Chapter

6.2

External timber framed walls

This chapter gives guidance on meeting the Technical Requirements for external walls of timber framed homes up to seven storeys high, substantially timber framed homes and timber wall panels.

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6.2.1 Compliance

Also see: Chapter 2.1

External timber framed walls shall comply with the Technical Requirements.

External timber framed walls that comply with the guidance in this chapter will generally be acceptable. For guidance on internal walls and floors within timber frame buildings, see Chapters 6.3 Internal walls and Chapter 6.4 Timber and concrete upper floors.

Where the components of the timber frame cannot be inspected on site (eg closed panels or fully fitted out volumetric units), the system should be subject to review by NHBC. Please refer to the NHBC Accepts website at **www.nhbc.co.uk/builders/products-and-services/techzone/accepts**.

6.2.2 Provision of information

Designs and specifications shall be produced in a clearly understandable format, include all relevant information and be distributed to all appropriate personnel.

Clear and fully detailed drawings should be available on site to enable work to be carried out in accordance with the design. Design and specification information should be issued to site supervisors, relevant specialist subcontractors and suppliers, and include the following:

- a full set of drawings
- materials specification
- the position and materials for cavity barriers in accordance with relevant Building Regulations
- fixing schedules
- manufacturers' recommendations relating to proprietary items.

The fixing schedule should detail every connection which is to be made on site, including those for structural connections, framing, wall ties, breather membranes, sheathing and air and vapour control layers (AVCL), and should show as appropriate:

- number and spacing of fixings
- size and type of fixing, including material and corrosion protection
- method of fixing, eg skew nailing.

Further guidance on the contribution of plasterboard to racking resistance can be found in Clause 6.2.7. Where wall design relies on plasterboard to take racking forces, the design should:

- clearly define those walls
- include the type and spacing of fixings required.

6.2.3 Design checking and certification

Design of the superstructure shall be adequately checked.

Homes with a timber frame superstructure require certification confirming that the design has been checked by an NHBC-approved timber frame certifier.

The timber frame certifier should:

- be listed on NHBC's list of timber frame certifiers
- be a suitably qualified civil or structural engineer with a minimum of three years' experience in timber frame construction
- not be the designer of the timber frame nor be from the same practice
- complete and sign a certificate confirming assessment of structural adequacy for each specific project
- provide the registered builder with the completed and signed certificate.

The registered builder should ensure that the completed timber frame certificate is available on site for inspection by NHBC.

Contact NHBC Standards, Innovation and Research via ***OperationsSupport@nhbc.co.uk***

- if you require contact details of frame certifiers, or
- to apply to become a timber frame certifier.

Alternatively, timber frame superstructures from Gold level members of the Structural Timber Association Assure scheme, who have engaged Silver/Gold level structural designers and engineers, are acceptable without additional certification.

The registered builder should ensure that a letter from the manufacturer is available on site for inspection by NHBC.

Designs should be submitted to NHBC when proposed buildings are four storeys or more and the floor joists are solid timber.

6.2.4 Load-bearing walls

Also see: Chapter 6.3, Structural Timber Association Advice Note 4 Tolerances

Load-bearing timber framed walls shall be constructed to support and transfer loads to foundations safely and without undue movement. Issues to be taken into account include:

1) timber elements
2) joints between panels and other elements
3) positioning of sole plates
4) packing under sole plates
5) fixing panels
6) timber frame erection tolerances
7) support of prefabricated chimneys.

6.2.4.1 Timber elements

Load-bearing timber framed walls should be in accordance with BS EN 1995-1-1, and take into account:

- wind loads
- roof loads
- floor loads
- cladding loads.

Structural timber components should be of a suitable strength class as specified by the designer to BS EN 338. Solid structural timber should be:

- machine graded to BS EN 14081, or visually graded to BS 4978 for softwoods or BS 5756 for hardwoods
- assigned a strength class based on BS EN 1912 when visually graded
- dry graded
- marked in accordance with BS EN 14081.

Further guidance on strength classes for certain timber species can be found in PD 6693.

Engineered wood products such as I-section or metal-web studs should be assessed in accordance with Technical Requirement R3.

Individual timber studs should have:

- a minimum width of 38mm
- a maximum spacing of 600mm, unless other adequate support is provided for wall boards and fixings.

Narrow or inaccessible gaps between studs which are difficult to insulate should be avoided.

Lintels and cripple studs should be provided at openings in load-bearing panels except where:

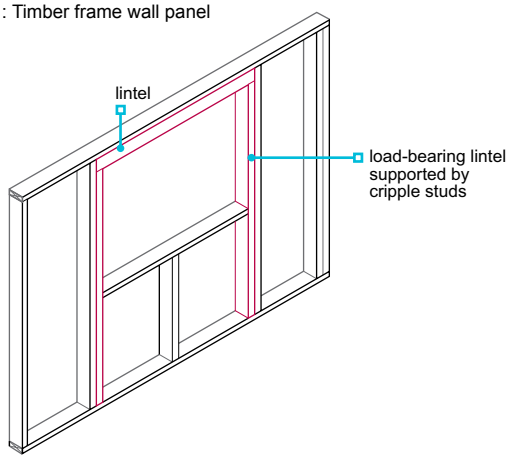
- the opening does not affect the stud spacing, or
- supported loads are carried by a ring beam or header joist.

Sheathing and associated fixings should be structurally adequate, and resist racking due to wind and other forces.

Where masonry cladding is used, additional studs may be required at openings and vertical movement joints to fix wall ties.

Multiple studs should be included to support multiple joists and other point loads, unless otherwise specified by the designer. Where head binders are not provided, joists and roof trusses, including girder trusses and other similar loads, should bear directly over studs.

Figure 1: Timber frame wall panel



6.2.4.2 Joints between panels and other elements

Wall panels should be:

- securely fixed together, and securely fixed to the floor and roof framing
- constructed to prevent buckling.

At joints between wall panels, sole plates and head binders should be provided to bind panels together. Joints in sole plates and head binders should:

- occur over a stud
- not coincide with joints between panels.

6.2.4.3 Positioning of sole plates

When setting out:

- the substructure should be correctly set out to receive the timber frame
- the timber frame should be checked to ensure that it is erected accurately, both horizontally and vertically
- the load from the frame should be supported as intended in the design
- protection should be provided where foundation ledges form moisture traps.

Figure 2: Sole plate foundation overhang

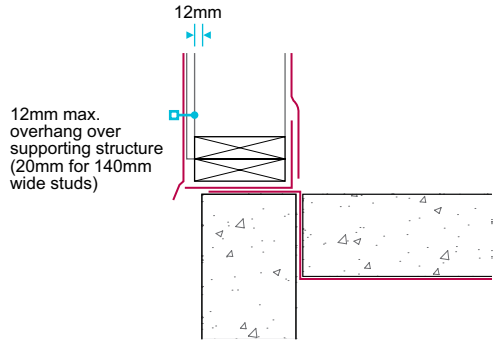
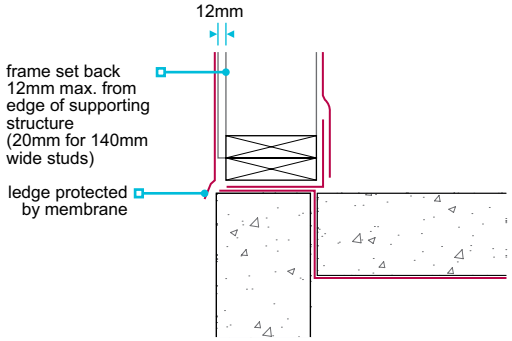


Figure 3: Sole plate foundation set back



6.2.4.4 Packing under sole plates

Where packing is required to ensure the timber frame or sole plate is level:

- permanent packing should be used for gaps less than 5mm
- grout and mortar should not be used for gaps less than 5mm
- hollow plastic packing with reduced bearing surfaces should not be used
- temporary spacers can remain in place provided they are durable and non-degradable.

Permanent packing should be:

- designed and approved by the timber frame designer to suit the horizontal and vertical loads on the sole plate
- at least the same plan area as the load points, eg studs or posts.

Packing exceeding 20mm should be agreed between the timber frame manufacturer's engineer and NHBC. The following methods are generally acceptable to NHBC for packing up to 20mm.

Permanent structural packing under sole plate

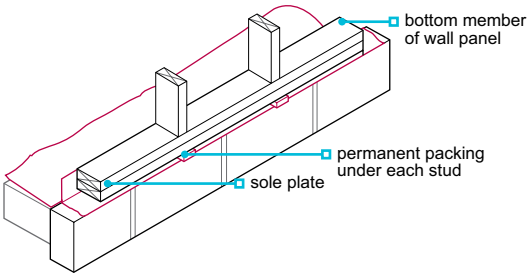
The sole plate should be levelled on temporary spacers.

When the first lift construction (including wall panels, first floor structure, or roof structure in a single storey building) has been erected, permanent packing should be placed under the sole plate, which can be:

- free-flowing non-shrinkable grout for the full length and width of the sole plate, or
- individual packers placed under each load point, eg stud or post.

Where grout is used as permanent structural packing, installation should be checked to ensure full bearing is achieved.

Figure 4: Permanent structural packing under each stud

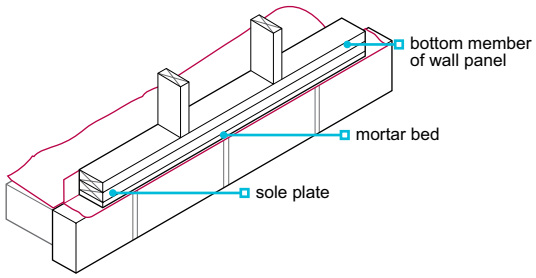


Bedding of the sole plate

The sole plate should be laid and levelled on a continuous bed of mortar prior to the erection of the wall panels.

The bedding should extend the full width of the sole plate. Care is needed to ensure that the bedding is not disturbed during the fixing of the sole plate.

Figure 5: Bedding of sole plate on mortar



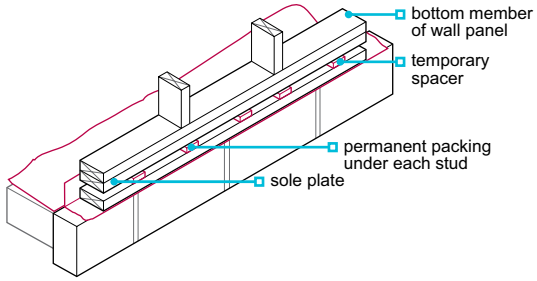
Double sole plate 'sandwich'

The lower sole plate should be fixed to follow the contours of the supporting structure.

The upper sole plate should then be fixed on top and levelled with temporary spacers inserted between the sole plates.

When the first lift construction has been erected, permanent packing should be inserted under each load point, eg stud or post.

Figure 6: Double sole plate sandwich



6.2.4.5 Fixing panels

The wall panels should be adequately fixed to the sole plate so that the frame can resist both lateral and vertical forces.

When fixing panels:

- fixings, including nailed joints and sheathing, should be as scheduled in the design
- they should be securely fixed together, to the floor and to the roof framing
- sole plates and head binders should be provided to bind the panels together.

6.2.4.6 Timber frame erection tolerances

Timber frame erection tolerances based on guidance from the Structural Timber Association will generally be acceptable.

6.2.4.7 Support of prefabricated chimneys

Prefabricated chimneys should be supported by:

- masonry cladding, or
- the timber frame, including any roof construction supported by the timber frame.

6.2.5 Fixing the frame

The timber frame shall be suitably fixed to the substructure.

Shotfiring

Where shotfiring:

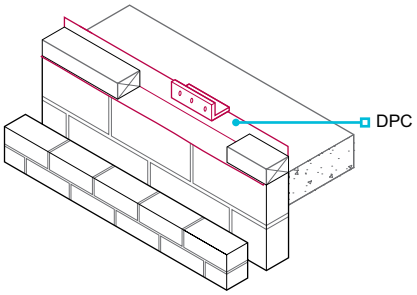
- into masonry, solid concrete blocks should be specified as BS EN 771, with a minimum crushing strength of 7.3N/mm^2, and positioned to receive fixings
- the blocks in beam and block floors should be grouted
- care should be taken not to spall edges of masonry or slabs.

Anchoring

When anchoring the frame:

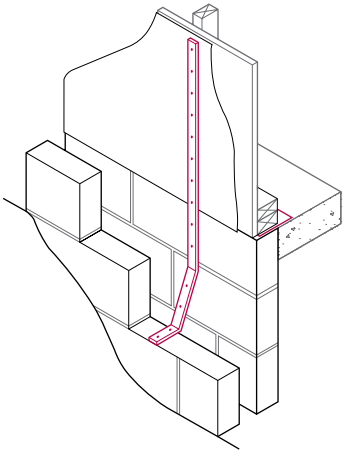
- the sole plate should be adequately anchored to the substructure so that the frame can resist both lateral and vertical forces
- care should be taken to avoid splitting timber plates or damaging the substructure.

Figure 7: Sole plate anchor brackets



Fixing to plate

Figure 8: Holding-down straps built into masonry cladding



Fixing to stud

Holding-down devices should be durable, as detailed in the design and manufactured from:

- austenitic stainless steel to BS EN 10088-1, minimum grade 1.4301
- galvanised mild steel with zinc coating to BS EN ISO 1461, minimum coating 940g/m^2 on each side.

Sole plate anchors within the internal envelope should be galvanised mild steel, minimum coating Z275.

6.2.6 Nails and staples

Nails and staples shall be durable and of the correct type to provide adequate mechanical fixing.

Nails for fixing sheathing or timber should be either:

- austenitic stainless steel, or
- galvanised, or
- sherardised.

Staples for fixing breather membranes should be:

- austenitic stainless steel, or
- other material of similar strength and corrosion resistance.

6.2.7 Sheathing

Sheathing shall be durable and capable of providing structural resistance to racking.

The following materials are acceptable:

Plywood	BS EN 636-2S or BS EN 636-3S
Oriented strand board	BS EN 300 type OSB/3 or OSB/4
Moisture-resistant chipboard	BS EN 312 type P5 or P7
Medium board	BS EN 622-3 type MBH.HLS1 or MBH.HLS2
Impregnated soft board	BS EN 622-4 type SB.HLS
Proprietary sheathing materials	Technical Requirement R3 and used in accordance with the assessment

Plasterboard may contribute to racking resistance when used in accordance with PD 6693-1. Limitations or exclusions apply to walls that are not separating walls comprising two or more built-up layers of plasterboard having a minimum thickness of 30mm, and walls where plasterboard is combined with a wood-based sheathing on the same wall diaphragm.

6.2.8 Differential movement

Also see: Institution of Gas Engineers and Managers and Structural Timber Association Differential Movement in Platform Timber Frame

Timber structures shall account for differential movement between the timber frame wall and other building elements.

As the timber frame dries out, it will shrink and the overall height will reduce. The extent of the differential movement increases with the number of storeys, and will typically occur between the timber frame and other parts of the construction, including:

- door and window openings with masonry cladding
- eaves and verges with masonry cladding
- openings for drive-throughs with masonry cladding
- balconies (including juliette balconies)
- service entries
- staircases and lift shaft enclosures (where they are not timber framed)
- the interface of the timber frame with any other construction at each floor level where cladding is fixed to the timber frame.

Where lightweight cladding is fixed to the timber frame, movement across floor zones should be allowed for in the cladding system and its supporting structure.

Movement joints should be provided to accommodate the expected movement. Joints should be detailed to:

- accommodate the expected amount of shrinkage or expansion safely
- provide an additional allowance for the residual thickness of any compressible filler materials after movement has occurred
- provide a weather-resistant and durable joint
- be protected by a cover strip where the movement gap/joint is expected to be more than 35mm.

Where compressible filler materials are specified, they should be specified based on the anticipated residual gap size after movement has occurred.

In the absence of project-specific calculations, gaps in accordance with Table 1 should be provided.

Table 1: Gap sizes with masonry cladding to accommodate differential movement

Gap location	Opening and closing gaps (mm)	
	Floor joists	
	Solid timber (mm)	Engineered I-joist (mm)
Eaves/verge	Add 5mm to gap dimension at level below	
Sixth floor	Specialist calculations to be submitted to NHBC(2)	61
Fifth floor		53
Fourth floor		45
Third floor	45	35
Second floor	35	25
First floor	20	15
Ground floor(1)	5	5

Notes

1. Ground floor or lowest level of timber frame.
2. Calculations, where required, are to be based on BS EN 1995-1-1.

Table 1 is based on the following:

- the table allows for a 2mm thickness of compressible material in closing gaps. Check the manufacturer's product details
- timber components are not saturated and have normal moisture contents at the time of construction, eg less than 20%, and tight-jointed construction
- the ground floor is concrete. For ground floors of timber joists, add 15mm for solid timber and 10mm for engineered timber joists
- timber joist and ring beam/header joist have a maximum depth of 240mm
- timber frame floor cross-section is as shown below, with maximum 45mm deep timber plates/binders
- single head binder at the eaves. Maximum double sole plates
- outer leaf brickwork with expansion rates no greater than 2.5mm per storey
- brickwork up to five storeys, with lightweight cladding above five storeys
- lightweight cladding — floor-level joints must be 15mm for solid timber joists and 10mm for engineered timber joists.

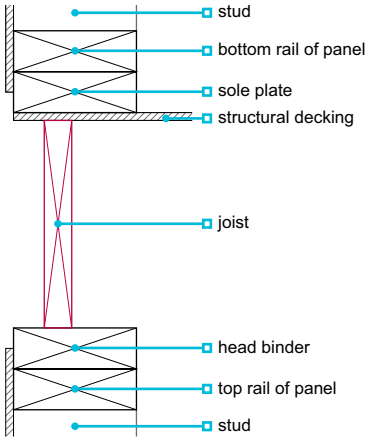
Differential movement should be accommodated by the services where they:

- are within the timber frame construction/envelope and pass across floor zones
- pass through the external envelope.

Common details

The following sketches consider downward movement of the timber frame and upward brick expansion, taken as 2.5mm per storey of clay masonry. Cavity trays, cavity barriers, open perpend vents, etc are omitted for clarity.

Figure 9: Platform timber frame floor zone



Timber frame construction on which Table 1 is based

Figure 10: Window head and sill with masonry cladding

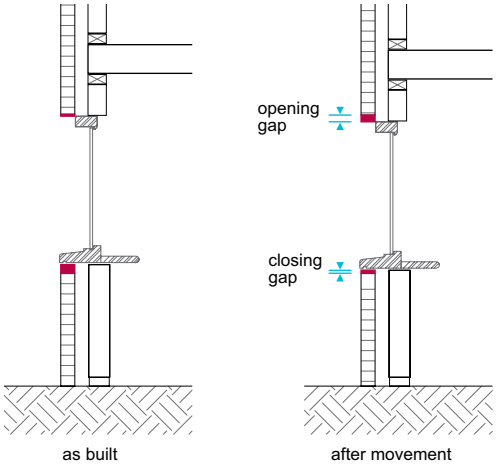


Figure 11: Movement allowance at window sill with masonry cladding

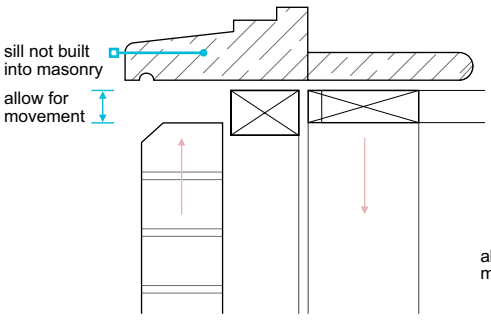


Figure 12: Movement allowance at window head with masonry cladding

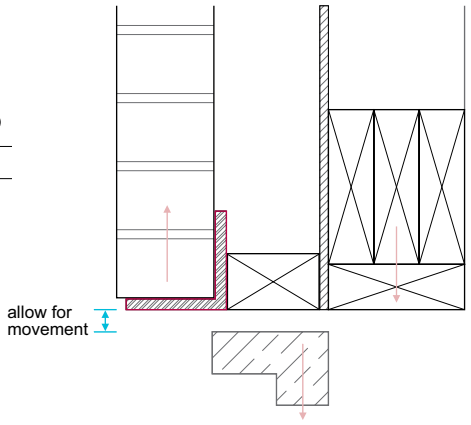


Figure 13: Movement allowance at window head and lintel with masonry cladding

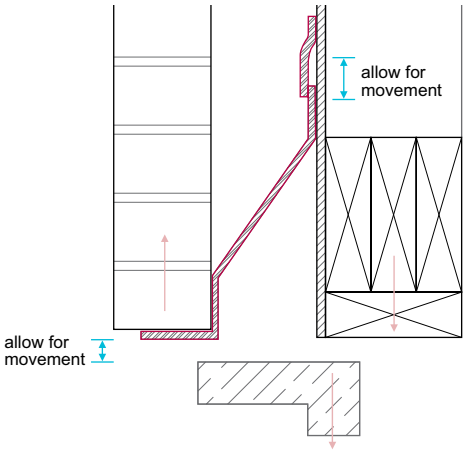


Figure 14: Lightweight cladding window head

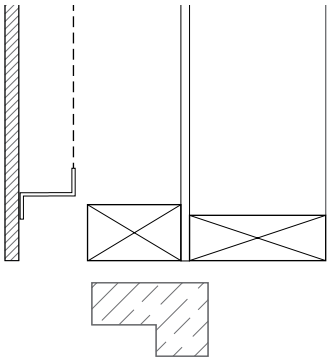


Figure 15: Lightweight cladding window sill

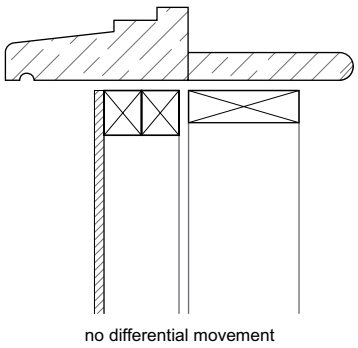


Figure 16: Movement allowance at roof to vertical abutment — before movement

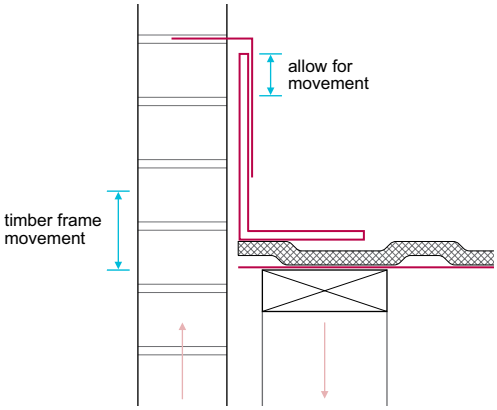


Figure 17: Movement allowance at roof to vertical abutment — after movement

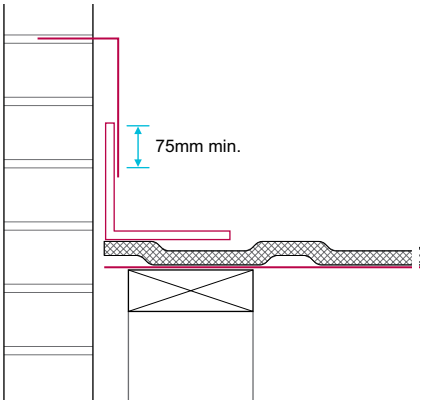


Figure 18: Timber frame interface with concrete or masonry communal areas — before movement

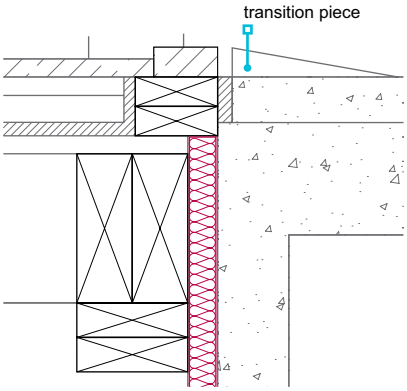
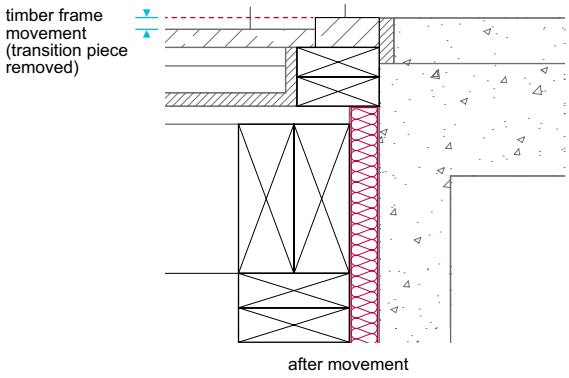


Figure 19: Timber frame interface with concrete or masonry communal areas — after movement



Eaves and verges

Where a movement gap provided between the top of an exterior cladding of masonry and the eaves or verge soffit exceeds 10mm and is not protected by a purposely designed overhang, the gap should be protected with a compressible filler material or mesh to prevent the entry of birds, etc. The filler material or mesh should be flexible so as not to inhibit the differential movement between the exterior cladding of masonry and timber frame. Where a flexible filler is used, it should be sized based on the anticipated residual gap after movement has occurred.

Figure 20: Movement allowance at roof eaves

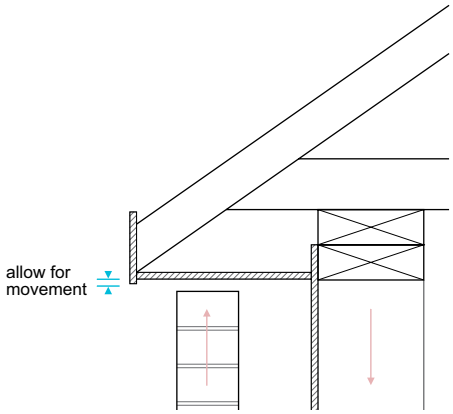
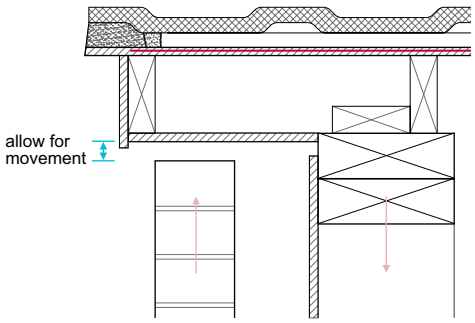
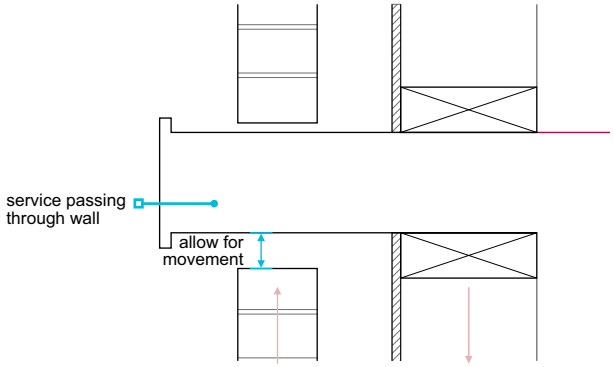


Figure 21: Movement allowance at roof verge



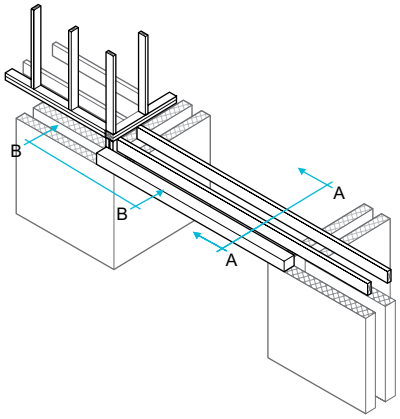
Services

Figure 22: Movement allowance at service penetrations through masonry cladding



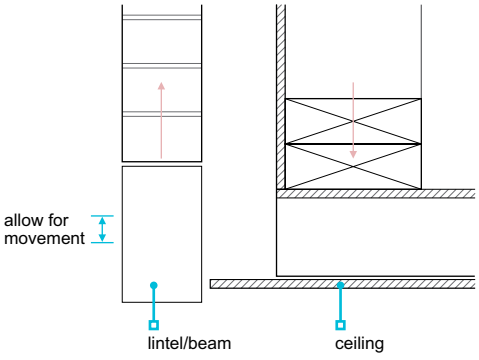
Drive through

Figure 23: Drive through section details



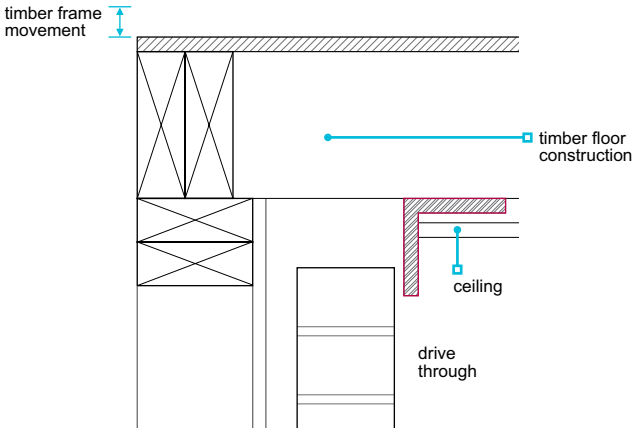
Drive through

Figure 24: Drive through Section A-A



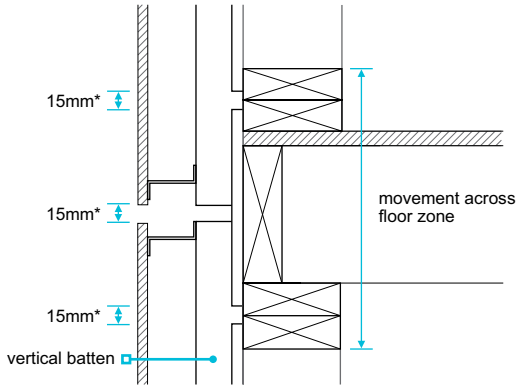
Section A-A

Figure 25: Drive through Section B-B



Section B-B

Figure 26: Floor zone movement gap with lightweight cladding



Lightweight cladding and masonry plinth

Figure 27: Movement gaps at the junction of lightweight and masonry cladding

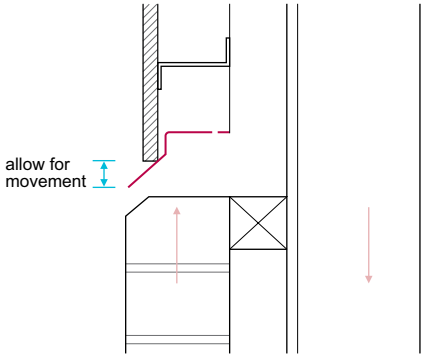


Figure 28: Balcony abutment — lightweight cladding

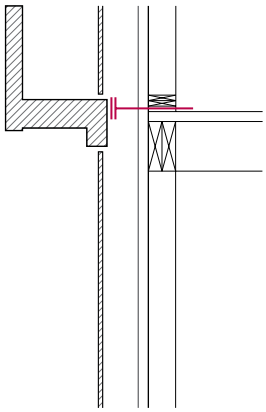


Figure 29: Balcony abutment — lightweight cladding

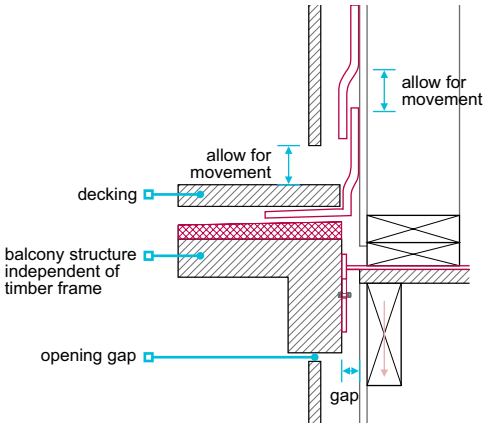


Figure 30: Balcony abutment — masonry cladding

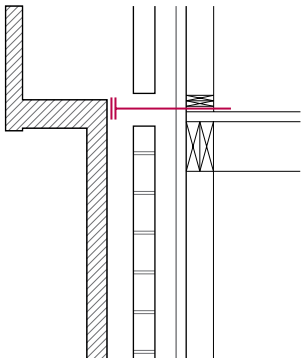


Figure 31: Balcony abutment — masonry cladding

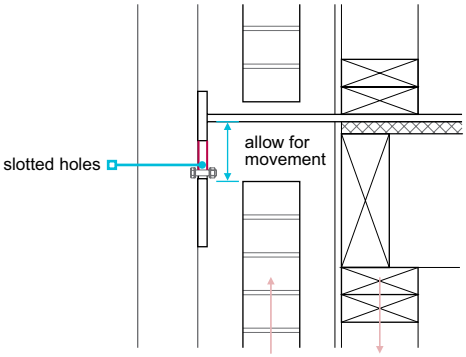


Figure 32: Slotted holes in balcony support brackets

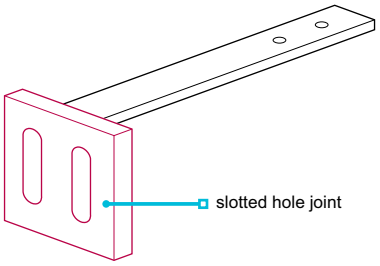


Figure 33: Sliding movement joint in balcony support bracket

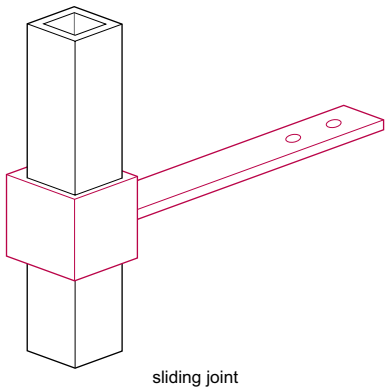


Figure 34: Juliette balcony support fixed to masonry cladding

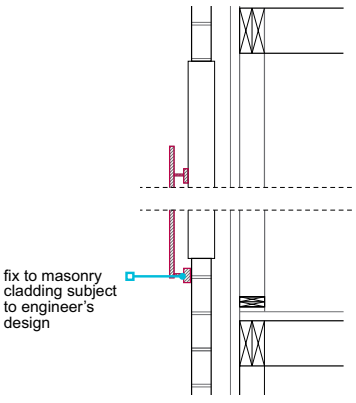
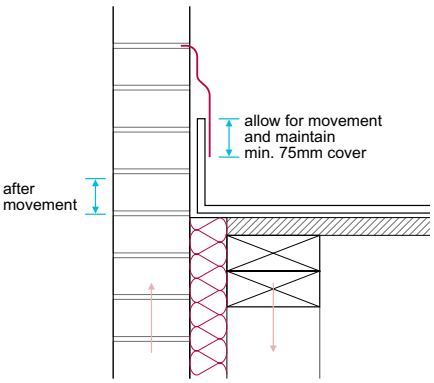


Figure 35: Flat roof to masonry abutment movement detail



6.2.9 Fire resistance

Timber walls and panels shall control and resist the spread of fire and smoke. Issues to be taken into account include:

1) cavity barriers and fire-stopping
2) services
3) fire resistance of the wall or panel.

All building elements should have adequate fire resistance. Materials in accordance with Building Regulations are acceptable; other materials should be assessed in accordance with Technical Requirement R3.

For guidance on the prevention of fire during construction, refer to Fire Prevention on Construction Sites, published by Fire Protection Association (**www.thefpa.co.uk**), and guidance from the Structural Timber Association (**www.structuraltimber.co.uk**) under the Site Safety Strategy, including the 16 Steps to Fire Safety and the Design Guide to Separating Distances.

6.2.9.1 Cavity barriers and fire-stopping

The installation, position and materials for cavity barriers and fire-stopping should be in accordance with the relevant Building Regulations and the design.

Where cavity barriers do not align with structural framing members, additional studs and full-depth noggings may be required to provide a solid backing for the cavity barrier; alternative designs should be supported with appropriate evidence.

Horizontal and vertical cavity barriers should be protected by DPCs arranged to shed moisture away from the sheathing. Horizontal cavity barriers in masonry cladding, except under eaves, should be protected with:

- a DPC tray with a 100mm minimum upstand, or
- a polyethylene-encased cavity barrier with a 100mm minimum upstand.

Horizontal cavity barriers in lightweight cladding should be protected by cavity trays, DPCs or flashings as appropriate.

Figure 36: Fire-stopping and compartmentation at compartment wall/roof junction

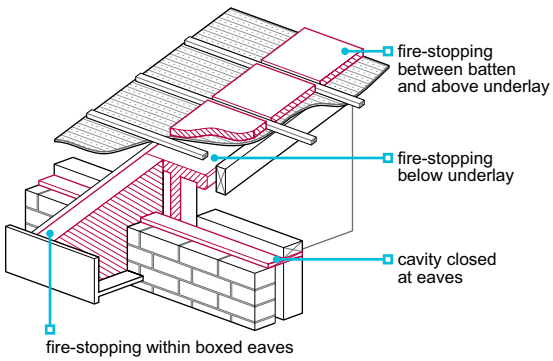


Figure 37: Horizontal cavity barrier protected with DPC

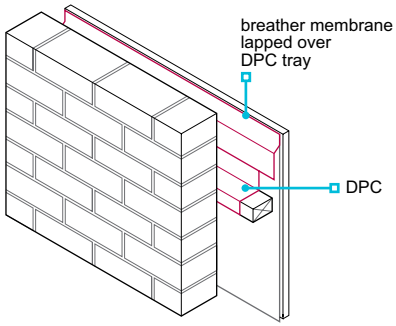
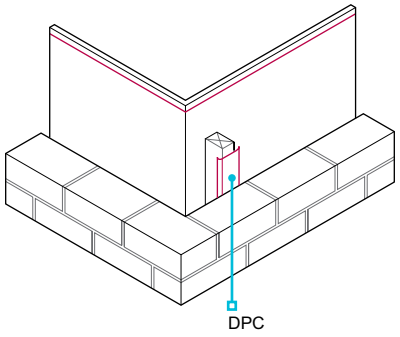


Figure 38: Vertical cavity barrier protected with DPC



6.2.9.2 Services

Only the services shown in the design should be installed in separating walls, and:

- service outlets should not impair the fire resistance of floors and walls
- service mains should not pass through separating wall cavities.

Notching or drilling of structural timber members should be carried out as detailed in the design. If these details are not available, the designer should be consulted before such operations are begun.

In Scotland, services are not permitted within a timber framed separating wall.

6.2.9.3 Fire resistance of the wall or panel

Timber frame walls should have adequate fire resistance in accordance with the relevant Building Regulations.

Timber frame systems should be supported with representative evidence to appropriate standards. Supporting evidence should be relevant to the materials, systems and details proposed.

6.2.10 Protection from moisture

Also see: Chapter 6.1 and 6.9

Timber structures and panels shall be adequately protected from the effects of moisture. Issues to be taken into account include:

1) **cavity construction**
2) **drainage and ventilation**
3) **DPCs and cavity trays.**

6.2.10.1 Cavity construction

A drained and vented cavity should be provided to reduce the risk of rain penetrating the frame. Cavity widths, measured between the cladding and sheathing, should be in accordance with Table 2.

Table 2: Cavity widths

Cladding	Minimum cavity width
Masonry	50mm nominal
Render on backed lathing	25mm nominal
Vertical tile hanging(1) where a breather membrane is provided and fixed to the sheathing	Dependent on batten support layout and spacing(1)
Other cladding(1)	15mm

Note

1. See Chapter 6.9 Curtain walling and cladding.

In areas of very severe exposure to wind-driven rain, wall construction should include a 50mm cavity between the sheathing and the cladding and:

- a high performance breather membrane (see Clause 6.2.13), or
- masonry cladding which is rendered or clad with an impervious material.

Cavities should be:

- vented to allow some limited, but not necessarily through, movement of air
- kept clean, free of obstructions and capable of draining freely.

Masonry cladding should be constructed in accordance with Chapter 6.1 External masonry walls. Lightweight render cladding should be constructed in accordance with Chapter 6.11 Render. Vertical tile hanging and slating should be constructed in accordance with Chapter 6.9 Curtain walling and cladding. Proprietary cladding should be fixed in accordance with the manufacturer's recommendations and Chapter 6.9 Curtain walling and cladding.

External wall cavities should not contain electricity cables other than meter tails.

6.2.10.2 Drainage and ventilation

Drainage and ventilation should be provided to the cavity between the timber frame wall and external cladding.

Cavities between masonry cladding (including brickwork, rendered blockwork and stone) and timber frame walls should be vented. Cavity vents should be:

- equivalent to open brick perpend joints every 1.2m
- located to prevent the ingress of rain
- located to drain moisture from the cavity.

Proprietary perpend ventilators should be used. Perpend ventilators should be installed to the base of external wall cavities below the lowest timber sole plate and above finished ground level; if continuous cavity trays are installed at sole plate level, perpend ventilators should be installed above and below the tray to provide drainage and ventilation to all areas of the timber frame. Where wall areas are divided by horizontal cavity barriers and/or cavity trays, each individual cavity should be vented. Weepholes should be provided at cavity trays over openings.

Cavities between lightweight external cladding and timber frame walls should be vented or ventilated depending on cladding type. Cavity vents should be:

- installed to promote through ventilation where required
- protected to prevent the ingress of rain, insects, birds and vermin
- located to drain moisture from the cavity.

Drainage and ventilation openings should be provided to the base of external lightweight cladding at/near ground level, above horizontal cavity barriers and flashings, and above openings (such as windows and doors).

Horizontal battens used to support lightweight external cladding should be spaced off the frame using vertical counter battens to provide a path for drainage and ventilation. Battens or carrier rail systems supporting lightweight cladding should be located over and fixed to studs. Vertical battens and carrier rail systems should have joints at floor zones to accommodate differential movement.

6.2.10.3 DPCs and cavity trays

DPCs should be:

- fitted at openings to prevent rain penetration
- installed below the sole plates of ground floor walls and internal partitions
- lapped with the DPM and AVCL to enhance airtightness at sole plate level
- installed over horizontal timber cavity barriers (except under eaves and verge) and lapped behind the breather membrane by at least 100mm.

Cavity trays should:

- be installed over openings, at abutments, and where specified at sole plate level
- have weepholes to deflect moisture out of the cavity over openings, or perpend ventilators where cavity trays are continuous
- be lapped behind the breather membrane by at least 100mm to deflect moisture away from the sheathing
- be marked to BS EN 14909 and have satisfactory assessment by an appropriate independent technical approvals authority accepted by NHBC.

Clause 6.1.17 contains further guidance on the installation of cavity trays in masonry cladding.

In Northern Ireland, Scotland and the Isle of Man, and in areas of severe or very severe exposure to driving rain, masonry should form a checked rebate at the reveals of openings to avoid a straight through joint where the frame abuts the masonry.

Figure 39: Window head detail with cavity tray and weepholes

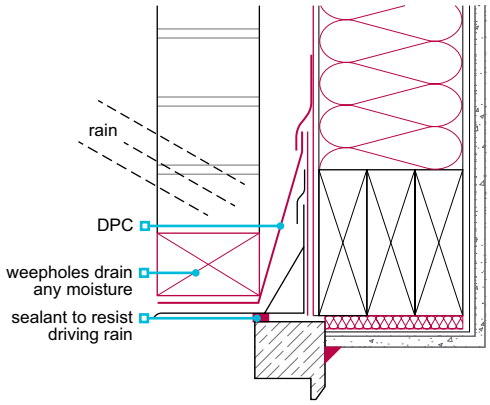
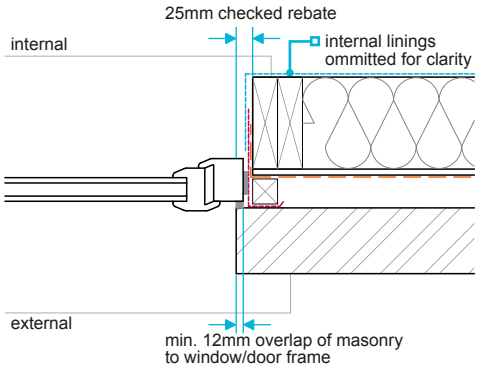


Figure 40: Checked rebate at window reveal in areas of severe or very severe exposure



Cavities should:

- extend below DPC to allow drainage
- be kept clear and be vented
- be suitably drained to prevent water build-up.

The lowest timber should be a minimum of 150mm above finished ground level. This may be reduced to 75mm in situations where the site is not subject to a high water table or where the cavity will not have standing water.

Figure 41: Lowest timber at least 150mm above external ground level

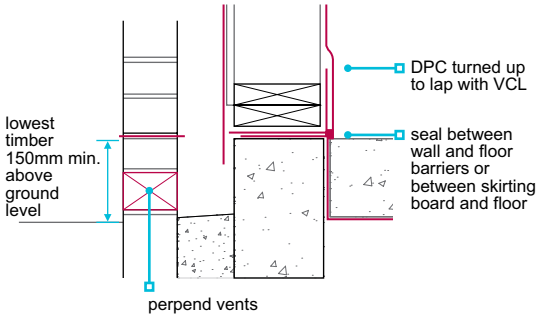
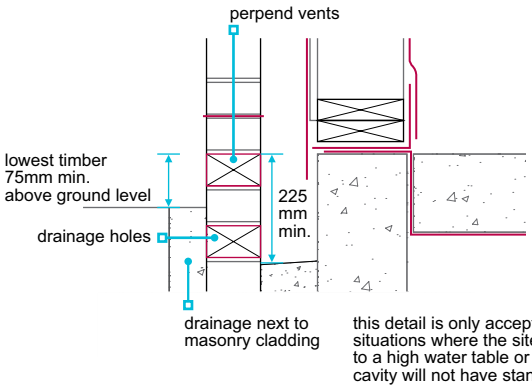


Figure 42: Lowest timber at least 75mm above external ground level



6.2.11 Timber preservation

Timber and timber products shall either have adequate natural durability or be treated with preservative to provide resistance against fungal decay and insect attack.

The following should have adequate natural durability or be preservative treated in accordance with Chapter 3.3 Timber preservation (natural solid timber):

- timber framing members including studs, rails, sole plates, etc
- external timber cladding
- engineered timber I-section or metal-web studs.

6.2.12 Air and vapour control layers

Air and vapour control layers shall be installed correctly and restrict the passage of air and water vapour from within the home into the timber frame.

A high-resistance air and vapour control layer should be provided, unless a condensation risk analysis shows that it is not necessary and the air and vapour control function is being provided by another solution compliant with NHBC Technical Requirements. An analysis in accordance with BS EN ISO 13788 (Glaser method), using the following boundary conditions, will generally be acceptable:

- >60% internal relative humidity
- 21°C internal air temperature
- -2°C external air temperature.

Air and vapour control layers should be:

- installed once framing timbers have a moisture content of less than 20%
- installed once the building is weathertight
- a minimum 500 gauge (125 micron) polyethylene sheet, vapour control plasterboard or a product assessed in accordance with Technical Requirement R3
- adequately fixed to the warm side of the insulation and frame
- fixed at 250mm centres to the top and bottom of the frame and at laps and around openings (vapour control plasterboard should be fixed in accordance with Clause 9.2.4)
- placed to completely cover the external framed wall area, including rails, studs, lintels and sills
- lapped with the DPC/DPM and at junctions to improve airtightness
- lapped into reveals and sealed to window and door frames
- sealed around service penetrations
- made good where damage has occurred.

Joints in the air and vapour control layer:

- should have 100mm minimum laps
- should be located on studs, rails or noggings, and be mechanically fixed
- may be sealed with adhesive tape for enhanced airtightness (but joints should still occur over studs, rails or noggings, and be mechanically fixed).

Where vapour control plasterboard is used, joints should be:

- positioned on studs, rails or noggings
- filled, taped and finished
- cut with care to avoid displacing the vapour control material.

Where floor zone airtightness membranes are specified for enhanced airtightness, they should be of a breathable material with a vapour resistance less than 0.6MNs/g (0.12 Sd) when tested in accordance with BS EN ISO 12572 using the set of conditions C and using five test specimens.

6.2.13 Breather membranes

Breather membranes shall be correctly installed to protect the sheathing and frame from moisture, and allow water vapour from within the frame to pass into the cavity.

Breather membranes should be:

- vapour resistant to less than 0.6MNs/g (0.12 Sd) when tested in accordance with BS EN ISO 12572 using the set of conditions C and using five test specimens
- at least Class W2 to BS EN 13859-2 with no water leakage during testing. In areas of very severe exposure (see Clause 6.1.6 for classification of exposure zones) or where liquid water penetration of the cladding is anticipated, for example open-jointed cladding, Class W1 should be used. When open-jointed claddings are used, or the membrane is likely to be left exposed during construction for a duration longer than normally to be expected (also see the membrane manufacturers' recommendations on exposure times), performance should be based on artificial aged behaviour in accordance with BS EN 13859-2. Where a vented and ventilated cavity with full rainscreen and no gaps, for example masonry or rendered board claddings is used, performance should be based on artificial aged behaviour in accordance with BS EN 13111
- capable of resisting water penetration
- durable and adequately strong when wet to resist site damage
- self extinguishing
- fixed so that vertical joints are staggered where possible, and at regular intervals, to prevent damage by wind
- lapped so that each joint is protected and moisture drains outwards and downwards
- lapped so that upper layers are over lower layers to ensure rain runs away from the sheathing
- lapped so that water is shed away from the lowest timber
- lapped with a minimum 100mm overlap on horizontal joints and 150mm on vertical joints
- fixed at a maximum spacing of 600mm horizontally and 300mm vertically
- fixed at a maximum spacing of 150mm around openings
- marked with stud positions for wall tie or cladding fixing
- applied using fixings that are in accordance with this chapter
- repaired or replaced before proceeding with the cladding, if damaged.

Figure 43: Breather membrane laps

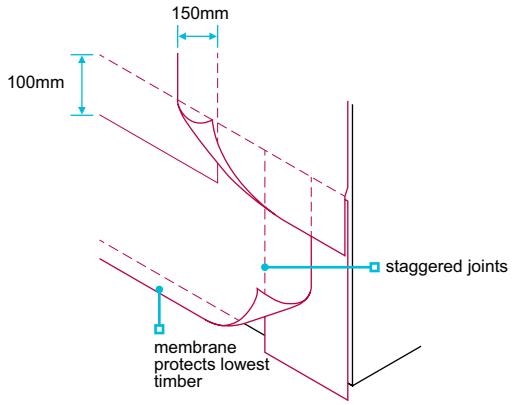
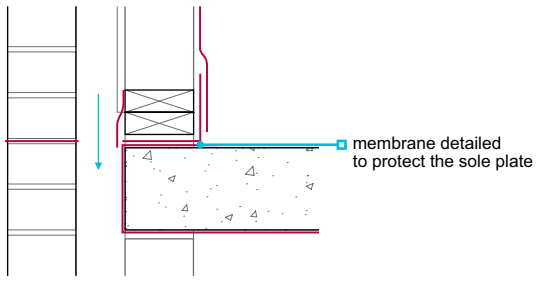


Figure 44: Breather membrane lapped over sole plate



6.2.14 Wall ties and fixings

Wall ties and fixings shall adequately connect the cladding to the timber frame.

Wall ties and their fixings should be:

- compliant with BS 845-1
- in accordance with the design
- capable of accommodating the anticipated differential movement
- of the type specified in the design
- of austenitic stainless steel
- fixed to the studs and not the sheathing using the fixings supplied by the wall tie manufacturer
- kept clean and free from mortar droppings
- spaced at a maximum of 600mm horizontally and 450mm vertically
- spaced at jambs of openings and at movement joints at a maximum of 300mm vertically and within 225mm of the masonry reveal or movement joint (additional studs may be needed)
- spaced within 225mm of the top of the wall, including at gables
- inclined away from the sheathing so that the slope is maintained following differential movement.

6.2.15 Insulation

Also see: BRE Report 262

Insulation shall be correctly installed and provide suitable performance.

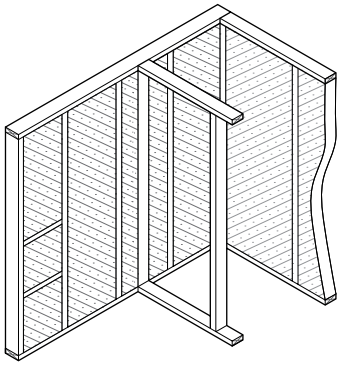
Insulation should be:

- breathable, eg mineral wool (rock or glass), or
- assessed in accordance with Technical Requirement R3 for use in timber frame wall panels.

Insulation should generally be placed within the stud void and cover the whole wall area between studs. No gaps should be left:

- at corners
- at junctions with partitions
- against studs, rails or noggings
- behind services and pattress panels.

Figure 45: Insulation between external wall studs



Water and heating services within walls should be on the warm side of the insulation.

Where insulation is to be installed to the external/cavity face of the frame:

- it should be assessed in accordance with Technical Requirement R3 as an integral part of the wall system
- a clear cavity should be provided, based on the dimensions set out in Table 2 in Clause 6.2.10, between the outer face of the insulation and the external cladding
- a breather membrane should be installed to protect the timber frame wall and sheathing (a secondary breather membrane to protect the external insulation may be necessary depending on the insulation manufacturer's installation instructions and independent technical approval)
- stud locator marks should be transferred onto the outer face of the insulation/external breather membrane (dependent on wall tie type and order of works)
- wall ties should transfer loads directly to the timber frame studs and not via the insulation
- the installation of lightweight cladding systems should be designed by a structural engineer to ensure adequate load transfer to the structural frame
- cavity barriers should be installed to fully close the cavity, ensuring their performance is unlikely to be made ineffective by failure of the insulation.

Where insulation, either in the form of insulated plasterboard or a separate continuous layer, is to be installed to the inside face of the frame, the fire resistance of the wall should be in accordance with Clause 6.2.9 with appropriate supporting evidence.

6.2.16 Further information

- *Structural Timber Association — Structural timber buildings fire safety in use guidance, Volume 1 — Pattern book systems, Version 3.0 April 2024*
- *Structural Timber Association — Structural timber buildings fire safety in use guidance, Volume 2 - Cavity barriers and fire stopping, Version 3.0 April 2024*
- *Structural Timber Association — Advice Note 4 Construction tolerances part 3, timber frame wall panels, Version 2 January 2014*
- *Institution of Gas Engineers & Managers — IGE/UP/7 Edition 2 + A:2008 — Gas installations in timber framed and light steel framed buildings*
- *Structural Timber Association — STA guide to differential movement — Design guidance for platform timber frame, Version 1.0 May 2008*
- *BRE Report BR 262 Thermal Insulation: avoiding risks. 3rd Edition 2002*

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