

Good Craftsmanship Guide

| Carpentry and Joinery - Carcassing |



Introduction

This Good Craftsmanship Guide highlights key problems with the major elements of Carpentry and Joinery - Carcassing, and gives guidance on how to avoid them. The problems are those most commonly identified during NHBC's inspection of homes under construction. All photographs are of defects and were taken on real building sites.

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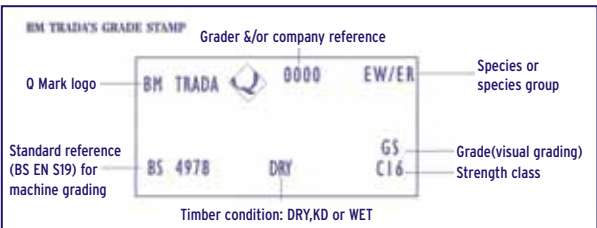
Joists

Problems to avoid:

- Inadequate structural support
- Uneven floors and ceilings
- Excessive drying shrinkage

What to do:

- ensure joist size and grade of timber is to the design
- ensure joists are correctly marked when delivered to site
- joists should be dry graded to BS 4978 and marked "Dry" or "KD"
- use regularised timber wherever possible

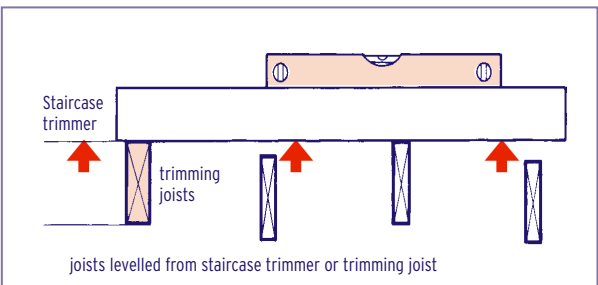


- provide adequate joist bearing (generally minimum of 90mm on masonry)
- space the joists as shown on the drawings (maximum 600mm) - do not increase the spacing
- keep the first and last joists clear from the wall by 25 - 75mm. This helps when installing services and fixing floor decking

- provide level bearing for joists
- if joist packing is necessary only use hard material such as slate or tile bedded in mortar



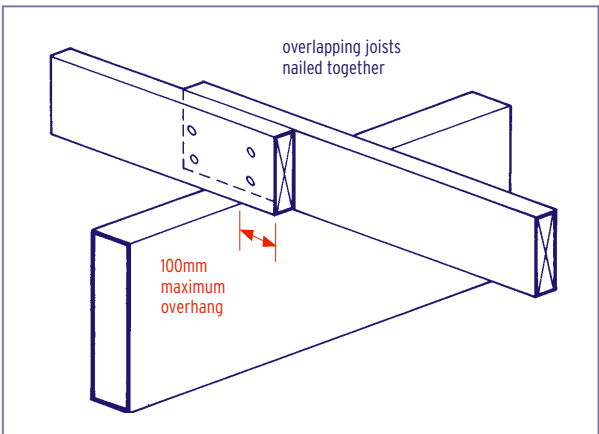
- check the design for sizes and number of joists around openings
- level the floor from the staircase trimmer and trimming joist



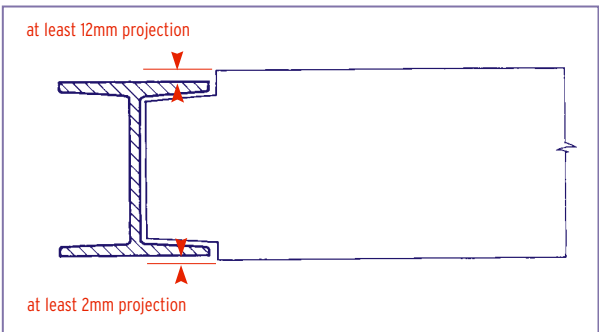
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Joists

- before building joists into external or separating walls check that this is in accordance with the design
- nail overlapping joists together and ensure overhang does not exceed 100mm to limit cantilever movement

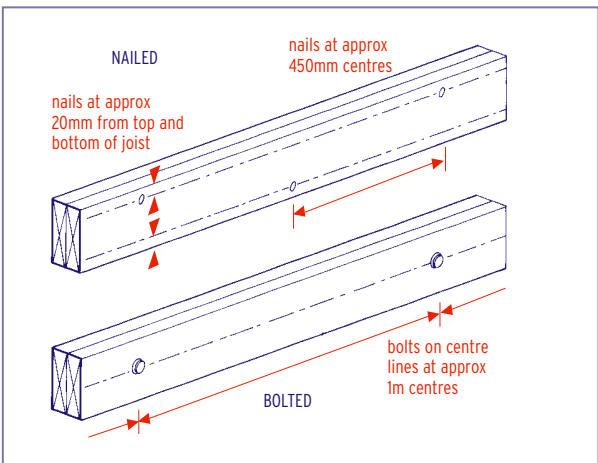


- notch joists correctly into steelwork to allow for timber shrinkage



Multi-joist fixing

- ensure multiple joists are correctly located as they may support additional loads
- join multiple joists together in accordance with the design or as shown below



- use washers, or single faced connectors with bolts
- use toothed connectors if required by the design

Timber engineered joists

Problems to avoid:

- Inadequate structural support

What to do:

When using timber engineered joists:

- ensure that they have third party assessment
- ensure that the manufacturer's information for fixing/assembly is available and followed on site



Note: Timber engineered joists will require restraint straps at the same centres as timber joists, but the fixing and support will be as detailed by the manufacturer.

Joist hangers

Problems to avoid:

- Inadequate support
- Movement of the floor



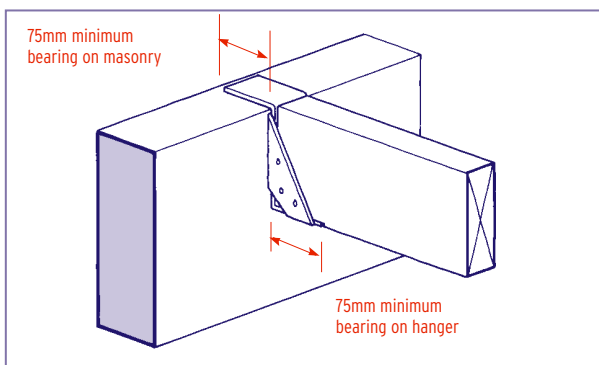
What to do:

- ensure the hanger is correct for the strength of lightweight block. The hanger should have this figure marked on it (e.g. 2.8N/mm^2 or 3.5N/mm^2)
- check that the masonry course carrying the joists is level and at the correct height

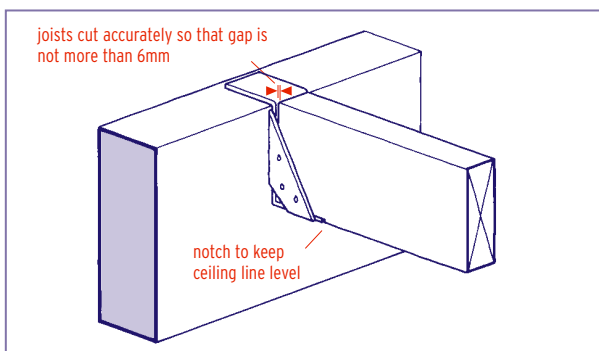


- ensure the hanger size is correct for the joist
- provide adequate bearing for the joists and hangers

Joist hangers



- ensure that the hanger is tight to the wall
- cut joist length accurately for a tight fit in the hanger (max 6mm gap)
- notch the joist bottom into the hanger
- ensure that hangers are fully nailed
- build up the masonry above the flange to the height recommended by the manufacturer and allow to harden before loading the floor



Note: Do not notch timber engineered joist into hangers. Provide web stiffeners to joist ends in accordance with manufacturer's instructions.

Strutting

Problems to avoid:

- Joist movement
- Springy floors



What to do:

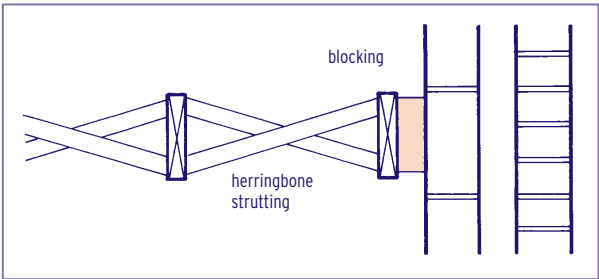
- provide strutting where required

Strutting should be provided before laying floor decking as follows:

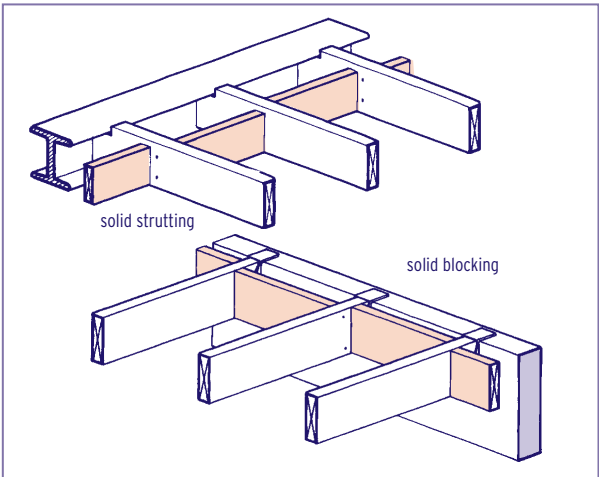
Joist span (m)	Rows of strutting
Up to 2.5	none needed
2.5 to 4.5	1 (at centre of span)
Over 4.5	2 (at equal spacing)

- fix strutting before laying the floor decking, using:
 - herringbone 38mm x 38mm
 - 38mm solid blocking x $\frac{3}{4}$ joist depth
 - proprietary metal strutting which has third party assessment. Ensure metal struts do not touch each other
- install blocking at the ends of strutting between the last joist and the wall (see diagram on page 10).

Strutting



- install strutting between joists when they are supported on steelwork or hangers



- strutting at the ends of joists can also provide support to the floor decking and plasterboard

Note: The installation, size and fixing of strutting for timber engineered joists is as detailed by the manufacturer.

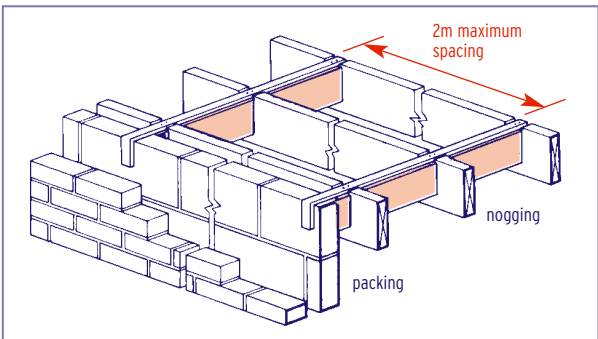
Restraint straps to floors

Problems to avoid:

- Movement/cracking of structure
- Elements not being properly tied together

What to do:

- position the restraint straps where shown by the design - (maximum 2m centres)
- notch the straps into a minimum of three joists and fix with two nails or screws into each joist



- support the straps on noggings between the joists:
 - $\frac{1}{2}$ joist depth if strap is on top of the joist
 - joist depth if the strap is below the joist (a 50mm gap is allowable at the top where there are services)
- provide full depth packing between the wall and the first joist

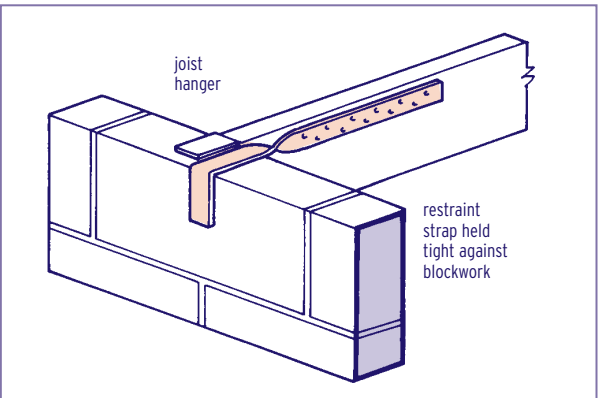
Restraint straps to floors



- ensure that the straps do not bear on perpend joints

Note: Timber engineered joists will require restraint straps, but the fixing and support will be as detailed by the manufacturer.

- fit separate straps in addition to hangers, as hangers are not designed to provide restraint



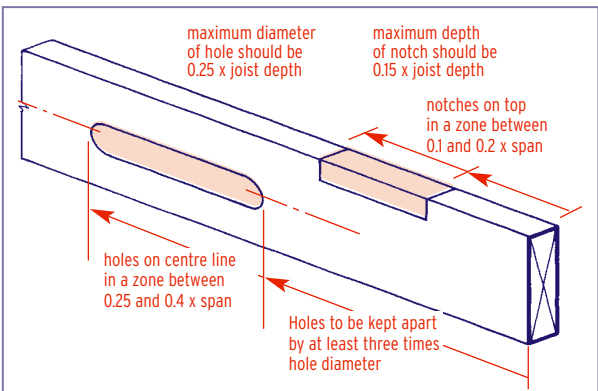
Notching and drilling

Problem to avoid:

- Weakening joists

What to do:

- keep notching and drilling to the minimum size necessary
- only notch and drill timber joists within the limits shown in the table below



Item	Location	Maximum size
Notching joists up to 250mm depth	Top edge 0.1 to 0.2 of span	0.15 x depth of joist
Drilling joists up to 250mm depth	Centre line 0.25 to 0.4 of span	0.25 x depth of joist

Note: Timber engineered joists should not be notched or drilled. Services should pass through the preformed holes in the web.

Wall plates

Problem to avoid:

- Movement of the structure

What to do:

- bed plates in mortar, to line and level
- use minimum timber length of 3m and half-lap plates at joints and corners (butt joints are acceptable in Scotland)



Note: Provide holding down straps at maximum 2m centres. Fix to wall plate and wall with at least three plug and screw fixings.

Trussed rafter roofs

Problems to avoid:

- Damage to trusses
- Movement/distortion of structure



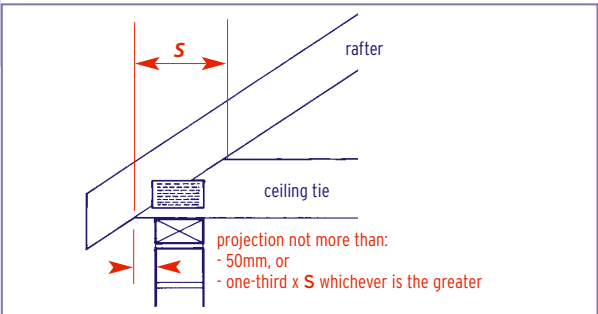
What to do:

- ensure that trusses are stored correctly, clear of the ground
- don't use or repair any damaged trusses
- keep trusses upright to prevent distortion

continued over

Trussed rafter roofs

- space trusses at the correct centres
- install trusses plumb (maximum deviation 25mm)
- fix trusses to the wall plates:
 - as shown on the design
 - using truss clips
 - by double skew nailing
- ensure multiple trusses are fastened together:
 - by the manufacturer before delivery
 - on site, in accordance with the design
- ensure trusses are supported at the junction of ceiling tie and rafter, unless designed otherwise



■ take extra care where:

- trimming around chimneys, hatch openings and rooflights
- combining trussed rafters and a cut roof
- diminishing trusses are to be supported
- roofs incorporate hips, valleys or other special features

Note: Detailed guidance on the use of trussed rafters is given in the Technical Handbook Site Installation Guide of the Trussed Rafter Association.

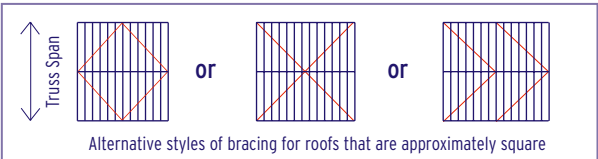
Trussed rafter bracing

Problems to avoid:

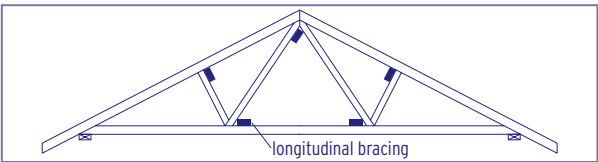
- Movement of structure
- Distortion of trusses

What to do:

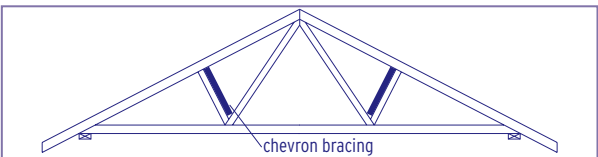
- complete all the bracing before commencing the roof covering
- install bracing in accordance with the design drawings
The minimum requirements for a standard 'Fink' or W-truss (the most common form) are:
 - provide at least 4 diagonal braces in every roof



- fix longitudinal members at the truss node points



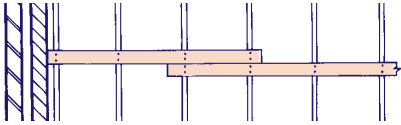
- install chevron bracing between the webs where the span exceeds 8m



Note: - Where there is no ceiling (such as detached garages), provide additional diagonal ceiling bracing.
- Check that mono-pitch roofs of any span, and duo-pitch roofs over 11m span, have bracing designed by an engineer or the truss manufacturer.

- use timber bracing of at least 100mm x 25mm size
- twice nail the bracing to each truss crossed with 65mm galvanised nails
- ensure that bracing is lapped over at least two trusses at any joints
- butt ends of longitudinal bracing solidly against the walls

binders abutted tightly against gable and separating walls



binders fixed to ceiling ties of trussed rafters, if necessary using two lap-jointed lengths



Strapping of the roof

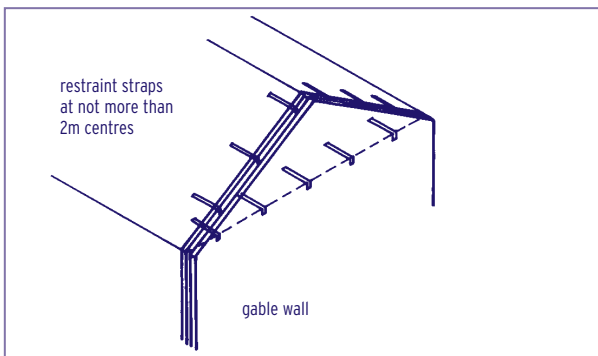
Problem to avoid:

- Movement/cracking of walls

What to do:

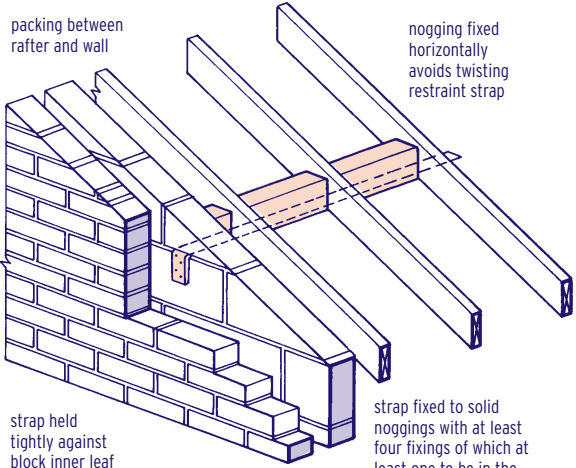
- install lateral restraint straps as shown in the design

Note: Unless a restraining form of gable ladder is used, restraint straps are generally required at both rafter and ceiling levels.



- use straps with a minimum cross-section of 30mm x 5mm
- fix straps under rafters and over ceiling joists
- ensure the turn-down of the strap is over a substantial piece of masonry and tight against it
- install noggings under the restraint straps
- fix straps to a minimum of three trusses
- fix each strap with four 75mm nails or screws - at least one should be in the third rafter
- alternatively, fix straps to the longitudinal bracing, provided straps are at centres not exceeding 2m
- install packing between the end truss and the wall face

packing between
rafter and wall



nogging fixed
horizontally
avoids twisting
restraint strap

strap held
tightly against
block inner leaf

strap fixed to solid
noggings with at least
four fixings of which at
least one to be in the
third rafter



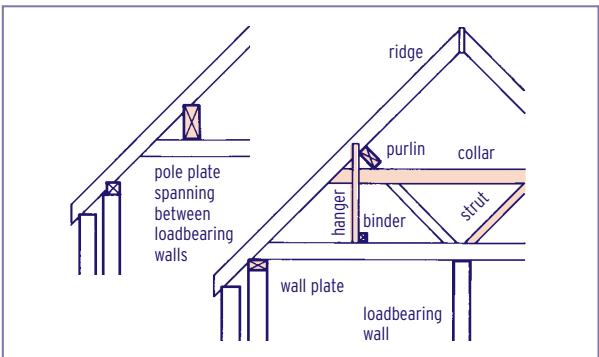
Cut roofs

Problems to avoid:

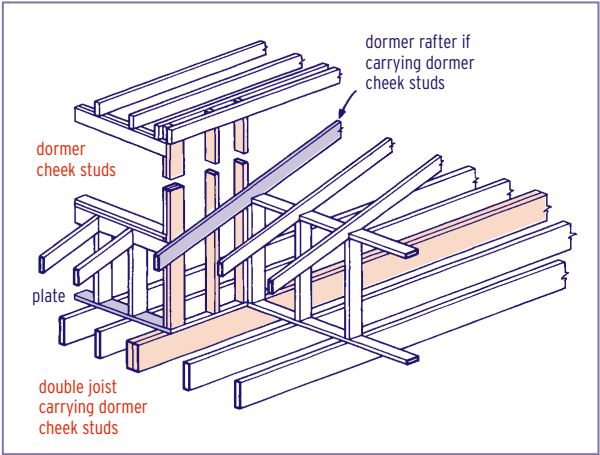
- Roof movement
- Overloading/distortion of members

What to do:

- use the correct grade and size of timber shown on the design drawings and ensure that it is correctly marked
- position all the members accurately, with purlins and binders built in as necessary



- ensure the roof framing is complete before any coverings are laid
- where the roof is not a simple triangle, ensure all members are fully supported and tied together
- provide temporary support to long span members until the framing is complete
- support the cheek studs on dormer construction:
 - by extending the cheek framing to floor level and supporting on a double joist, or
 - by using a double rafter



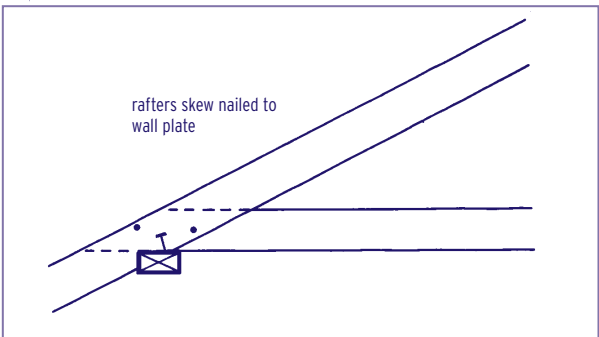
- take particular care with construction of valleys and hips with their support and the splay cutting of rafters



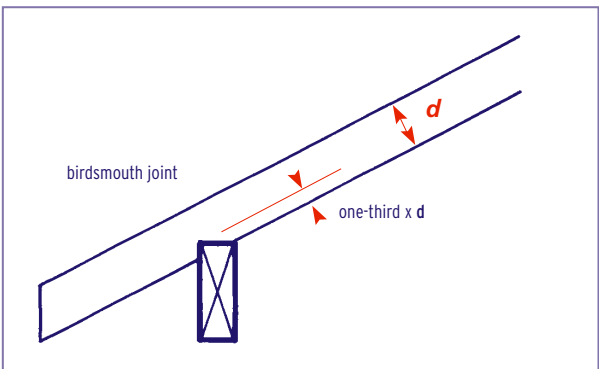
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Cut roofs

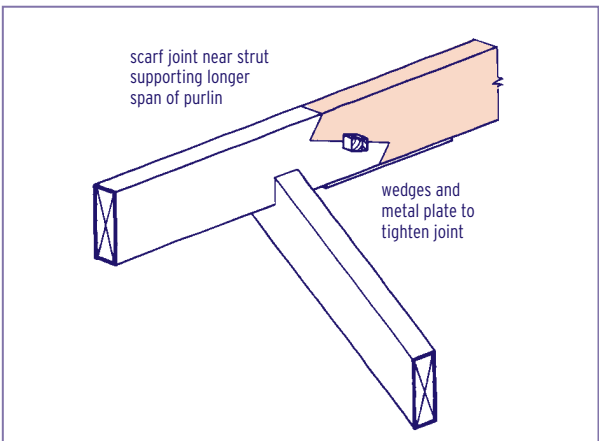
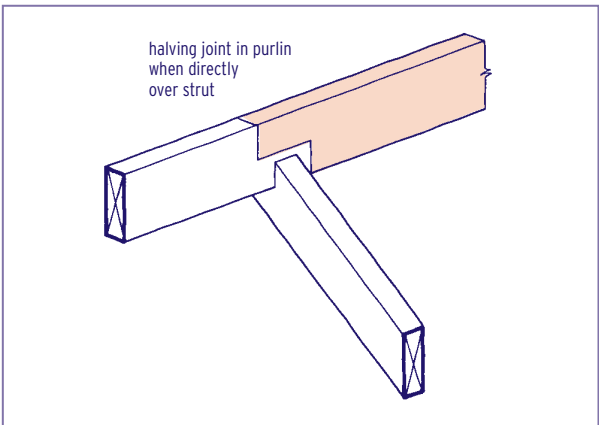
- cut joints accurately to fit tightly, and do not split the timbers when nailing
- use the following at the main connections
- **RAFTERS** to ceiling joists: nailed lapped joint. The rafter should be birdsmouthed over the wall plate and skew nailed



- **RAFTERS** to purlin: a birdsmouth joint should be used if the purlin is fixed vertically



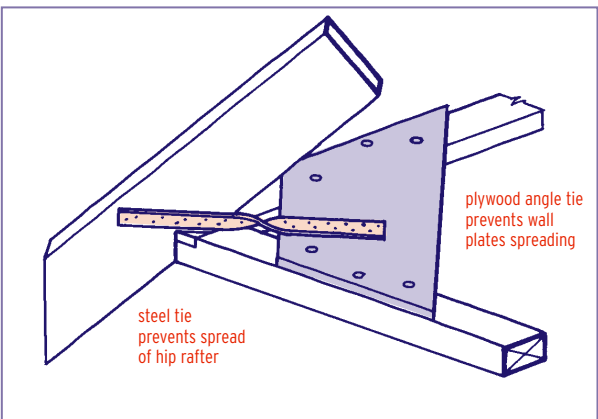
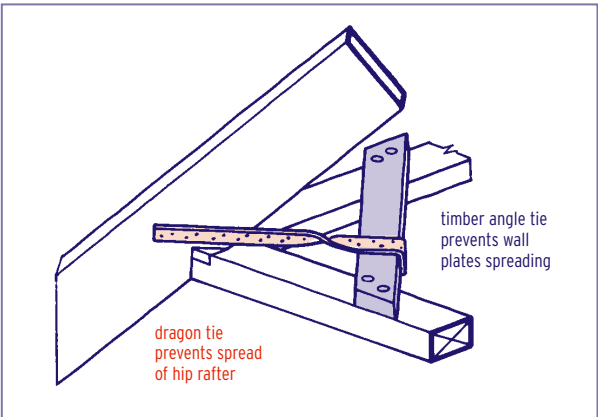
- PURLIN connections: support should be provided directly under joint or use a scarf joint. Any scarf joint should be made near a strut so that the joint supports the longer span

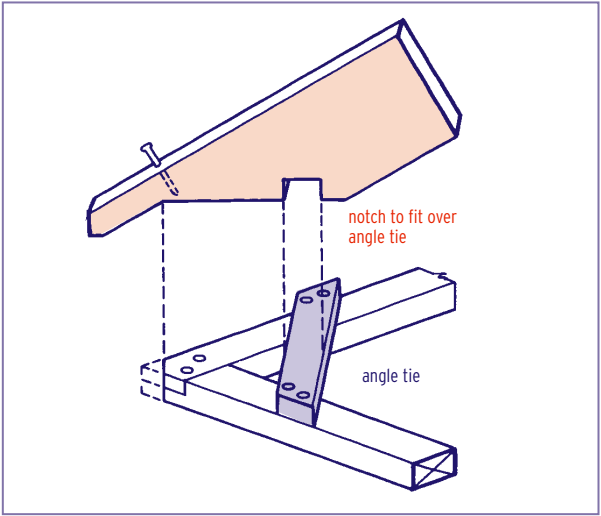


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Cut roofs

- use angle ties on hipped roof corners to prevent the wall plates spreading. For heavily loaded hip rafters, e.g. where they are carrying purlins, dragon ties or similar bracing should be used to prevent hip rafter spread





Cold water storage within roof space

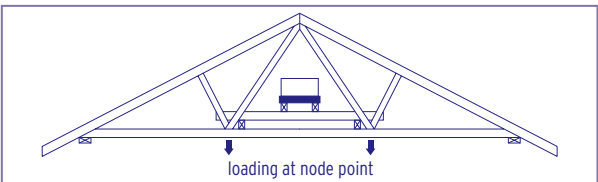
Problems to avoid:

- Distortion of trusses and cracking of finishes
- Inadequate support for tank



What to do:

- support tank as shown on the design drawings. For trussed roofs:
 - distribute the tank load over the appropriate number of trusses (minimum three), depending on the tank capacity
 - ensure that the tank load is transferred to the node points of trusses



Note: Offset the longitudinal ceiling bracing at the node points to clear the tank bearers.

- provide continuous support to the tank bottom using:
 - softwood boarding
 - marine plywood
 - chipboard type P5
 - oriented strand board type OSB3
- provide gangway boarding from the roof access opening to each water tank
- provide 1m² of boarding around each tank

Ventilation

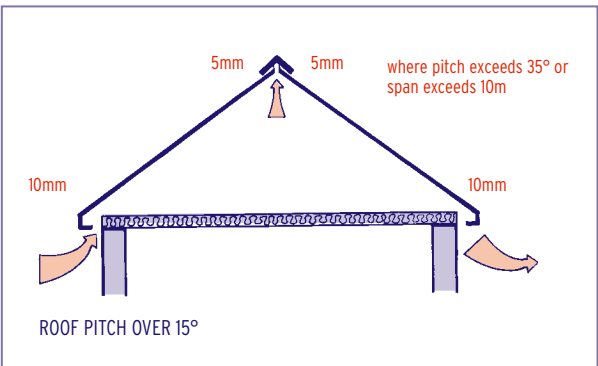
Problem to avoid:

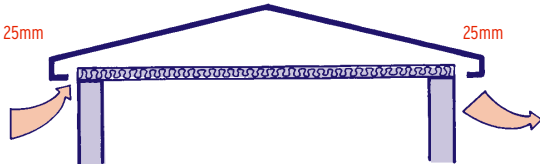
- Condensation in the roof space



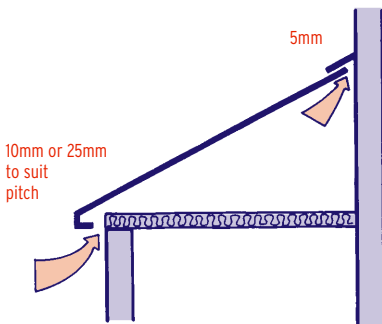
What to do:

- ensure sufficient ventilation is provided on opposite sides of the roof span, equivalent to a continuous gap of these widths

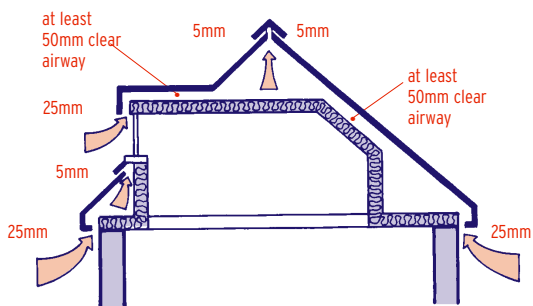




ROOF PITCH BELOW 15°



MONO-PITCHED ROOF



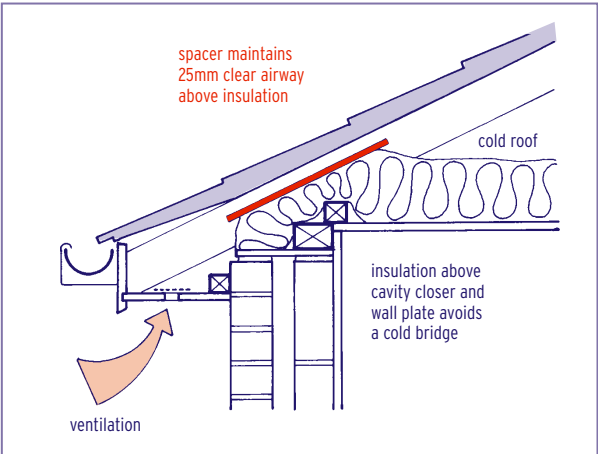
ROOM-IN-THE-ROOF (FLAT ROOF DORMER)

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Ventilation

Note: Additional ventilation openings will be required where the ventilation path up the roof slope is blocked by roof lights.

- provide the ventilation in the soffit or fascia as design
- support the underlay with a continuous fillet at the eaves. This is essential when the roof pitch is below 30°



- provide a vapour control layer on the warm side of the insulation where the ceiling board is fixed to the rafters and insulation is placed between the rafters

Note: New vapour permeable underlays (VPUs) may avoid the need to ventilate the roof space. However you must check that the material has third party assessment and that you are able to meet any conditions imposed for its use.

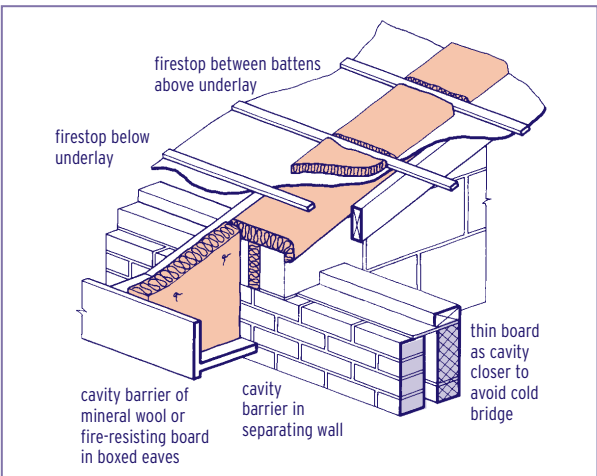
Firestopping

Problem to avoid:

- Spread of fire

What to do:

- provide fire stopping and cavity barriers:
 - at junctions between cavities
 - above separating walls
 - within the boxed eaves of separating walls
- provide a soft fire-resistant packing, such as mineral wool, above the wall to allow for movement in the roof timbers and prevent “hogging” of the tiles
- use wire-reinforced mineral wool blanket within the boxed eaves, cut to shape and nailed to the rafter



Materials storage

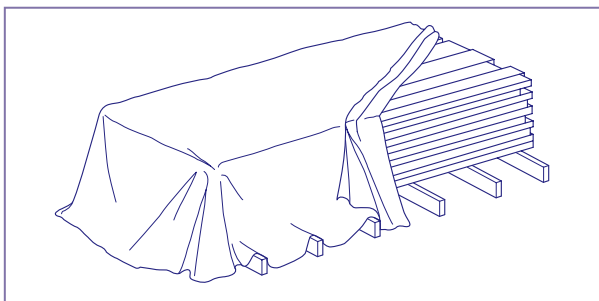
Problems to avoid:

- Deterioration of timber
- Excessive wetting of timber
- Distortion/damage of components
- Corrosion of metal fastenings

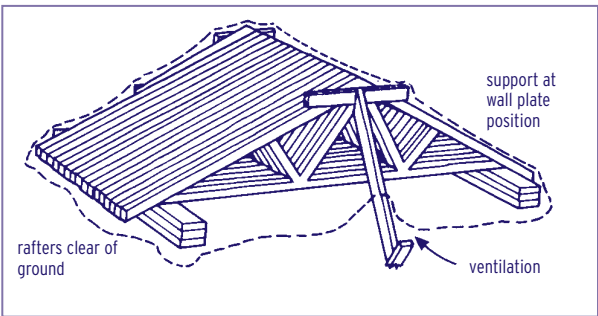


What to do:

- provide storage for timber and joinery products where they cannot be used immediately by:
 - protecting from damage upon delivery
 - storing them off the ground on bearers or in racks
 - stacking/storing them correctly to limit the risk of distortion
 - protecting them from the weather
 - allowing air to circulate freely around them



- store trussed rafters clear of the ground:
 - flat on level bearers under the joints (for short term)
 - vertical and propped at designed support points (for long term)
 - protected against the weather
 - with ventilation provided



Notes

Notes



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