roof design

Supply only

The supply-only service involves the customer supplying detailed project drawings directly to the TRA member, who then designs the trussed rafters using specialist software. Such project drawings will need to include the information listed in the 'Examples of key design responsibilities' section on page three of this guide. When the trussed rafter design

is completed, a copy will be provided to the customer for approval and once signed off, the TRA member will manufacture the trussed rafters to your specification and supply them to your site, at an agreed date and time.

When choosing a supply-only service, you are then responsible for ensuring safe unloading and correct storage of the trussed rafters when they are delivered. You are also responsible for ensuring that the trussed rafters are properly installed by a suitably qualified person.

Supply and fit

Many TRA members can provide a service that includes the manufacture, delivery and installation of trussed rafters.

With a supply and fit service, you have just one point of contact throughout your roof construction. Choosing this option gives you the peace of mind in knowing that those responsible for the installation are fully qualified specialist roofing joiners. In addition, the responsibility for developing

risk assessments and safe systems of work for storage and installation lies with your chosen TRA member.

Full roof design

On a bespoke basis, trussed rafter designers can take on more responsibilities for the roof design, if requested by the building designer or contractor.

Trussed rafters can be used for any shape and type of roof, regardless of how complex. A specialist trussed rafter designer will produce detailed designs to meet your requirements.

After discussing your project, the trussed rafter designer produces technical drawings using the latest software. Many TRA members also offer 3D visualisation, which is useful to help clients visualise unusual or complex designs. TRA members undertaking roof design will work to Eurocode 5 and provide structural design calculations and certificates for building control as required.

To find a TRA member in your area, visit: www.tra.org.uk/search-members or www.traireland.ie. It couldn't be easier to buy a trussed rafter roof to meet your exact specification.

With a TRA member, you are guaranteed the following:

Quality

All manufacturing members have registered with an independent quality assurance scheme to ensure their trussed rafters consistently meet the highest standards.

Reliability

TRA members are committed to using the highest quality materials. All strength graded timber meets the requirements of EN 14081 and the metal plates EN 14545.

Insurance

Every manufacturing member has professional indemnity (PI) insurance of at least £1 million.

Latest software

TRA members use state of the art software to design trussed rafters and to meet your exact requirements.

Skilled

Regular training sessions, seminars and online training courses are run to ensure TRA members have up-to-date knowledge and skills.

Complete service

TRA members offer a complete package, from feasibility to final design and supply service, no matter how simple or how complex the roof design.

Environmentally responsible

Many TRA member companies are independently assessed against chain of custody standards to demonstrate they supply wood products derived only from sustainable forests under the Forest Stewardship Council (FSC) and Programme for Endorsement of Forest Certification (PEFC) frameworks.

Peace of mind

All members are committed to the TRA's stringent standards of quality and service.

Construction checklist

Installing trussed rafters requires specific construction skills. For buyers who are responsible for the installation of the trussed rafters, the TRA has produced the checklist below as a useful guide of the construction elements which need to be

inspected to ensure a safe and correct installation.

Any points on the list that are checked as 'no' must be addressed and rectified before work proceeds.

	Yes	No
Trussed rafters		
Correct quantity, positions and orientation		
Centres not greater than specified		
Verticality and bow after installation 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 two trusses		
Bracing of trussed 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		

Site Certification in Ireland

Rules covering compliance in building works were introduced in Ireland in April 2014.

The regulations place legal obligations on various parties to produce compliant buildings that are safe for occupants. These include additional responsibilities and duties on all parties to the building contract. Designers, specifiers, suppliers, specialist sub-contractors, installers and inspectors are "Ancillary Certifiers".

TRA Ireland members fully recognise they have a role to play in this process in terms of the design and supply of trussed rafters, and metal web joists. These products fall within the Construction Products Regulations (CPR) and therefore are fully CE marked and supported by the appropriate Declarations of Performance. In addition, TRA Ireland members have professional indemnity insurance to cover the design aspects for which they are responsible.

Trussed rafters are most often undertaken on a design and supply only contract. On this basis TRA Ireland members provide as part of the documentation pack all of the required information to support the design and supply of their products in accordance with EN 14250 and the CPR. In addition, where required, members can provide signed copies of Ancillary Certificates in relation to design only e.g. the current SD and SC certificates endorsed by bodies such as RIAI and Engineers Ireland.

However, as TRA members have no control over the installation or overall performance of the roof structure they will not and are under no obligation to provide a signed copy of the SI certificate, or any form of signed certification that relates to installation. A separate contract

of engagement may be put in place for TRA Ireland members to provide such additional inspection services, at an additional charge.

To assist contractors to undertake their own inspection a construction checklist for trussed rafters is provided on page 20.

Alternatively, some TRA Ireland members offer trussed rafters on supply and fit contract terms which will include the provision for installation certificates such as the current SI form.

www.tralreland.ie



**TRUSSED RAFTER
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The latest version of this guide can be downloaded online at tra.org.uk or traireland.ie

All information is correct at the date this guide was produced. We reserve the right to make technical changes at any time.