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STRUCTURAL TIMBER ASSOCIATION

Building solutions in timber

Timber frame construction

A useful pocket site guide

Technically supported by

NHBC

LABC

Delivering building control through local authorities

The Structural Timber Association (STA) gratefully acknowledges the input and financial support of the following companies.

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Technical support for the STA pocket guide kindly provided by NHBC and LABC. This guidance is general in its scope: the project design specification, along with the NHBC Standards and/or LABC Warranty Technical Manual take priority, where adopted.

NHBC

LABC Delivering building control through local authorities

The Structural Timber Association (STA) is the membership body which promotes the use of structural timber in buildings. As part of the drive to deliver sustainable materials and energy efficient buildings, the STA provides best practice guidance for its members. Timber frame construction is a clear leader in fabric first solutions, addressing today's building regulations for thermal and acoustic needs, as well as being flexible enough to accommodate future improvements in the building regulations.

"As part of a nationwide campaign to further improve quality and workmanship, this timber frame guide provides information on correct procedures in constructing domestic timber frame structures. It should be read in conjunction with all project-specific drawings and technical details. The golden rule is always… if in doubt, ask! We hope you find this guide useful."

Andrew Carpenter
Chief Executive
Structural Timber Association

Further information visit the STA website
www.structuraltimber.co.uk

Contents

Introduction

Quality assured panels and components from STA members are delivered to the construction site, where the assembly of the timber frame and follow on trades, such as plasterboarding and cladding, occurs. A successful project requires every trade in the construction process to deliver the right quality work for the project's design objectives. Good projects start with good designs, and a good design is one that is matched to the client's expectations, both in cost and performance. The best practice for design is outside the scope of this guidance, which concentrates on site work - the accuracy of which is a vital link in ensuring the success of our buildings.

This pocket book presents best practice site checks to deliver good build quality for low rise domestic timber buildings. The timber structural method covered is for open panel timber frame with timber floor joists and truss rafter roofs. The principles can be applied to other types and methods of timber buildings - such as pre-insulated and closed panel frame systems - but additional detailing may be required.



Of course, Health & Safety on the construction site is of significant importance. See the Structural Timber Association website for further information and Health & Safety guidance.

This guide is of use to:

- Project managers
- Timber frame erectors
- Site managers
- Site inspectors
- Trade trainers

This guide provides:

- Information for the coordination of successful projects
- Design-to-site details
- The build sequence linked to a checklist of 'What to look for'
- Best practice advice for principle details
- Reference papers and further reading.

Using the guide

It is not a substitute for the drawings, specifications or standard details issued with your project.

This guide complements the specific project design and specification. Where differences occur, the project design should take precedence. This is assuming that the design has been undertaken by an STA member, where the competence of the design team is part of the membership quality process.

Persons using the guide should be familiar with construction terms and have access to additional, more detailed literature.

The information is divided by colour code as follows. Look out for the icons below within this guide.

Best practice, including typical details/approach.
See pages 19 - 61

Defect warnings, giving a clear indication of what not to do, are highlighted in red

Checklists, providing summaries of what to do, are highlighted in green

Coordination checklist

Use the checklists below to ensure successful completion of timber frame projects. Reference papers and further reading is provided at the end of this guidance.

Contractor and design team checklist

- [ ] Foundation drawings
- [ ] Architectural drawings
- [ ] M+E drawings
- [ ] Timber frame erection drawings
- [ ] Timber frame detail books
- [ ] NHBC chapter 6.2/Certification/LABC technical manual as appropriate
- [ ] Finishes and material lists for insulation, lining and cladding the timber frame
- [ ] Fire safety plan reviewed

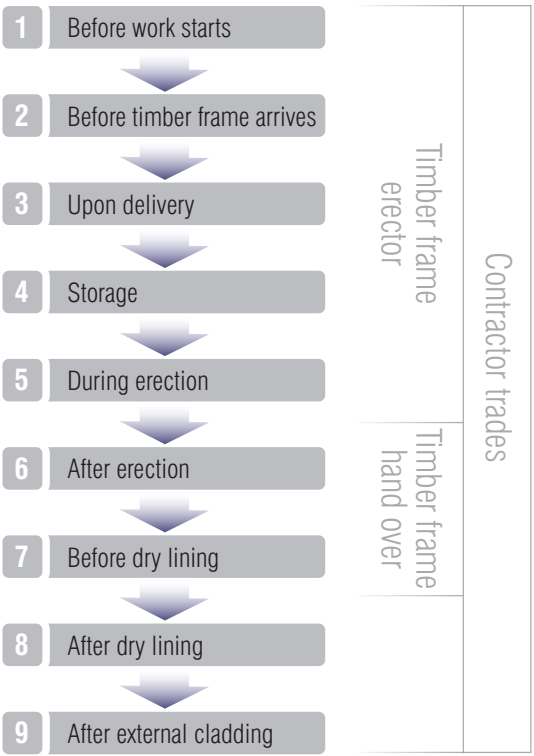
Timber frame erectors and contractors checklist

- [ ] Agreed work scope and specification
- [ ] Communication and liaison agreement
- [ ] Risk assessments/method statements
- [ ] Health & Safety plan
- [ ] Site safe policy/fire safety plan reviewed
- [ ] Erection programme/delivery plan
- [ ] Craneage plan/method statement
- [ ] Scaffolding plan and details

Timber frame erectors checklist

- [ ] Material schedules
- [ ] Timber frame erection drawings/foundation drawings
- [ ] Nailing schedules
- [ ] Erection sequence
- [ ] Site supervisors checklist
- [ ] Any special instructions/assembly

Build sequence - what to look for



1 2 weeks before work starts

1. A full drawing package.
2. Detail booklet and erection instructions.
3. Nailing schedule.
4. Fire plan/Health & Safety plan.
5. Review plans, establish build methodology and check against standards.
6. Pre-start meeting completed.
7. Craneage and scaffolding agreed.
8. Agreed build programme.

2 1 week before frame delivery

9. Foundations constructed correctly using setting out drawings.
10. Top of substructure is level within tolerance.
11. Top of substructure is square and diagonals within tolerance.
12. Foundations are dimensionally correct.
13. Problems reported and rectified.
14. Scaffolding completed.
15. Access and plant off load available.
16. Crane hardstanding agreed.
17. Storage space available.
18. Check substructure against standards.

3 Upon delivery

19. Check all components delivered.
20. Check for damage to frame.
21. Report shortages/damage.
22. Sign for goods received.

4 Storage

23. Keep materials off ground, cover and maintain ventilation.
24. Store panels flat with sheathing side up.
25. Keep materials under cover but maintain ventilation.
26. Keep trusses vertical on bearers at node points or flat on adequate bearing.

5 During erection

27. Take care to avoid damage.
28. Follow drawings, details and standards.
29. Ensure temporary bracing is fitted.
30. Ensure floors are not overloaded by materials.

31. Ensure safe systems of work are implemented.
32. Flooring is protected or cleared of excessive moisture.
33. Ensure panels are correctly nailed and secured.
34. Ensure work is progressed systematically, floor-by-floor.
35. Tidy up as you go.
36. Ensure all work is completed per level (do not drop back later).
37. Ensure scaffolding progresses well ahead and safely (do not modify without authority).

6 Upon completion of erection

What to check for generally

38. Frame is anchored to slab.
39. All damage is repaired.
40. Check external cladding and cavity width requirements - cross reference to the design drawings.
41. Appropriate to the work scope that the structure is wind and weathertight, i.e. felted and battened, windows and doors fitted.
42. Structural shell is handed over and signed for.

Wall construction to check

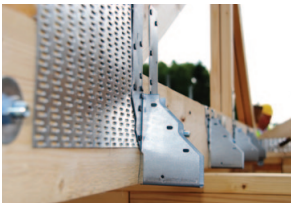
43. DPCs are under all ground floor walls in contact with slab.
44. Cavities are clear.
45. Panels are right way up, in correct position and plumb to tolerance.
46. All joints are aligned and tight to tolerance.
47. All fixings as per schedule/specification.
48. Breather membrane laps are present and repaired, if necessary.
49. Multiple studs present under beam loads.
50. Partitions are plumb and square.
51. Vertical DPCs are fitted to all external openings.
52. Locating plate and headbinders fitted.

Floor construction to check

53. Flooring is protected or cleared of excessive moisture.
54. Joists are in accordance with design drawings, with decking correctly screwed or nailed to them. Do not rely on adhesive alone.

55. Joists have adequate bearing - cross reference to the design drawings. Typically minimum 45mm, but some joist hangers and support conditions may require more.

56. Joists are nogged or blocked as per the design. Note, engineered joists designs don't usually include mid span structing/dwangs (Scottish term). Cross reference to the design drawings.
57. Joist connections are nailed and tight as per design.
58. Joists are level and even.
59. Stair is trimmed correctly with fixings to the design.
60. Notching or drillings are only as per detail - if no detail, then ask.
61. Joist hangers are fully nailed and close fitting. Check joist hanger bearing and size compliance - do not use oversized hangers.
62. No excessive loads are applied to the floor, i.e. plasterboard stacks, etc.



Roof construction to check

63. Trusses are correctly spaced and plumb to tolerance.
64. All trusses have clips fitted or are adequately nailed.
65. Trusses are correctly braced.
66. Roof is watertight before starting internal work.
67. Loose infill is tight and well-connected.
68. Girder trusses are bolted or nailed in accordance with design details.
69. Multiple studs are fitted under point loads.

70. Locating plate and headbinder plate is fitted if required.
71. Eaves plumb cuts are straight and true.
72. Soffit is supported with noggins.
73. Valley boarding is fitted.
74. Ladder sections connected to spandrel panels.
75. Roof bracing connected to spandrel panels.
76. All shoe ironmongery fitted and fully nailed.
77. Water tanks are placed on platforms.
78. Eaves vent ducts fitted to give 50mm airflow or breather membrane with third party accreditation used.

7 Before dry lining

What to check for generally

79. Frame moisture content is less than 20% and watertight before fixing insulation and plasterboard.
80. Cavity barriers are fitted to separating floors and walls.
81. Insulation is to specification.
82. Insulation is fitted correctly (acoustic and thermal) with no gaps.

83. If vapour control plasterboard/boarding is used, there is no requirement for a separate polythene vapour control layer.
84. If fitting polythene based vapour control layer check that:
    - It is the correct density
    - 100mm laps at all joints
    - It is fitted to warm side of insulation
    - Holes for services are neat, tidy and taped to specification
    - Splits, etc. are repaired
    - Check correct sealing around socket boxes
85. Vapour control layer or vapour control plasterboard is fitted to all external walls and laps to floor junctions.

Services to check

86. Notching or drilling carried out as per details.
87. Noggins/dwangs fitted as required.
88. Vapour control layer fitted.
89. Check all service holes in vapour control layer are neat and tidy.
90. Insulation is still in place.
91. No timber contact with flues or chimneys. A suitable clearance air gap should be provided.

92. Services in separating walls are protected so they do not affect the sound/fire performance of these walls (e.g. by battening out).
93. Avoid services in separating walls if possible.
94. No cables except service tails in external cavities.
95. All first fix services installed as drawings.

8 After dry lining

96. Lining is securely fixed in accordance with manufacturer's instructions with nails or screws not overdriven.
97. Installation matched to standards.
98. All joints sealed with filler, tape or skim and jointing compound.

9 After external cladding

99. Roof is tiled to manufacturer's requirements.
100. Roof is correctly ventilated or a breather membrane is installed.
101. Cavity perpend vents are fitted and not blocked.
102. Wall ties (plus fixings) and nails are stainless steel and fixed at correct centres.
103. Wall ties are fitted to the stud centre line, sloping away from the timber frame. They should be straight and not have collected mortar droppings.
104. Check cavity width. Cavity barriers should be correctly installed and completely close the cavity.
105. Settlement gaps are fitted, e.g. at eaves, sills, penetrations and verges and are filled with suitable compressible filler, such as impregnated foam tape.
106. Window and door apertures are sealed, using an impregnated foam tape for example - and where relevant cover strips used.

Best practice advice notes

Substructure

Defect warning

Badly laid and inaccurate substructure is the single biggest problem faced on site by the timber frame erector.

Extreme care must be taken to rectify faults before the construction begins.

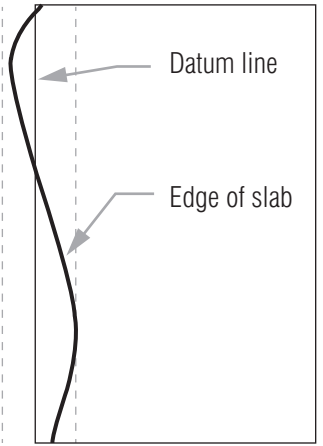
Check dimensions

Measure diagonals. If they are equal, the base is square.
Acceptable deviation:
+/- 5mm up to 10m
+/- 10mm over 10m

Measure lengths of wall. They must be within +/- 10mm of the dimensions shown in the drawings.

Check edges

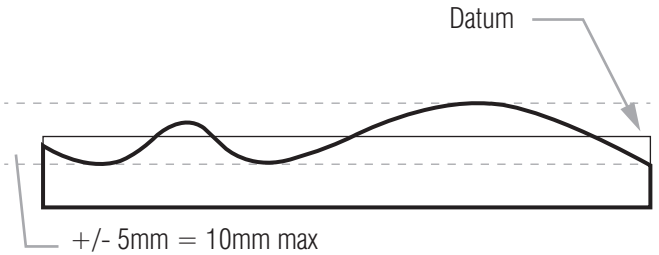
The edge must be within +/- 10mm of the straight measurement line.



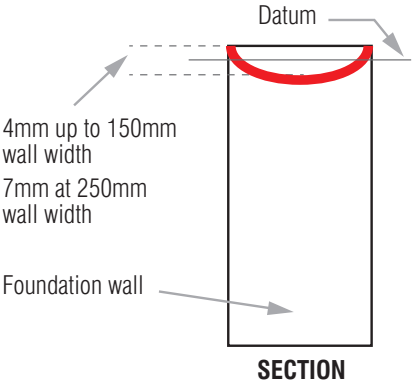
PLAN VIEW

Check substructure level

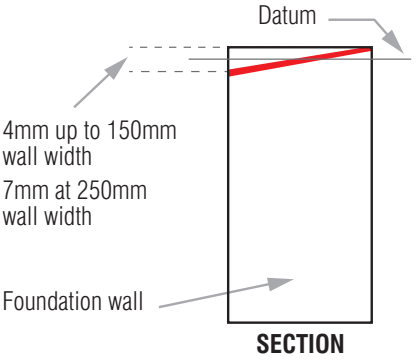
Concrete slabs must be not more than +/- 5mm from datum. Over the whole slab, the level must not be out by more than 10mm.



Check levels of foundation walls



SECTION



SECTION

If you can't achieve the permitted tolerances, stop and consult.

Sole plates

The sole plate is the first level of timber on a project. The tolerance of the setting out of the sole plate and its fixing can influence the complete building performance. It is therefore essential to ***get this right.***

Note: *Sole plates are sometimes called wall plates and the same principles apply at each storey lift level.*

Defect warning

Any faults at foundation stage only become exaggerated as each storey is erected.

If foundations are not within recommended tolerances, they must be rectified before panel erection starts. Errors cannot be rectified at a later stage.

Correctly set out the sole plate. For block up stands use a minimum 7.3N/mm^2 block.

Sole plates are usually installed before delivery of the timber frame.

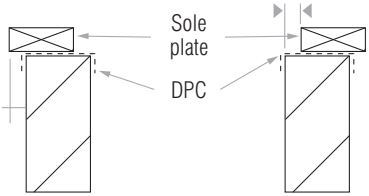
Sole plates cont.../

Sole plate checklist

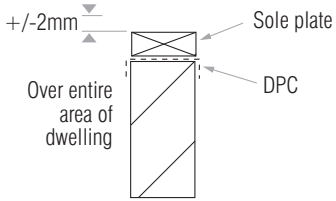
- [ ] Check DPC is provided under the sole plate to the specification
- [ ] Check size and grade of timber against specification
- [ ] Replace damaged plates or heavily fissured timber
- [ ] Sole plates are treated with preservatives. They are sometimes supplied in random lengths for cutting to suit on site or in pre-cut lengths. Cut ends to be brush treated with suitable preservative
- [ ] Check joints in the DPC lap by 100mm

Accuracy of setting out

The structural frame engineer is to be consulted if the sole plate extends or is set back by more than 10mm



HORIZONTAL TOLERANCE CHECKS



VERTICAL TOLERANCE CHECKS

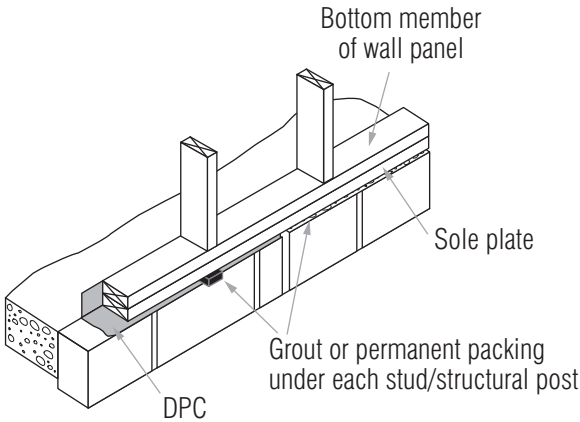
Packing under sole plates

Where packing under a sole plate is required, the packing option to be adopted should be detailed on the construction drawings.

Sole plates cont.../

3 common options are:

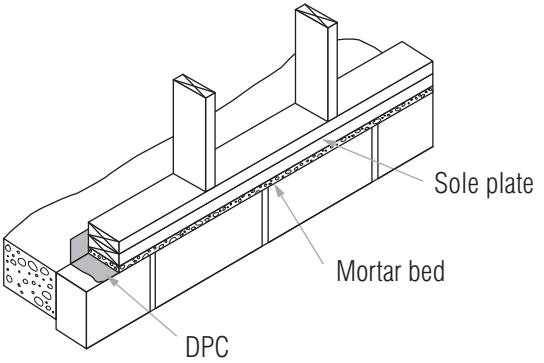
1. Permanent structural packing under sole plate



The sole plate is levelled on temporary spacers (no greater than 0.9m centres). After the ground floor wall panels and floor over or roof structure have been erected, then permanent packing is placed under the sole plates. This packing can be:

- Free flowing non shrinkable grout along the full length and width of the sole plate
- Individual durable robust packers placed under the full area of each load point.

2. Bedding of sole plate

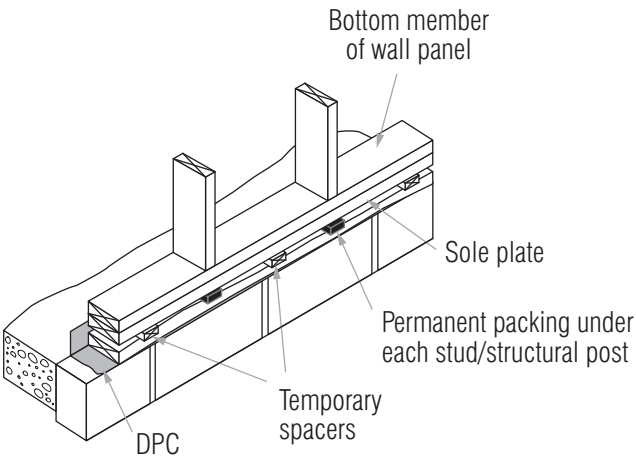


The sole plate is laid on a continuous level bed of mortar, prior to wall panel erection. The mortar should extend the full length and width of the sole plate.

The sole plate is checked for line and level and spacers may be used to do this.

Sole plates cont.../

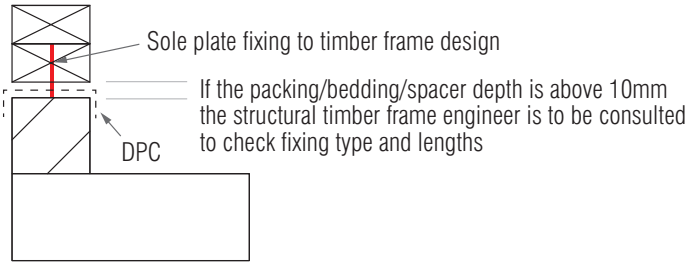
3. Double sole plate 'sandwich'



The lower sole plate is fixed along the contours of the supporting structure. The upper sole plate is fixed on top and levelled with temporary spacers inserted between the sole plates.

Once the first lift construction has been erected, permanent timber or robust packing is inserted under each load point for the full area.

Depth of packing



The packing/bed must:

- Support each stud
- Be durable
- Not deform under load
- Maintain DPC between packing and plate.

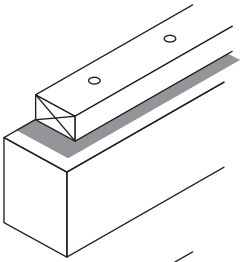
Defect warning

Consult design team about suitable fixing types matched to the packing and bedding depths.

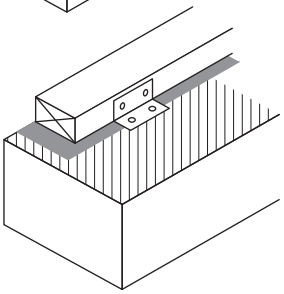
Fixing

The sole plate is to be anchored to the substructure to resist lateral and vertical forces. The design drawings will provide the fixing method.

Sole plates cont.../



Direct fixing of sole plates using shot fired nails or screw and plug to design specification and centres.



Sole plate brackets within the internal envelope should be galvanised mild steel, minimum coating Z275 with matching corrosion protection fixings.

If the fixing is in the cavity the brackets should be stainless steel.

Defect warnings

Ensure fixing length takes account of packing depth. If in doubt, ask.

Avoid splitting the timber sole plates or damaging the substructure as this may cause the edges of masonry or slabs to spall. Should this occur, consult the design team.

Fixing checklist

- [ ] Consult wall plate/sole plate layout
- [ ] Set out the wall plate/sole plate on prepared substructure
- [ ] Check line, level and diagonals before fixing
- [ ] Use the correct fixing method, at specified centres, as per schedule
- [ ] Length of fixings and spacing to be agreed with frame engineer
- [ ] Brackets and fixings to be high load, galvanised coating or stainless steel nailed as specified
- [ ] Use non-compressing shims and durable packing

Frame erection

Always check line, level and diagonals of substructure before erection. If they are not within the tolerances, do not start. Instead, consult site supervisor.

Ensure panels have been stored correctly - check damaged frames or out of square panels as these can cause the poor fitting frames and lead to out of tolerance buildings.

Nail panels together to timber frame specifications. Panel to panel fixings should be at least 300mm centres vertically. Rail to sole plate fixings should be at least 600mm centres. The frame specification should be followed in all cases. ***If there is no specification, ask for one.***

Nail separate head binder (if specified) to top of wall panels and ensure that binders cover panel joints and overlap by 600mm.

Check specification for VCL membranes to be installed during the panel erection, e.g. junction of internal to external walls and floor to external wall junctions.

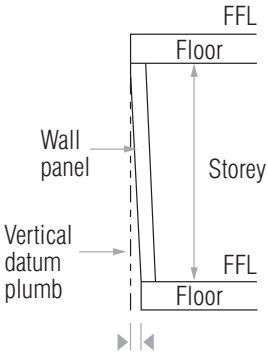
Check specification if sealant or compressible seal is used in the connections of panels and floors.

Ensure that the floor-to-wall junctions are correct and that a specification on nailing/screw fixings is available.

Do not overhang floors into the cavity by more than 10mm.

Fix floor and roof members to the speciation - ensure roofs are tied down. Check that the timber frame is correctly built around chimneys and flues. Seek the specification for clearance - a minimum air gap of 40mm is typically required.

Vertical Tolerances



10mm maximum per storey and maximum cumulative value of +/- 10mm from vertical datum on two storey height, assuming maximum storey height of 3m

Remember, the more accurate the plumb and alignment, the more constant the cavity width.

Line of panels

+/- 3mm on the line of the sole plate.

+/- 5mm deviation measured at wall panel mid height from an agreed datum line.

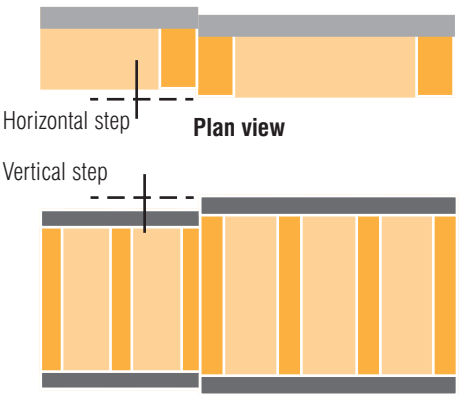
Frame erection cont.../

Alignment

Internal horizontal building face of the panel on plan shall be a maximum step of 5mm with an average of no more than 3mm to any one panel.

Steps to the vertical level shall be reviewed to consider the impact on floor or roof structure above the wall.

Gaps above 2mm in height and above 300mm long shall have a rigid full bearing packer inserted. Maximum steps shall be +/- 5mm before investigations are undertaken and adjustment works considered.



Aim for nil deviation and use the manufacturer's detail books and checklist.

Frame cannot be plumb after the plasterboard is fixed.

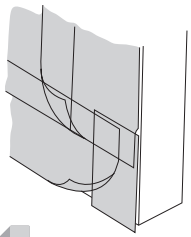
Non-loadbearing walls

Non-loadbearing walls on floor decking must be adequately supported on joists or noggins below. All non-loadbearing walls below the floor deck/joists require lateral restraint at the top rail/head binder at maximum 600mm centres. Check the design details for secure fixing.

Breather membrane

Breather membrane is often pre-fixed in the factory. If applied on site, fix and lap to manufacturer's instructions: laps usually 100mm horizontal; 150mm vertical; The breather membrane is to provide protection to the timber frame from water penetrating the cavity. A minimum 25mm over sail is recommended but it is good practice to have 100mm to ensure that the membrane sheds any water into the cavity and accommodates tolerances and sole plate packing.

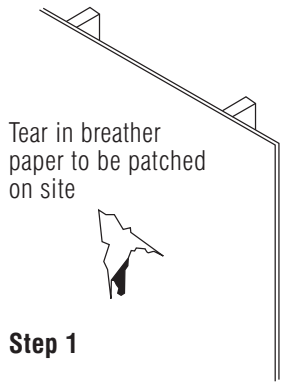
Identification marks on the membrane pinpoints the location of timber studs. These are important for the cladding trades.



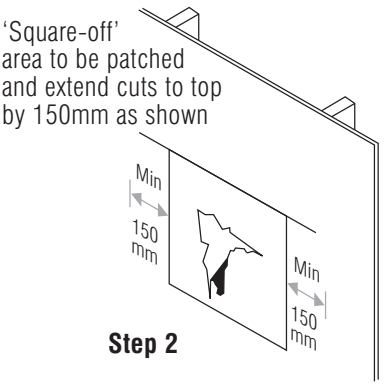
! Repair damaged areas with surplus material lapped correctly below and over the existing material and securely stapled.

Make sure any membrane tears are properly repaired. None of the timber frame structure should be visible once the membrane is fixed and any tears made good.

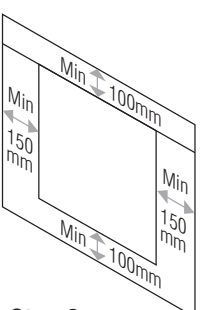
Patching tears in breather membrane



Step 1



Step 2



Step 3

Slip breather paper patch up below site. Cut breather paper to provide 100mm min over-lap, allow 150mm min over-lap to both sides. Allow 100mm min over-lap to bottom edge

Staple in position using stainless steel staples at 150mm centres

Insulation

Insulation for walls and roofs will be specific for each project. Check if it is required in the floors. Consult the design specification and details.

Insulation can be wood wool, mineral wool, natural wool, cellular fibres or ridged foam. All insulation requires CE marking for the end application.

Fixing and insulation to be in accordance with manufacturer's guidance. If in any doubt, stop and consult.

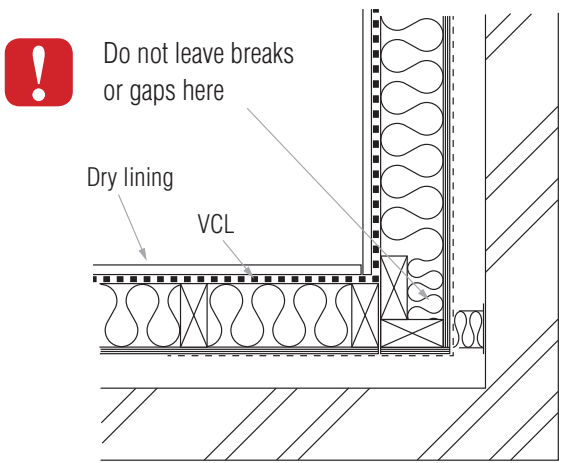
Insulation checklist

- [ ] Do not use wet or damp insulation
- [ ] Ensure that the timber moisture content is less than 20%. This can only be achieved by the use of a correctly calibrated moisture meter
- [ ] Ensure the building is watertight or that protection to the insulation is provided
- [ ] Ensure that the insulation fills the whole area between studs and plates - no gaps
- [ ] Do not overfill insulation between supports as this can give nail popping

Insulation cont.../

Wall insulation

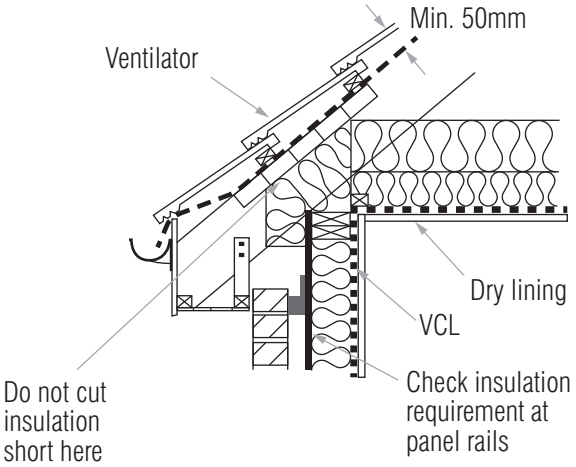
This is a standard wall detail. Other types and make ups are available.



Defect warning

Filling behind return studs is essential to avoid uninsulated zones.

For trusses, it is common practice to have insulation at the ceiling tie level. This is called a cold roof space. Other roof types are available and the design specification should be consulted for guidance.



Insulation cont.../

Insulation checklist

- [ ] Ensure roof insulation is placed below ceiling wind bracing
- [ ] Ensure insulation is dressed around and over but not beneath water tanks
- [ ] Cross-lap insulation in layers for roof insulation to required depth
- [ ] For a ventilated roof, rafter ventilator must be fixed to stop insulation from blocking airflow
- [ ] Insulation must continue over and below the wall head to prevent cold bridging

Fully filled party walls

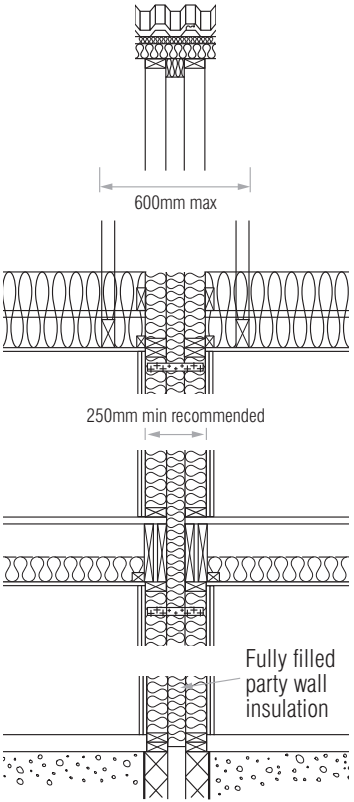
Fully filled insulation to party walls is a common requirement for current building regulation compliant buildings. Check if project requires fully filled insulation.

Insulation between timber frame mineral wool to design specification.

For open timber frame panels, insulation between timber frame panels installed once the building is dry and watertight.

For sheathed party walls check method statement to install insulation between timber frame panels so that insulation is installed and kept dry.

Refer to STA Advice Note no. 10 - Party Walls for further information.



Defect warning

For the party wall cavity check there is a minimum 50mm clear gap and the distance between the internal faces or plasterboard is a minimum of 240mm.

Vapour control layers & airtightness

Durability of the structure is ensured by keeping the timber dry. In most timber frame walls, this is achieved through a combination of:

- A vented cavity between the frame and the external cladding.
- A protective breather membrane on the cold side of the insulation - applied to the outer face of the sheathing.

Airtightness

It should be noted that the VCL layer can be an important component in providing airtightness. The design specification should be consulted for airtight details.

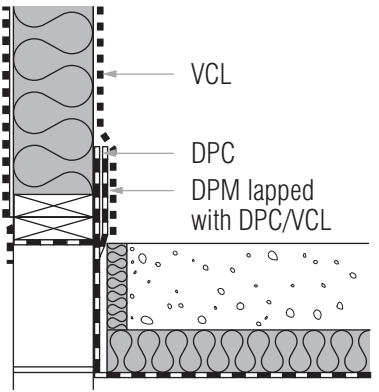
VCL checklist & airtightness

- [ ] A VCL is on the warm side of the insulation, applied beneath or as a part of the plasterboard lining
- [ ] VCL may be a separate polythene sheet or a vapour check plasterboard or appropriate internal wood based board
- [ ] Do not install VCL if moisture content of framing is above 20%
- [ ] For 500 gauge/125 micron polythene sheet VCL lap 100mm with joints on studs or rails. Fix with 9mm by 9mm by 18 gauge stainless steel staples at max 250mm centres
- [ ] Airtightness specification may require specialist VCL tape. Consult with the design specification
- [ ] Sheet VCLs to overlap into separating walls and across to floor airtight barrier. Return VCL into reveals, head and sill of openings. Consult with design specialist
- [ ] Repair damaged VCL to ensure airtight and vapour control is maintained. Seek advice on repairs

Thermal efficiency and airtightness

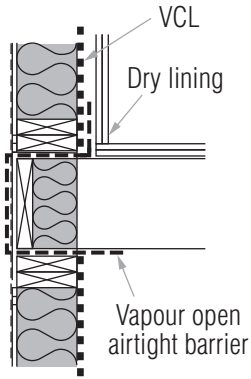
New timber frame houses have high levels of insulation, double glazed windows and highly efficient heating systems. To ensure that the design matches the as-built performance, the site trades are to be aware of the accuracy of the construction and to apply the design details.

If the detail is not considered practicable, then consult with the design team - do not change the design intent.



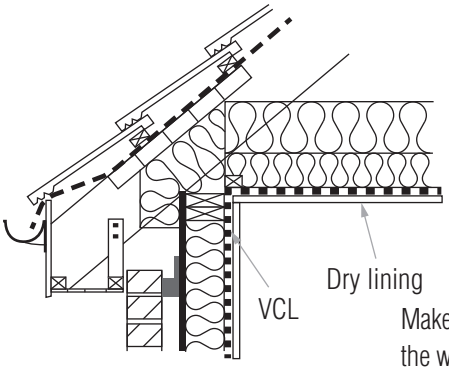
Continuity of the airtightness barrier is important, especially around windows, doors and other penetrations through the external envelope.

At floor level, make sure the VCL laps with the DPC.



Make sure that the VCL around the floor frame will be able to lap onto the VCL for the walls.

The airtight layer around the floor should be of a suitable material to ensure that no water vapour collects at this point. E.g. do not use polythene.



Make sure that the VCL around the wall to the roof lap.

Dry lining

Dry lining should not occur until the frame is watertight. Test services in wall before plaster boarding.

Dry lining is used for final wall finish providing fire protection and acoustic performance. Fixing of dry lining should not occur on timber with greater than 20% moisture content.

Correct dry lining fixing is essential to achieve the design fire performance. If the fixings are inadequate the boards will fail early.

Where the fire resistance is achieved with two layers of dry lining, both layers should be fully nailed or screwed to specification.

Fixing specifications depend upon type of fixing used - dry lining nails or drywall screws. Always refer to manufacturer's instructions.

In general, nail fixings should be at maximum 150mm centres and drywall screw fixings at 230mm for ceilings or 300mm for walls.

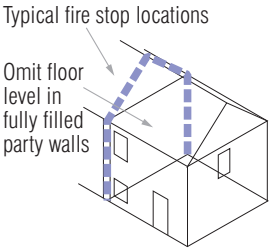
Drywall screws reduce the risk of 'nail popping' in walls and ceilings, resulting from moisture movement in the timber. Ensure the board is fixed tight to the timber support.

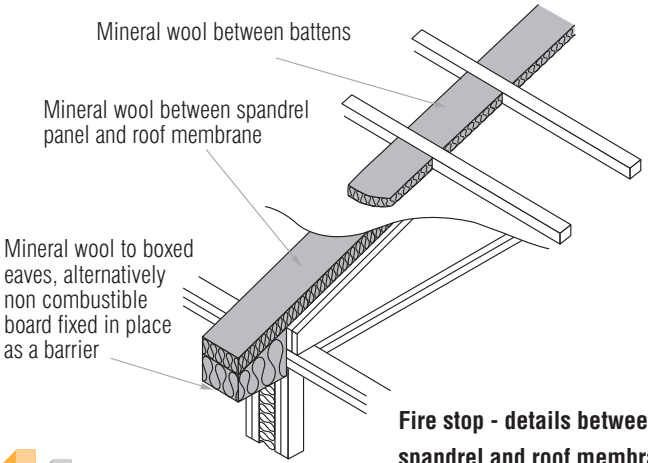
Fire stops

Fire stops are used to ensure that fire resistance requirements are met for the compartment of the building. Typically they are non-combustible board or mineral wool.

Fire stops are installed at:

- Wall junctions between dwellings such as roof to wall.
- Where services and penetrations occur at party walls and floors.
- Other fire compartment separations.





Fire stop - details between spandrel and roof membrane

Cavity barriers

Cavity barriers are used within cavities to prevent the spread of smoke and fire. They can be rigid - preservative treated timber battens, non-combustible board - or flexible and based on mineral wool or approved intumescent-based strips.

Cavity barriers must be fixed accurately in all positions shown on drawings and to the appropriate material specification.

All floor and party wall cavity barriers to be positioned against solid timber members e.g. studs, rim beam.

If you are in any doubt about the positions, please ask.

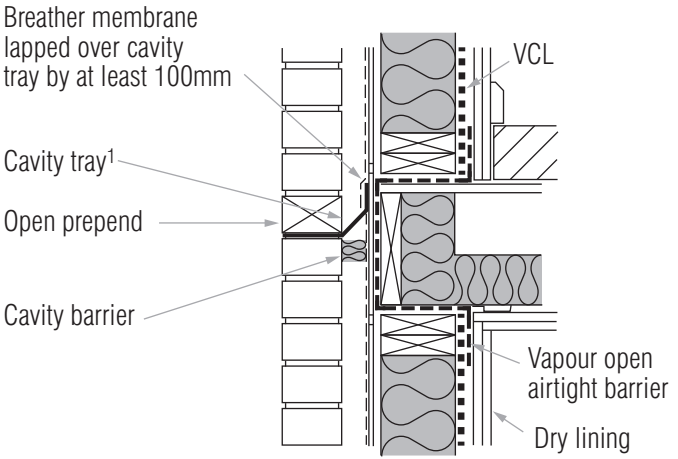
For dwellings, cavity barriers are required:

1. Around all openings in external walls.
2. The top of the external wall cavity.
3. The junction between compartment walls or floors and external walls.
4. At the junction between a compartment wall that separates buildings.
5. For non-domestic properties in England and Wales vertical cavity barriers are required at every 10m.

In ***Scotland*** and ***Northern Ireland*** cavity barriers are also required:

1. At the junction between any floor and an external wall.
2. At vertical or horizontal centres not exceeding:
    a) 10m in Scotland.
    b) 8m in Northern Ireland.

See STA guide on installing cavity barriers.



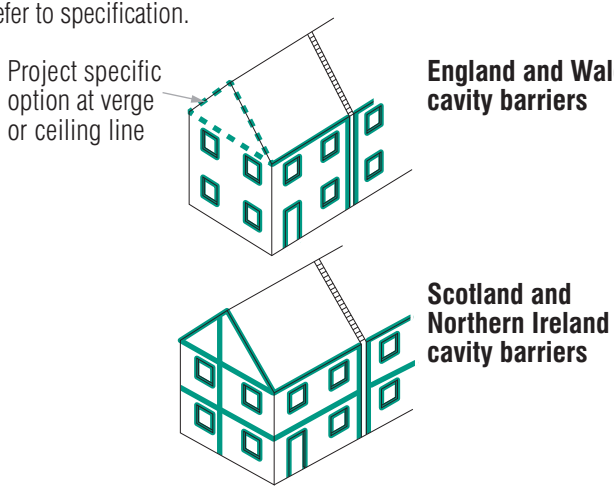
External wall details where cavity barriers are required - see page 50.

[1] Check if cavity tray is already part of the cavity barrier assembly.

Cavity barriers cont.../

Cavity barrier position

The diagrams indicate cavity barrier positions for a typical semi-detached or end terrace dwelling. Full details of positions of all cavity barriers and fire stops will be found on the design drawings. For fixing requirements, refer to specification.



Note: *Cavity barriers at maximum 10m centres, which may be at the corners or in the length. For steps and staggers refer to drawings. For fire stops see page 47.*

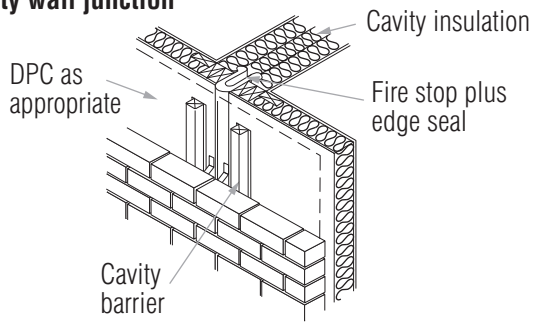
Note: *For flattened developments, there should be a cavity barrier at each floor level.*

Cavity barriers checklist

- [ ] Cavity barriers installed to provide a cavity tray, or with intumescent cavity barrier strips, allow the cavity moisture to drain. A cavity tray can be integral with the barrier, as in polythene encased cavity barriers
- [ ] Barriers should completely close the cavity and be positioned against solid timber members
- [ ] Flexible cavity barriers must be a tight fit and the correct thickness of material should be used
- [ ] Fix flexible cavity barriers with stainless steel staples at specified spacings
- [ ] Rigid cavity barriers must be the exact width. If too small, make up with suitable flexible material
- [ ] Protect timber cavity barriers with a DPC between the outside cladding
- [ ] At cavity barrier junctions, there should be no gaps between the materials
- [ ] Horizontal cavity barriers to be overlapped by the breather membrane above
- [ ] The mineral wool in flexible cavity barriers must be tightly butted or lapped by 100mm at each junction

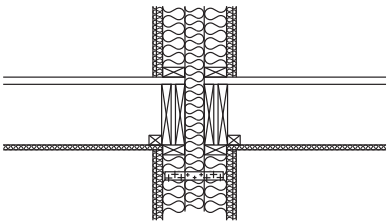
Cavity barriers and fire stops at party walls

Vertical party wall junction



Note: *Vertical party wall junction - other options available. See specifications.*

Horizontal party wall junction



Fire stop to be installed at floor level if wall is not detailed to have a full filled party wall insulation[1].

[1] Fire stop material at floor level junction may form part of the fully filled party wall solution.

Masonry cladding

Masonry cladding should be constructed using a coursing rod to ensure the right levels are achieved at the openings and eaves levels. Pre-plan the coursing to allow for a clearance between window sills, soffits, balcony structures, etc. for differential movement.

Cavity width maintained between the frame assembly and masonry cladding which is typically a minimum 50mm and maximum 60mm, or to specific design detail.

Before starting to build external masonry walls, plumb down from the eaves and gables of timber frame to check that the cavity widths will fall between the minimum and maximum tolerances. If they do not, then consult and agree actions.

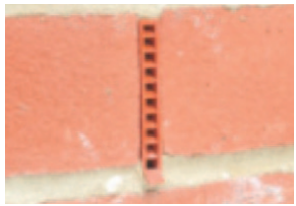
Keep cavities clean and vented. On no account should breather paper, cavity trays or cavity barriers be damaged when cleaning cavities.

Masonry cladding cont.../

Vented cavity checklist

- [ ] Ensure a clear cavity, e.g. clear of mortar droppings
- [ ] At base of wall, one brick course below DPC and below sole plate, leave open perpends for vented cavity at maximum 1500mm centres (in Scotland, 1200mm centres, plus have perpend vents at the eaves level)
- [ ] Above horizontal cavity trays (e.g. lintels and cavity barriers) open perpends to be at 900mm centres and at least two per lintel

Note: *Vented underfloor construction requires vents to be built into the masonry - check details and levels on the drawings.*



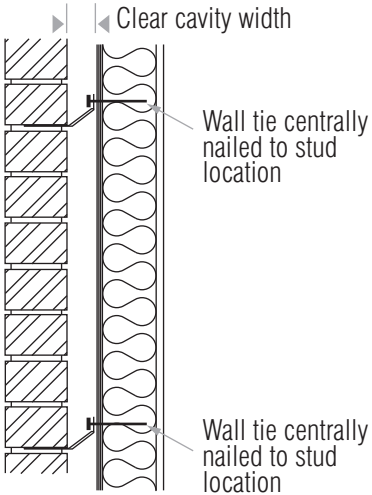
Vents in brickwork above ground level

To maintain the performance of the building make sure of the following:

- Breather membrane is repaired of any tears and has laps over joints.
- There are no mortar droppings bridging cavities.

Typical clear cavity width minimum 50mm, maximum 58mm. Check specification.

Cavity to be vented



Typical section

Fixing wall ties

Ensure walls ties are suitable for the cavity width. Wall ties centres and wall tie sizes to the engineer's specification. Make sure they are timber frame wall ties that can accommodate movement.

Do not straighten out pre-bent ties - bend points upwards. Place in line with stud. Bedded end must be flat against brick.

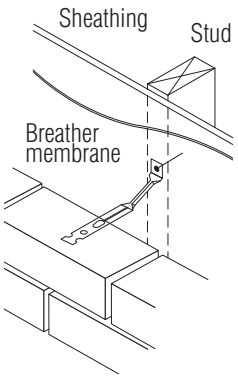
Drive stainless steel nail home firmly to stud locations - not into sheathing only, unless specific sheathing design allows for this.

Most timber frame ties will be stainless steel and require stainless steel nails to fix them.

Typical tie spacing

The figures below are for typical tie spacing at maximum centres. However the design specification should be checked.

- Horizontally at 600mm
- Vertically at 450mm/375mm depending on stud centres and design
- Openings at 225mm
- Eaves and verges at 300mm
- Expansion joints at 225mm



Installing services

Floor joists

- Only notch or drill solid timber floor joists within specified limits.
- Do not notch I-joists or open web joists.
- Notch solid timber joists to designer's limits.
- Use knockouts for I-joists.
- Refer to manufacturer's recommendations for holes and services in engineered wood joists.

VCL patch behind services in external walls

Walls

- Ensure that studs and rails are drilled and notched only when stated on the drawings.
- Ensure service points/sockets are fully backed to achieve fire resistance requirements - consult the details.
- For external service penetrations consult the specification for fire stopping and cavity barrier requirements.

Other aspects

- Where possible avoid plumbing in external walls and where practical provide access to pipe bends, stop valves, etc.
- Seal service penetrations of the VCL with PVC tape.
- Use de-rated cabling within the stud framework, in accordance with IEE guidelines.
- Protect any services from nail penetrations with conduits.

Differential movement

Why it happens

- Timber is typically installed at maximum 20% moisture content. This reduces to around 10-12% for internal walls in the heated building.
- As timber dries out, its cross-section shrinks and the structure settles.
- Cladding materials also change: clay bricks expand; blocks and calcium silicate bricks shrink - but not in tandem with the timber!
- It is good practice to pre-load the timber frame structure with roof tiles and internal sheeting materials prior to the installation of the masonry cladding, within structural limits.

The implications

- Any material or component attached to the timber frame structure which overhangs or projects through masonry cladding must have an adequate gap beneath it to allow differential movement to take place without damage to the structure or the cladding.
- Gaps should be filled with a compressible filler, such as an impregnated foam tape.

Where allowances needs to be made

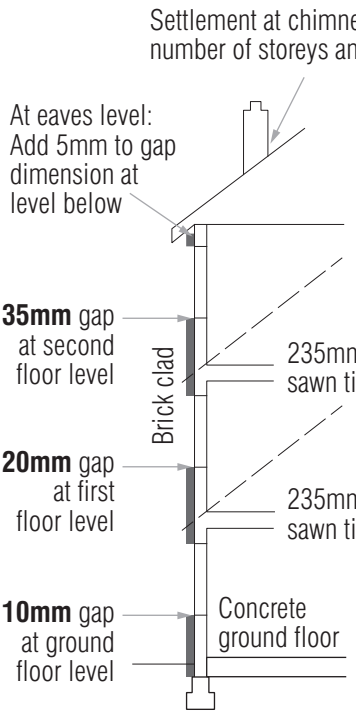
- Window sills.
- Roof verges and eaves.
- Where attached to cladding, e.g. timber or boarding overhangs brickwork.
- Flues and chimneys.
- Overflow pipes.
- Traditionally built stair cores.

Reducing vertical shrinkage

- Use I-joists, open web joists or super dried timbers.
- Ensure detailing is correct to allow for settlement.
- Ensure adequate gaps are left to take up the downward movement of the frame.
- Keep timbers as dry as possible.

Differential movement cont.../

Engineered joists, such as open web, super dry timbers and I-joists, will reduce the movement values given below.

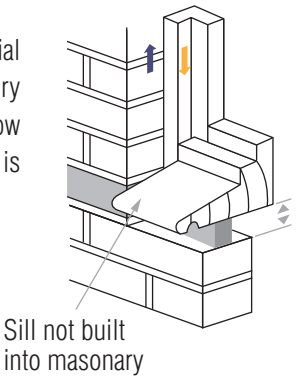


Note: *The values shown are for generic gaps. They include allowances for brick expansion and filler compression.*

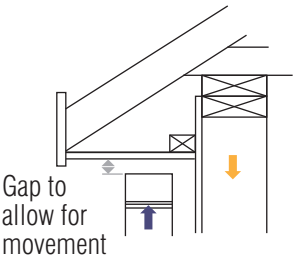
The STA member project design specification values can be used in place of these values.

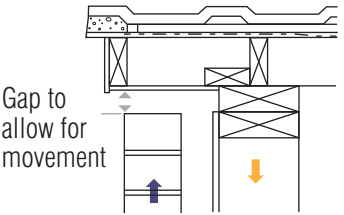
Sills

Allow for the differential movement of masonry cladding and the window frame and sill, which is fixed to the timber frame.



Verges and eaves





Summary

For site supervisory staff, the 'golden rule' is attention to detail. Measure, check and check again. Remember that mistakes are more difficult to rectify later. If in doubt, ask.

Take pride in constructing homes and buildings, ensuring generations can enjoy places that are:

- High quality
- Environmentally friendly
- A joy to live in
- Economic to run.

STOP AND ASK.
DO NOT TAKE RISKS.
THINK SAFETY.



Reference documents and further reading

For the project

- The timber frame manufacturer's details, drawings and specification.
- The architect's details for all construction details.

Good practice

NHBC Standards - Chapter 6.2

LABC Warranty Technical Manual

Timber Frame Construction - TRADA

STA - Advice notes on timber frame and tolerances

STA - Cavity barrier best practice

STA - Erector training books

Background

There is lots of useful information on airtightness and thermal efficiency within the **'Free resources for housing professionals'** pages of the Energy Saving Trust website:

www.energysavingtrust.org.uk/organisations/technology

2nd Edition, 2014

This guide has been updated by Martin Milner for the STA. We hope you find it useful. The management of the STA operates a continuous improvement policy and would therefore be very grateful to receive any review comments for incorporation in the next edition of this pocket book. Thank you.

STA/TFCPG/0816

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