Chapter 6.9

Curtain walling and cladding

CONTENTS

SCOPE

This Chapter gives guidance on meeting the Technical Requirements and recommendations for curtain walling and cladding.

INTRODUCTION

This Chapter gives guidance on the forms of curtain walling and cladding acceptable to NHBC. Curtain walling and cladding systems that do not conform to the following descriptions will not normally be acceptable to NHBC.

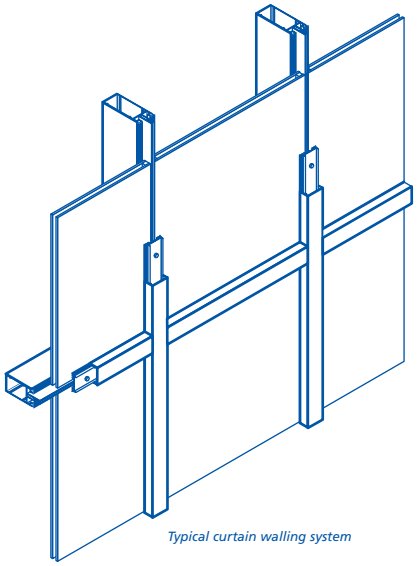
Guidance on the use of other types of cladding including brickwork, rendered masonry, vertical tile & slate cladding and timber cladding is given in Chapter 6.1 'External masonry walls' and Chapter 6.2 'External timber framed walls'.

CURTAIN WALLING

This Chapter deals with the following curtain walling systems:

- prefabricated or site assembled support framework with infill panels or
- prefabricated factory assembled wall sections and glazing systems that include:
  - structural silicone glazing
  - mechanically fixed structural glazing
  - slope glazing (excluding patent glazing)
  - coupled door and window frame assemblies one storey or more in height (including spandrel panels).

Conservatories are not covered by this Chapter.

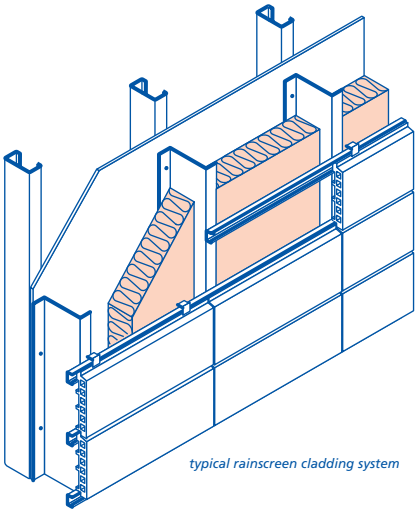


Typical curtain walling system

RAINSCREEN CLADDING

This Chapter deals with rainscreen cladding systems that comprise:

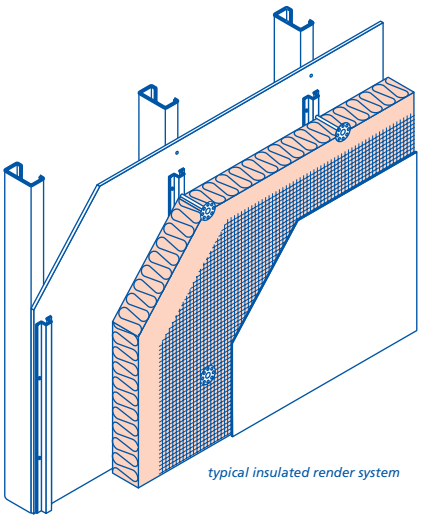
- an outer skin of panels, which have open, baffled, or labyrinth (rebated) joints. Joints should not be sealed
- a pressure equalised air gap at least 50mm wide between the insulation and the panels
- an insulated airtight backing wall.



typical rainscreen cladding system

INSULATED RENDER

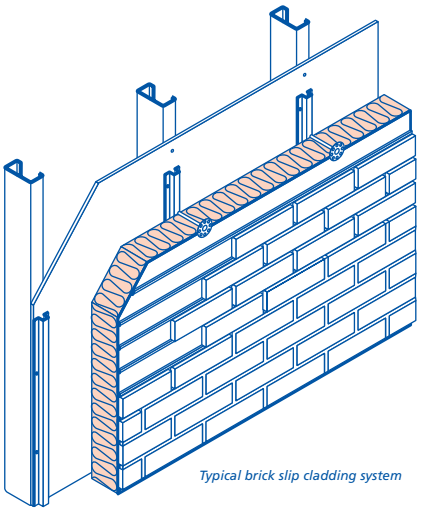
This Chapter deals with insulated render systems that are fixed to all types of backing wall.



typical insulated render system

BRICK SLIP CLADDING

This Chapter deals with brick slip cladding systems that are fixed to all types of backing wall.



Typical brick slip cladding system

STONE & PRECAST CONCRETE CLADDING

Stone & precast concrete cladding should be designed as curtain walling or rainscreen cladding and comply with the relevant section of this Chapter.

DEFINITIONS (FOR THIS CHAPTER)

Air barrier
A continuous layer that limits air leakage through the backing wall.

Air gap
The space between the back of the cladding panels and the external face of the insulation in a rainscreen system.

Air cushion
Balancing external and internal air pressure to create a cushion within the air gap.

Backing wall
A framed or masonry wall to which the cladding system is fixed.

Brick slip cladding system
A brick slip system fixed to masonry or framed backing walls, normally supported by a proprietary carrier.

Cavity
The space between the cladding system and the backing wall. The cavity should be adequately drained, and where required by the design, be ventilated.

Cladding panels
The outer layer of a rainscreen cladding system that shields other parts of the system from direct rain.

Compartmentation
The provision of baffles and cavity closers to form compartments within the air gap of a rainscreen cladding system, to achieve pressure equalisation. Cavity barriers that are provided to control the spread of smoke and fire may also be used to form the compartments.

Curtain walling
A form of vertical building enclosure that supports no load other than its own weight and the environmental forces that act upon it, e.g. wind, water and solar. Curtain walling also includes slope glazing and coupled door and window frame assemblies one storey or more in height (including spandrel panels).

Curtain walling system
The vertical building enclosure system, including all frames, brackets, fixings, flashings, gutters, copings, glass, panels, gaskets and sealant that form the assembly.

CWCT
The Centre for Window and Cladding Technology at Bath University.

CWCT Standards
The current CWCT Standards for Systemised Building Envelopes.

Design life
The period for which materials, products and systems should be designed to be durable, assuming routine inspection and maintenance.

Dpc/Dpm
Horizontal or vertical damp-proof course/membrane to prevent the passage of moisture. In curtain walling terminology, a dpc is sometimes referred to as a dpm.

Façade
The face of a building which forms the outer appearance.

Fire and smoke stopping
Preventing the transmission of fire and smoke through voids or cavities in the curtain walling or cladding assembly.

Fixing
A component which is used to attach the curtain walling or cladding system to the structure.

Gasket
A compressible material that forms an air and water seal at joints between components.

In-service performance
The manner or quality of functioning for a material, product or system in use.

Insulated render system
A proprietary render system applied to the external face of an insulation material that is in turn fixed to the backing wall.

Interstitial condensation
Condensation caused by vapour condensing on colder surfaces within the wall construction.

Negative pressure
Where the air pressure on the internal face of the system is greater than that on the external face.

Positive pressure
Where the air pressure on the external face of the system is greater than that on the internal face.

Primary components
Framing, fixings, insulation, vapour control layers, weathering components, cladding panels and other secondary components that are not easily replaceable.

Pressure equalisation
The creation of an air cushion within the cavity to significantly reduce the amount of water passing through the joints of a rainscreen. Compartmentation and adequately large joints are required to achieve pressure equalisation.

Rainscreen
The part of the assembly (normally the outermost) that prevents the majority of rain from penetrating the wall.

Some water may pass through the joints of a rainscreen, but appropriate detailing of open joints or the provision of baffled or labyrinth joints should limit the amount.

Rainscreen cladding system
A multi-layer façade fixed to the outside face of a building that provides a barrier to wind and rain. The system normally includes a vapour control layer, air barrier, supporting framework and fixings, insulation, breather membrane, cavity/air gap and cladding panels.

Traditional tile hanging and timber cladding are not rainscreen cladding systems as defined in this Chapter.

Replaceable components
Secondary components are those that can be easily replaced without compromising the design and durability of the building (see Technical Requirement R3), or the need for progressive dismantling of the envelope system. Where this cannot be achieved components should be designed as primary components. A method statement should be provided to demonstrate how components will be replaced with specific reference to accessibility as detailed in clause 6.9 - D4.

Secondary components
Cladding panels, internal linings, external finishes, window and door furniture, glazing, gaskets, seals and sealant that are easily replaceable.

Separating floor
A floor that separates flats or rooms for residential purposes.

Separating wall
A wall that separates adjoining dwelling houses, flats or rooms for residential purposes.

Slope glazing
A drained and ventilated sloped roofing system.

Spandrel panel
A panel used in place of glazing units to hide the edges of floor slabs, ceiling details, insulation, and other building elements.

Test pressures
The pressures at which testing is carried out in accordance with the design.

Vapour control layer
A layer that restricts the passage of water vapour into the construction to reduce the risk of interstitial condensation.

DESIGN STANDARDS

6.9 - D1 Design shall meet the Technical Requirements

Design that follows the guidance below will be acceptable for curtain walling and cladding.

STATUTORY REQUIREMENTS

6.9 - D2 Design shall comply with all relevant statutory requirements

Design should be in accordance with relevant Building Regulations and other statutory requirements.

DESIGN LIFE

6.9 - D3 Design shall provide satisfactory in-service performance subject to routine inspection and maintenance

Items to be taken into account include:

(a) primary components
Primary components should be designed and specified to provide satisfactory in-service performance for the design life of the building. See Technical Requirement R3.

(b) secondary components
Secondary components should be designed and specified to provide satisfactory in-service performance for at least 25 years.

ACCESSIBILITY FOR MAINTENANCE

6.9 - D4 Appropriate arrangements shall be provided for the purposes of cleaning, inspection, maintenance and repair

Provision should be made for safe future access to the façade. Access should normally be provided from a safe working platform such as a cradle or mobile elevating platform.

Appropriate arrangements should be made for the replacement of failed insulating glass units without incurring excessive costs for gaining access.

Curtain walling

CERTIFICATION

6.9 - D5 Curtain walling systems shall be designed and certificated in accordance with appropriate Standards

Curtain walling systems should have certification confirming satisfactory assessment in accordance with the current CWCT Standard for Systemised Building Envelopes by an appropriate independent technical approvals authority accepted by NHBC. The CWCT Standard provides

detailed guidance on performance and testing.

Other certification bodies or test documentation may be acceptable if they are considered by NHBC to be a suitable alternative.

The certification, together with all test documentation should be made available to NHBC before work on the curtain walling or cladding begins on site.

The use of the system should be within the scope of the certification and test documentation.

IN-SERVICE PERFORMANCE

6.9 - D6 Curtain walling systems shall be designed and specified to ensure adequate in-service performance

Items to be taken into account include:

(a) loads, movement, brackets and fixings
Dead and live loads should be transferred safely to the building's structure without undue permanent deformation or deflection of any component.

Imposed loads should be calculated in accordance with BS EN 1991-1-1 and BS EN 1991-1-4 and take account of both internal and external pressures, together with the location, shape and size of the building.

Thermal-induced loads due to differential stresses caused by temperature gradients within materials or components should be accommodated without any reduction in performance. The stresses in components and materials should not exceed the permissible values recommended by the product manufacturer.

Movement within the curtain walling should be accommodated without any reduction in performance. Causes of movement include:
- dead and live loads
- changes in temperature
- changes in the moisture content of components
- freezing of retained moisture
- creep.

Fixings and supports should be designed to accommodate specified loads and take account of the product manufacturer's recommendations.

Pull-out or destructive testing of anchors and fixings should be carried out in accordance with the design, BS 5080 and the Construction Fixings Association Guidance Note 'Procedure for Site Testing Construction Fixings'. Tests should be carried out at a suitable rate agreed with NHBC. The test results should be made available to NHBC.

Packing of brackets to achieve surface tolerance should be permitted only in accordance with the product manufacturer's recommendations.

(b) insulating glass units
Insulating glass units should be in accordance with Chapter 6.7 'Doors, windows and glazing'.

(c) weather resistance
The curtain walling system, including doors, windows and other openings, should resist the passage of water to the inside of the building, allow free drainage and not trap water. It should have:
- external and internal air and water seals, and
- drained and ventilated glazing rebates.

Particular attention should be given to the interfaces between the curtain walling system and other elements or cladding systems.

External and internal air and water seals and a drained ventilated cavity should be provided at all interfaces. Guidance on interfaces is provided in Appendix 6.9-A.

(d) air infiltration
Appropriate gaskets and sealants should be used to resist the flow of air from the outside to the interior surface of the curtain walling system. Particular attention should be given to the interfaces between the curtain walling system and the walls, roof, doors, windows and cladding system.

Pre-formed factory-moulded 'picture frame' type vulcanised epdm or silicone internal gaskets should be used for all curtain walling systems.

Sealant should be specified in accordance with BS 6213 and the manufacturer's recommendations.

(e) condensation
The curtain walling system should be designed to minimise the risk of surface and interstitial condensation by the use of thermal breaks and a continuous vapour control layer.

Thermal bridging should be controlled to ensure no part of the curtain wall is more at risk of surface condensation forming than the glazing.

(f) acoustic performance
Noise from the curtain walling system caused by loads, movements and changes in the environmental conditions should be accommodated without being intrusive.

The curtain walling system should be designed to resist the passage of airborne and impact sound within the building. Particular attention should be given to flanking transmission at:
- the edges of separating floors
- the outer ends of separating walls
- the outer ends of partition walls
- the junctions with roof constructions and parapets.

(g) testing
Air and water testing of the 'prototype' curtain walling system should be carried out in accordance with and pass the CWCT Standard (test sequence A or B) tested at a test pressure of 600 Pascals. Panels tested should be of similar size and configuration to those to be used on the building.

Where the maximum calculated design wind pressure is above 2400 Pascals the test pressure should be increased to 0.25 x the design wind pressure.

The 'prototype' should remain watertight during and after the test.

At a test pressure of 600 Pascals an air infiltration rate no higher than 1.5m^3/hr/m^2 for fixed glazed panels is permissible provided there is no evidence of concentrated leakage.

Wind resistance, serviceability and safety testing should be carried out in accordance with the CWCT Standard.

(h) electrical continuity and earth bonding
The curtain walling system should comply with BS 7671 'Requirements for Electrical Installations, formerly IEE Wiring Regulations' and BS EN 62305 'Protection against lightning. General principles'.

(i) durability
The curtain walling system should be constructed with corrosion resistant or adequately protected materials. The risk of bimetallic corrosion should be avoided by the isolation of dissimilar metals.

Aluminium components should be separated from direct contact with cementitious surfaces.

The curtain walling system should not include materials liable to infestation attack by micro-organisms, fungi, insects or vermin.

Where timber is used it should be treated in accordance with the guidance in Chapter 2.3 'Timber preservation (natural solid timber)'. Timber should only be used where it can be easily inspected and replaced without disturbing the curtain walling system.

(j) tolerances
The design should allow for the line, level, plumb and plane of the completed curtain wall to be within reasonable tolerances. See Chapter 1.2 'A consistent approach to finishes'.

Rainscreen cladding

CERTIFICATION

6.9 - D7 Rainscreen cladding systems shall be designed and certificated in accordance with appropriate Standards

Rainscreen cladding systems, including panels, should have current certification confirming satisfactory assessment by an appropriate independent technical approvals authority accepted by NHBC, including: British Board of Agrément (BBA) or Building Research Establishment (BRE) Certification.

Systems that are assessed and certificated by an appropriate independent technical approvals organisation in accordance with the CWCT Standard for Systemised Building Envelopes will normally be acceptable to NHBC.

Other certification bodies or test documentation, may be acceptable if they are considered by NHBC to be a suitable alternative.

The certification, together with all test documentation should be made available to NHBC before work on the rainscreen begins on site.

The use of the system should be within the scope of the certification and test documentation.

IN-SERVICE PERFORMANCE

6.9 - D8 Rainscreen cladding systems shall be designed and specified to ensure adequate in-service performance

Items to be taken into account include:

(a) loads, movement and fixings

Dead and live loads should be transferred safely to the building's structure without undue permanent deformation or deflection of any component.

Imposed loads should be calculated in accordance with BS EN 1991-1-1 and BS EN 1991-1-4 and take account of the location, shape and size of the building.

Thermal-induced loads due to differential stresses caused by temperature gradients within materials or components should be accommodated without any reduction in performance. The stresses in components and materials should not exceed the permissible values recommended by the product manufacturer.

Movement within the rainscreen cladding should be accommodated without any reduction in performance. Causes of movement include:

- dead and live loads
- changes in temperature
- changes in the moisture content of components
- freezing of retained moisture
- creep.

Fixing rails, frames, fixings and fasteners should be designed to accommodate specified loads and take account of the product manufacturer's recommendations.

Pull-out or destructive testing of anchors and fixings should be carried out in accordance with the design, BS 5080 and the Construction Fixings Association Guidance Note 'Procedure for Site Testing Construction Fixings'. Tests should be carried out at a suitable rate agreed with NHBC. The test results should be made available to NHBC.

Bonded fixings should be specified only where there is no suitable alternative and should be designed in accordance with the product manufacturer's recommendations.

Packing of the supporting rails, frame or the panel fixings to achieve surface tolerance should be permitted only in accordance with the product manufacturer's recommendations.

The air gap between the face of the insulation and the back of the rainscreen panels should be of sufficient width to allow any water passing the joints to run down the back of the rainscreen panels and be discharged externally without wetting the insulation or the backing wall.

The design should avoid the need for disproportionate work when repairing or replacing individual components.

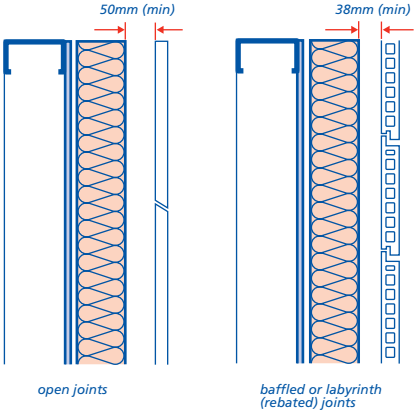
(b) weather resistance

The design should ensure that water is prevented from reaching any parts of the wall that could be adversely affected by the presence of moisture.

Sealants should be specified in accordance with BS 6213 and the manufacturer's recommendations.

The minimum width for air gaps should be:

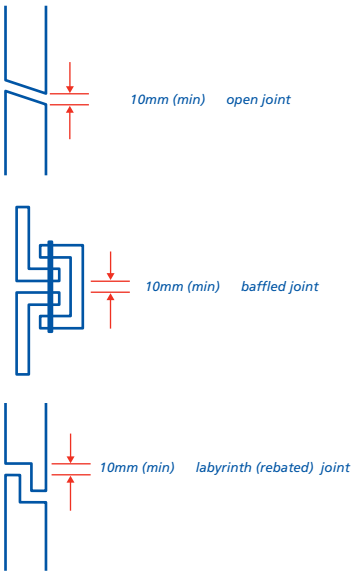
- 50mm for panels with open joints
- 38mm for panels with baffled or labyrinth (rebated) joints.



The air gap should be adequately ventilated. Dpc/dpm trays with stop ends should be provided above openings, at the base of the rainscreen and at interfaces where necessary, to ensure water is drained to the outside.

Particular attention should be given to the interface between the rainscreen cladding system and the walls, roof, doors, windows, other cladding systems, and curtain walling. External and internal air and water seals should be provided at all interfaces. Guidance on interfaces is provided in Appendix 6.9-A.

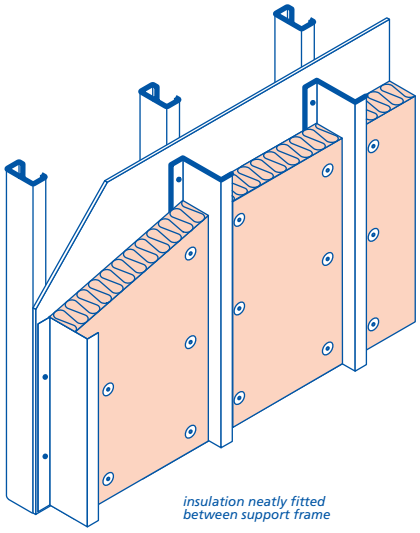
Open, baffled or labyrinth (rebated) joints should normally have a minimum opening of 10mm.



A screen to prevent birds and animals entering the cavity should be provided at the top and bottom of the rainscreen and penetrations through the cladding.

(c) insulation

Where insulation forms part of the rainscreen cladding system it should cover all exposed areas of the backing wall, be neatly cut around fixings and brackets and be fixed in accordance with the product manufacturer's recommendations.



Where the insulation is fixed to the backing wall a minimum of one non-combustible fixing per square metre or per insulation batt, whichever is the lesser, should be provided in addition to the other fixings.

Reference should be made to BRE document BR135 - 2003 'Fire performance of external thermal insulation for walls of multi-storey buildings' when specifying the type of insulation system to be installed.

The design should ensure that the insulation is continuous around penetrations through the rainscreen cladding system.

Where the rainscreen panel joints are open and the performance of the insulation could be diminished by moisture, a breather membrane should be provided over the outer face of the insulation.

(d) thermal bridging and condensation
The rainscreen cladding system should be designed to minimise the risk of thermal bridging and, surface and interstitial condensation.

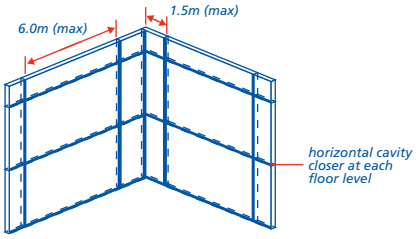
A vapour control layer should be provided unless a condensation risk analysis in accordance with BS 5250 shows that one is not necessary. The vapour control layer should be fixed on the warm side of the wall insulation.

(e) air infiltration
The rainscreen cladding system should be fixed to a backing wall that is reasonably airtight, e.g:
- masonry walls jointed to a high standard with all joints filled
- framed walls with a rigid sheathing on the cavity face with all joints taped or sealed.

Where reasonable airtightness cannot be achieved, a separate continuous vapour permeable air barrier with joints taped or sealed should be provided on the outer face of the backing wall.

(f) compartmentation
A rainscreen cladding system that has open joints between the panels should be designed as a pressure equalised system.

The cavity should be compartmented by:
- a horizontal cavity closer at each floor level, and
- vertical cavity closers at centres not exceeding 6.0m,
- vertical cavity closers at centres not exceeding 1.5m within 6.0m of an internal or external corner, and
- a vertical cavity closer as close as possible to an external corner, normally within 300mm.



This compartmentation is in addition to the requirements of the Building Regulations for cavity barriers to control the spread of smoke and fire. However, the same cavity barriers may be used for the compartmentation.

(g) acoustic performance
Noise from the rainscreen cladding system caused by rain striking the outer surface of panels should be accommodated without being intrusive e.g. by the use of noise absorbing or anti-drumming material.

(h) electrical continuity and earth bonding
The rainscreen cladding system should comply with BS 7671 'Requirements for Electrical Installations, formerly IEE Wiring Regulations' and BS EN 62305 'Protection against lightning. General principles'.

(i) durability
The rainscreen cladding system should be designed with corrosion resistant, adequately protected or durable materials.

Fixings and bracketry should normally be stainless steel or a suitable non-ferrous metal.

The risk of bimetallic corrosion should be avoided by the isolation of dissimilar metals.

Aluminium components should be separated from direct contact with cementitious surfaces.

The rainscreen cladding system should not include materials liable to infestation attack by micro-organisms, fungi, insects or vermin.

(j) tolerances
The design should allow for the line, level, plumb and plane of the completed rainscreen cladding system to be within reasonable tolerances for the materials involved. See Chapter 1.2 ' A consistent approach to finishes'.

Insulated render systems

CERTIFICATION

6.9 - D9 Insulated render systems shall be designed and certificated in accordance with appropriate Standards

Insulated render systems should have current certification confirming satisfactory assessment by an appropriate independent technical approvals authority accepted by NHBC, including: British Board of Agrément (BBA) or Building Research Establishment (BRE) Certification.

IN-SERVICE PERFORMANCE

6.9 - D10 Insulated render systems shall be designed and specified to ensure adequate in-service performance

Items to be taken into account include:

(a) loads, movement and fixings
Dead and live loads should be transferred safely to the building's structure without undue permanent deformation or deflection of any component.

Imposed loads should be calculated in accordance with BS EN 1991-1-1 and BS EN 1991-1-4 and take account of the location, shape and size of the building.

Thermal-induced loads due to differential stresses caused by temperature gradients within materials or components should be accommodated without any reduction in performance. The stresses in components and materials should not exceed the permissible values recommended by the manufacturer.

Movement within the insulated render system should be accommodated without any reduction in performance. Causes of movement include:
- dead and live loads
- changes in temperature
- changes in the moisture content of components
- freezing of retained moisture
- creep.

Movement joints in the backing wall should be continued through the insulated render system and formed in accordance with the manufacturer's recommendations.

Fixing rails, frames, mechanical and bonded fixings should be designed to accommodate specified loads and take account of the manufacturer's recommendations.

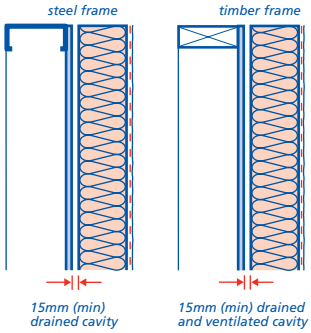
Pull-out or destructive testing of anchors and fixings should be carried out in

accordance with the design, BS 5080 and the Construction Fixings Association Guidance Note 'Procedure for Site Testing Construction Fixings'. Tests should be carried out at a suitable rate agreed with NHBC. The test results should be made available to NHBC.

(b) weather resistance
Insulated render systems, together with the backing wall to which they are applied, should satisfactorily resist the passage of moisture to the inside of the building.

For timber and steel framed backing walls a cavity of at least 15mm should be provided between the wall and the insulation to allow any moisture to drain away.

Where the backing wall is timber framed the cavity should be ventilated in accordance with Chapter 6.2 'External timber framed walls' (Design).



The introduction of a cavity is likely to increase the risk of impact damage to vulnerable areas of the insulated render system, e.g. at low level, around balconies and where cradle systems, etc. can come into contact with the façade. Suitable precautions to resist impact damage should be included in the design e.g. by the provision of a rigid board behind the insulation whilst maintaining the cavity.

Dpc/dpm trays with stop ends should be provided above openings, above cavity barriers, at the base of the insulated render system and at interfaces where necessary to ensure water is drained to the outside. The insulated render support system should not obstruct the drainage paths.

Insulated render systems can be applied direct to concrete panels or masonry backing walls without a cavity being provided.

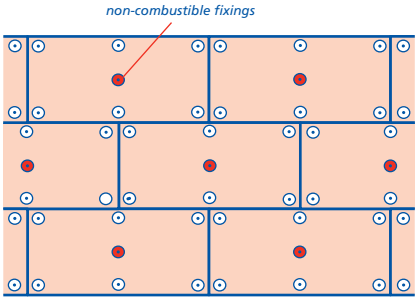
Particular attention should be given to the interfaces between the insulated render system and the walls, roof, doors, windows, other cladding systems and curtain walling. Guidance on interfaces is provided in Appendix 6.9-A.

Sealants and tapes should be specified in accordance with BS 6213 and the manufacturer's recommendations.

Where appropriate, a screen to prevent birds and animals entering the cavity should be provided at the top and bottom of the cavity and to penetrations through the cladding.

(c) insulation
The insulation type should be suitable for the intended purpose and be appropriately keyed to receive the render finish.

The insulated render system should be securely fixed to the support frame or backing wall with appropriate fixings/ adhesive in accordance with the manufacturer's recommendations.



A minimum of one non-combustible fixing per square metre or per insulation batt, whichever provides the greater number, should be provided in addition to the other fixings. The non-combustible fixings should be fixed through the mesh reinforcement.

Reference should be made to BRE document BR135 - 2003 'Fire performance of external thermal insulation for walls of multi-storey buildings' when specifying the type of insulation system to be installed.

The design should ensure the continuity of insulation around openings and other penetrations.

(d) thermal bridging and condensation
The insulated render system should be designed to minimise the risk of thermal bridging and surface and interstitial condensation.

A condensation risk analysis in accordance with BS 5250 should be carried out. Unless it shows otherwise, a vapour control layer should be provided. The vapour control layer should be fixed on the warm side of the wall insulation.

(e) reinforcement
Reinforcement mesh should be included in the design in accordance with the manufacturer's recommendations. Typically, reinforcement mesh should also be provided at points where there is a likelihood of increased stress in the render system, e.g. at the corners of window or door openings.

Appropriate trims should be provided at openings, corners, angles, interfaces and movement joints in accordance with the manufacturer's recommendations.

(f) render
Proprietary render systems should be specified in accordance with the manufacturer's recommendations and include the correct number and thickness of render coats.

Corners, returns and features should be formed with appropriate trims in accordance with the manufacturer's recommendations.

(g) durability
The insulated render system should be designed with corrosion resistant or adequately protected materials.

Fixings and bracketry should normally be stainless steel, suitable non-ferrous metal or suitable plastics.

The risk of bimetallic corrosion should be avoided by the isolation of dissimilar metals.

The insulated render system should not include materials liable to infestation attack by micro-organisms, fungi, insects or vermin.

(h) tolerances
The design should allow for the line, level, plumb and plane of the completed insulated render system to be within reasonable tolerances for the materials involved. See Chapter 1.2 ' A consistent approach to finishes'.

Brick slip cladding systems

CERTIFICATION

6.9 - D11 Brick slip cladding systems shall be designed and certificated in accordance with appropriate Standards

Brick slip cladding systems should have current certification confirming satisfactory assessment by an appropriate technical approvals authority accepted by NHBC, including: British Board of Agrément (BBA) or Building Research Establishment (BRE) Certification.

IN-SERVICE PERFORMANCE

6.9 - D12 Brick slip cladding systems shall be designed and specified to ensure adequate in-service performance

Items to be taken into account include:

(a) loads, movement and fixings
Dead and live loads should be transferred safely to the building's structure without undue permanent deformation or deflection of any component.

Imposed loads should be calculated in accordance with BS EN 1991-1-1 and BS EN 1991-1-4 and take account of the location, shape and size of the building.

Thermal-induced loads due to differential stresses caused by temperature gradients within materials or components should be accommodated without any reduction in performance. The stresses in components and materials should not exceed permissible values recommended by the manufacturer.

Movement within the brick slip system should be accommodated without any reduction in performance. Causes of movement include:

- dead and live loads
- changes in temperature
- changes in the moisture content of components
- freezing of retained moisture
- creep.

Movement joints in the backing wall should be continued through the brick slip cladding system and formed in accordance with the manufacturer's recommendations.

Fixing rails, frames, fixings and fasteners should be designed to accommodate specified loads and take account of the manufacturer's recommendations.

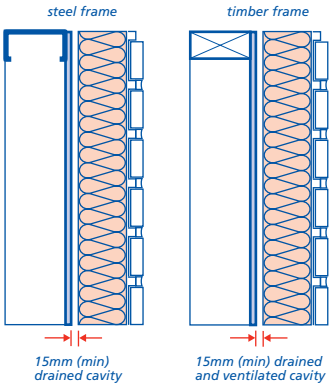
Bonded fixings of rails, frames, fixings and fasteners should be specified only where there is no suitable alternative and should be designed in accordance with the manufacturer's recommendations.

Pull-out or destructive testing of anchors and fixings should be carried out in accordance with the design, BS 5080 and the Construction Fixings Association Guidance Note 'Procedure for Site Testing Construction Fixings'. Tests should be carried out at a suitable rate agreed with NHBC. The test results should be made available to NHBC.

(b) weather resistance
Brick slip cladding systems, together with the backing wall to which they are applied, should satisfactorily resist the passage of moisture.

For timber and steel framed backing walls a cavity of at least 15mm should be provided between the wall and the brick slip cladding system to allow any moisture to drain away.

Where the backing wall is timber framed the cavity should be ventilated in accordance with Chapter 6.2 'External timber framed walls' (Design).



The introduction of a cavity is likely to increase the risk of impact damage to vulnerable areas of the brick slip cladding system, e.g. at low level, around balconies and where cradle systems, etc. can come into contact with the façade. Suitable precautions to resist impact damage should be included in the design e.g. by the provision of a rigid board behind the insulation whilst maintaining the cavity.

Dpc/dpm trays with stop ends should be provided above openings, above cavity barriers, at the base of the brick slip cladding system and at interfaces where necessary to ensure water is drained to the outside. The brick slip support system should not obstruct the drainage paths.

Brick slip cladding systems can be applied direct to concrete panels or masonry backing walls without a cavity being provided.

Particular attention should be given to the interfaces between the brick slip cladding system and the walls, roof, doors, windows, other cladding systems and curtain walling. Guidance on interfaces is provided in Appendix 6.9-A.

Sealants should be specified in accordance with BS 6213 and the manufacturer's recommendations.

Where appropriate a screen to prevent birds and animals entering the cavity should be provided at the top and bottom of the cavity and to penetrations through the cladding.

(c) insulation
Insulation forming an integral part of the brick slip cladding system should be specified and fixed with appropriate fixings/adhesive in accordance with the manufacturer's recommendations.

Other insulation included in the design should be suitable for its intended purpose and be specified and fixed with appropriate fixings/adhesive in accordance with the manufacturer's recommendations.

A minimum of one non-combustible fixing per square metre or per insulation batt, whichever is the lesser, should be provided in addition to the other fixings.

Reference should be made to BRE document BR135 - 2003 'Fire performance of external thermal insulation for walls of multi-storey buildings' when specifying the type of insulation system to be installed.

The design should ensure the continuity of insulation around openings and other penetrations.

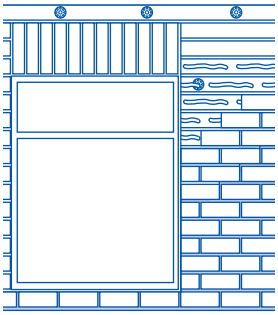
(d) thermal bridging and condensation
The brick slip cladding system should be designed to minimise the risk of thermal bridging and surface and interstitial condensation.

A vapour control layer should be provided unless a condensation risk analysis in accordance with BS 5250 shows that one is not necessary. The vapour control layer should be fixed on the warm side of the wall insulation.

(e) carriers
Proprietary carriers forming an integral part of the brick slip cladding system should be fixed with appropriate fixings/adhesive in accordance with the manufacturer's recommendations.

(f) brick slips
Brick slips should be specified and fixed in accordance with the system manufacturer's recommendations.

The design should ensure that excessive cutting of brick slips is avoided, e.g. in the storey heights, at corners and around openings. Coursing should be arranged to suit lintel heights.



(g) joints
Mortars, proprietary mortars and grouts should be specified in accordance with the system manufacturer's recommendations to enable each joint to be adequately filled and appropriately struck.

(h) durability
Fixings for the brick slip cladding system should be corrosion resistant or adequately protected materials.

Fixings and bracketry should normally be stainless steel, suitable non-ferrous metal or appropriate plastics.

The risk of bimetallic corrosion should be avoided by the isolation of dissimilar metals.

The brick slip cladding system should not include materials liable to infestation attack by micro-organisms, fungi, insects or vermin.

(i) tolerances
The design should allow for the line, level, plumb and plane of the completed brick slip cladding system to be within reasonable tolerances for the materials involved. See Chapter 1.2 ' A consistent approach to finishes'.

General

PROVISION OF INFORMATION

6.9 - D13 Designs and specifications shall be produced in a clearly understandable format and include all relevant information

Drawings and specifications should include:
- full set of drawings
- schedule of revisions
- manufacturer's specification
- fixing schedules
- specific details of all interfaces
- manufacturer's recommendations relating to proprietary items
- on-site testing regime.

6.9 - D14 All relevant information shall be distributed to appropriate personnel

Ensure that design and specification information is issued to site supervisors and relevant specialist subcontractors and/or suppliers.

Manufacturers' requirements for installation and fixing should be made available for reference on site to ensure work is carried out in accordance with the design and specification.

All relevant information in a form suitable for the use of site operatives should be available on site before work on the curtain walling or cladding starts.

MATERIALS STANDARDS

6.9 - M1 All materials shall:
(a) meet the technical requirements
(b) take account of the design

Materials that comply with the design and the guidance below will be acceptable for curtain walling, rainscreen cladding, insulated render and brick slip cladding systems.

Materials for curtain walling, rainscreen cladding, insulated render and brick slip cladding systems should comply with all relevant standards, including those listed below. Where no standard exists, Technical Requirement R3 applies (see Chapter 1.1 'Introduction to the Standards and Technical Requirements').

References to British Standards and Codes of Practice include those made under the Construction Products Directive (89/106/EEC) and, in particular, appropriate European Technical Specifications approved by a European Committee for Standardisation (CEN).

DPC/DPM MATERIALS

6.9 - M2 Materials for damp-proofing shall resist adequately the passage of moisture
Items to be taken into account include:

(a) dpcs/dpms
The following materials are acceptable for use as dpcs/dpms:
- polyethylene to BS 6515
- EPDM
- neoprene
- proprietary materials assessed in accordance with Technical Requirement R3.

Materials for dpcs/dpms should be compatible with adjoining materials.

Dpcs/dpms and flexible cavity trays should be of the correct dimensions to suit the detailed design.

For complicated junctions, preformed cavity trays are recommended.

(b) flashings
The following are acceptable as flashings:
- rolled lead sheet (at least code 4) complying with BS EN 12588
- aluminium and aluminium alloys to BS EN 485 and BS EN 573
- zinc alloys to BS EN 988
- stainless steel.

Aluminium and aluminium alloys should not come into contact with cementitious material.

GLAZING

6.9 - M3 Glazing shall be as required by the design

Reference should be made to Chapter 6.7 'Doors, windows and glazing' (each section) for guidance on glazing.

GASKETS

6.9 - M4 Materials for gaskets shall provide satisfactory performance

Extruded rubber gaskets should comply with BS 4255.

Other materials may be used if satisfactorily assessed in accordance with Technical Requirement R3.

SEALANT

6.9 - M5 Materials for sealant shall provide satisfactory performance

Sealant should be selected and applied in accordance with BS 6213 and BS EN ISO 11600.

Sealant to be used in locations where differential movement may be expected, e.g. interfaces between the façade and the structure, should be one of the following:
- two part polysulphide
- one part polysulphide
- one part silicone
- one or two part polyurethane.

Other materials may be used if satisfactorily assessed in accordance with Technical Requirement R3.

THERMAL INSULATION

6.9 - M6 Insulation materials shall provide the degree of insulation to comply with the design

Insulation materials should be inert, durable, rot and vermin proof and should not be adversely affected by moisture or vapour.

Insulation materials that comply with the following Standards are acceptable:
- mineral wool to BS EN 13162
- FR grade (flame retardant) expanded polystyrene to BS EN 13163
- FR grade (flame retardant) extruded polystyrene to BS EN 13164
- rigid polyurethane foam and polyisocyanurate to BS EN 13165
- phenolic foam to BS EN 13166
- cellular glass to BS EN 13167.

Other materials may be used if satisfactorily assessed in accordance with Technical Requirement R3.

BREATHER MEMBRANES

6.9 - M7 Breather membranes shall be durable and be capable of allowing water vapour to pass outwards and prevent moisture from penetrating inwards

Breather membranes should comply with BS 4016 (Type 1 in areas of very severe exposure).

Other materials may be used if satisfactorily assessed in accordance with Technical Requirement R3.

CAVITY BARRIERS AND FIRE-STOPS

6.9 - M8 Materials used for cavity barriers and fire-stops shall be capable of providing adequate resistance to fire and smoke

Materials specified in statutory requirements are acceptable.

Other materials may be used if satisfactorily assessed in accordance with Technical Requirement R3.

Systems incorporating proprietary intumescent materials should follow the guidance provided by The Intumescent Fire Seals Association (IFSA) and the Association for Specialist Fire Protection (ASFP).

FIXINGS

6.9 - M9 Fixings shall be of durable material and provide satisfactory performance

Fixings should be manufactured from:
- phosphor bronze
- silicon bronze
- stainless steel to BS EN ISO 3506
- mild steel with coatings to BS EN 12329, BS EN 12330, BS EN 1461, or other appropriate treatment in accordance with BS EN ISO 12944 or BS EN ISO 14713
- aluminium alloy to BS EN 573 and BS EN 755
- appropriate plastics.

Materials that comply with recognised Standards, which provide equal or better performance to those above, would also be acceptable.

Other materials may be used if satisfactorily assessed in accordance with Technical Requirement R3.

Aluminium and aluminium alloys should not come into contact with cementitious material.

TIMBER PRESERVATION

6.9 - M10 Timber shall be either naturally durable or preservative treated to provide adequate protection against rot and insect attack

Reference should be made to Chapter 2.3 'Timber preservation (natural solid timber)' (each section) for guidance on preservative treatments.

VENTILATION SCREENS

6.9 - M11 Ventilation openings shall be protected from the entry of birds and animals

Ventilation openings where the least dimension exceeds 10mm should be protected to prevent the entry of birds and animals.

Acceptable protection of openings can be provided by:
- rigid fabrications with width of opening greater than 3mm and less than 10mm (no restriction on length)
- rigid fabrications with round holes greater than 3mm and less than 10mm diameter
- square or rectangular mesh where the clear opening size is greater than 3mm and less than 10mm.

SITEWORK STANDARDS

6.9 - S1 All sitework shall:
(a) meet the Technical Requirements
(b) take account of the design
(c) follow established good practice and workmanship

Sitework that complies with the design and guidance below will be acceptable for curtain walling and cladding systems.

All relevant information in a form suitable for the use of site operatives should be available on site before work on the curtain walling or cladding system starts, including:
- full set of drawings
- schedule of revisions
- manufacturer's specification
- fixing schedules
- specific details of all interfaces
- manufacturer's recommendations relating to proprietary items
- on-site testing regime.

6.9 - S2 Curtain walling and cladding systems shall be installed by competent operatives

Curtain walling, rainscreen cladding, insulated render and brick slip cladding systems should be installed by operatives who:
- are competent
- are familiar with the system being installed
- hold a certificate confirming they have been trained by the system manufacturer, supplier or installer.

HANDLING AND STORAGE

6.9 - S3 Materials, products and systems shall be protected and stored in a satisfactory manner to prevent damage, distortion, uneven weathering and degradation

Items to be taken into account include:

(a) handling and storage
The curtain walling or cladding system should be transported, lifted, handled and stored in accordance with the manufacturer's recommendations.

Insulated glass units should be carefully stored and protected in a sheltered dry area.

(b) protection
All practical steps should be taken to avoid the risk of damage to the curtain walling or cladding system during construction.

Curtain walling

LOCATION AND FIXING

6.9 - S4 Curtain walling systems shall be correctly located and securely fixed in accordance with the design

Curtain walling systems should be correctly located and securely fixed in accordance with the manufacturer's specification and the design details.

The type, size and positioning of all fixings should be in accordance with the design.

Proprietary fixings should be used in accordance with the manufacturer's recommendations with particular attention given to:
- the correct embedment, spacing and edge distances
- correct torque settings
- the provision of suitable locking nuts and washers
- the isolation of dissimilar metals
- the isolation of aluminium from cementitious material.

WEATHER RESISTANCE

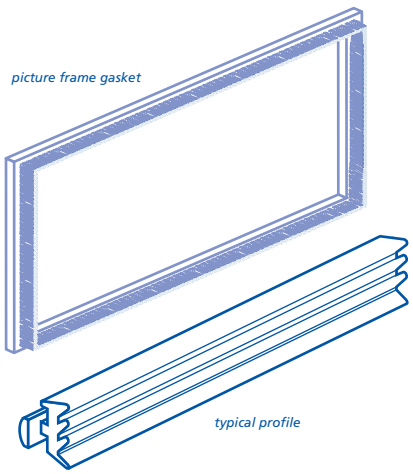
6.9 - S5 Curtain walling systems shall be correctly installed to prevent moisture entering the building

Items to be taken into account include:

(a) weathertightness
Curtain walling systems including doors, windows and other components should be installed correctly to ensure satisfactory in-service performance.

(b) gaskets and sealants
Appropriate gaskets and sealants should be installed and used to ensure satisfactory performance. Gaskets and sealants should be used in accordance with the design and the manufacturer's recommendations.

Pre-formed factory-moulded 'picture frame' type vulcanised epdm or silicone internal gaskets should be used.



External and internal air and water seals and a drained cavity should be provided at all interfaces. Guidance on interfaces is provided in Appendix 6.9-A.

(c) dpcs/dpms
Dpcs/dpms should be installed correctly to provide a physical barrier to the passage of moisture. Dpc/dpm arrangements which

rely solely on sealant should not be used. Guidance on the use of dpcs/dpms at interfaces is provided in Appendix 6.9-A.

Dpc/dpm arrangements should extend the full height of the curtain walling system and have appropriate details at all interfaces including floors, walls, roofs, balconies and terraces, to ensure moisture is directed to the outside.

(d) opening doors and lights
Opening doors and lights should be fitted in accordance with the design, hang square within the curtain wall frame and fit neatly with minimum gaps to ensure effective weatherproofing.

GLAZING

6.9 - S6 Glazing shall be carried out in accordance with relevant standards

Glazing should be carried out in accordance with Chapter 6.7 'Doors, windows and glazing' (Design and Sitework).

CONTROL OF CONDENSATION

6.9 - S7 Installation shall ensure that the risk of condensation is minimised

Insulation should be installed in accordance with the design, ensuring that all interfaces are adequately insulated.

A continuous, durable vapour control layer should be provided in accordance with the design.

ALLOWANCE FOR MOVEMENT

6.9 - S8 Installation shall allow movement of the curtain walling system and the building without causing damage or deformation

Allowance for movement should be provided in accordance with the design.

TOLERANCES

6.9 - S9 Installation shall achieve the design tolerances

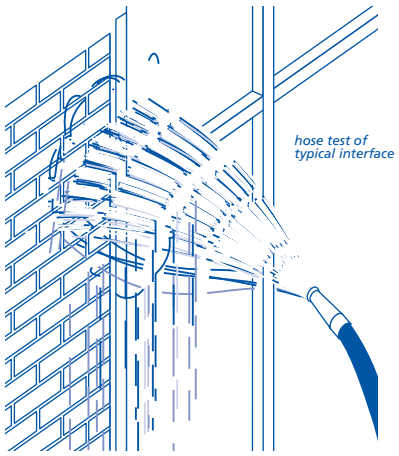
The line, level, plumb and plane of the completed curtain walling system should be in accordance with the design. See Chapter 1.2 ' A consistent approach to finishes'.

TESTING

6.9 - S10 Site hose testing shall be carried out on the curtain walling system to confirm satisfactory performance

On-site testing should be carried out to determine the resistance to water penetration of the curtain walling system, including all joints and interfaces which are designed to be permanently closed and watertight.

Representative samples of the finished installation should be hose tested on site in accordance with the current CWCT Standard for curtain walling.



At least 5% of the completed curtain walling system should be tested, with particular focus on vulnerable areas such as joints and interfaces.

Other testing may be acceptable if it is considered by NHBC to be a suitable alternative.

The results of all testing should be made available to NHBC.

Rainscreen cladding

LOCATION AND FIXING

6.9 - S11 Rainscreen cladding systems shall be correctly located and securely fixed in accordance with the design

Rainscreen cladding systems should be correctly located and securely fixed in accordance with the manufacturer's specification and the design details.

The type, size and positioning of all anchors, fixing rails, frames, fixings and fasteners should be in accordance with the design.

Bonded fixings should only be used in accordance with the design.

Anchors, fixings and bracketry should normally be stainless steel or a suitable non-ferrous metal.

Proprietary fixings should be used in accordance with the manufacturer's recommendations with particular attention given to:
- the correct embedment, spacing and edge distances
- correct torque levels
- the provision of suitable locking nuts and washers
- the isolation of dissimilar metals
- the isolation of aluminium from cementitious material.

WEATHER RESISTANCE

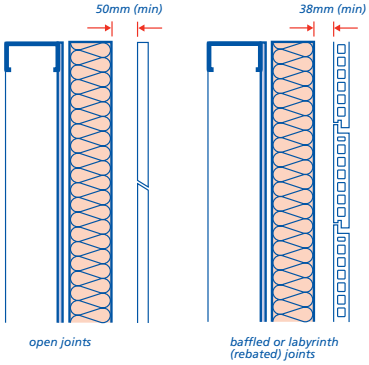
6.9 - S12 Rainscreen cladding systems shall be correctly installed to prevent moisture entering the building

Items to be taken into account include:

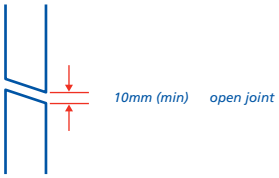
(a) weathertightness
Rainscreen cladding systems including door, window and other openings and cover flashings, should be installed correctly to ensure satisfactory in-service performance.

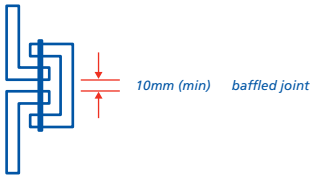
Installation should prevent water reaching any parts of the wall that could be adversely affected by the presence of moisture.

The following minimum air gap should be maintained behind all rainscreen panels:
- 50mm for panels with open joints, or
- 38mm for panels with baffle or labyrinth (rebated) joints.



Unless specified otherwise in the design, all open, baffled or labyrinth (rebated) joints should have a minimum opening of 10mm.





Where required by the design a screen to prevent birds and animals entering

the cavity should be provided at the top and bottom of the rainscreen and to penetrations through the cladding.

Where required by the design, dpcs/dpms should be installed correctly to provide a physical barrier to the passage of moisture. Dpc/dpm arrangements which rely solely on sealant should not be used.

To ensure moisture is directed to the outside, dpc/dpm arrangements should be correctly formed with suitable upstands and stop ends including at the junction between the rainscreen cladding and any other component or system. External and internal air and water seals and a drained cavity should be provided at all interfaces. Guidance on interfaces is provided in Appendix 6.9-A.

Appropriate sealants should be used in accordance with the design and the manufacturer's recommendations to ensure satisfactory performance.

(b) insulation and condensation
Where insulation forms part of the rainscreen, it should be installed in accordance with the design and the manufacturer's recommendations, ensuring that all parts of the backing wall are adequately insulated.

Where the rainscreen panel joints are open and the insulation could be adversely affected by the presence of water, a continuous durable breather membrane should be provided to the outer face of the insulation.

Where the insulation is fixed to the backing wall, a minimum of one non-combustible fixing per square metre or per batt, whichever is the lesser, should be provided in addition to the other fixings.

Installation should ensure that the insulation is continuous around penetrations through the rainscreen.

The rainscreen cladding system should be installed to minimise the risk of thermal bridging and surface and interstitial condensation.

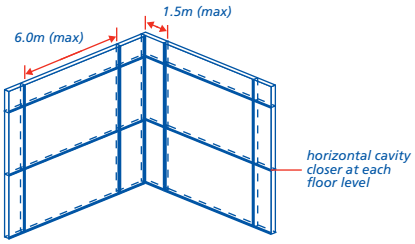
(c) air infiltration
The rainscreen cladding system should be fixed to a backing wall that is reasonably airtight, e.g:

- masonry walls jointed to a high standard with all joints filled
- framed walls with a rigid sheathing on the cavity face with all joints taped or sealed.

Where reasonable airtightness cannot be achieved, a separate continuous vapour permeable air barrier with joints taped or sealed should be provided on the outer face of the backing wall.

(d) compartmentation
To help achieve pressure equalisation in open jointed rainscreen cladding systems, the cavity should be compartmented by:

- a horizontal cavity closer at each floor level, and
- vertical cavity closers at centres not exceeding 6.0m, and
- vertical cavity closers at centres not exceeding 1.5m in the area within 6.0m of an internal or external corner, and
- a vertical cavity closer as close as possible to an external corner, normally within 300mm.



This compartmentation is in addition to the requirements of the Building Regulations for cavity barriers to control the spread of smoke and fire. However, the same cavity barriers may be used for the compartmentation.

Cavity closers should be rigid and be installed in accordance with the manufacturer's recommendations with particular attention given to maintaining ventilation and drainage in accordance with the design.

(e) durability
The rainscreen cladding system should be fabricated and installed with corrosion resistant or adequately protected materials.

Fixings and bracketry should normally be stainless steel or suitable non-ferrous metal.

The risk of bimetallic corrosion should be avoided by the isolation of dissimilar metals.

Aluminium components should be separated from direct contact with cementitious surfaces.

The rainscreen cladding system should not include materials liable to infestation attack by micro-organisms, fungi, insects or vermin.

(f) testing
On-site hose or sparge bar testing should be carried out with particular emphasis on interfaces that are designed to be permanently closed and watertight.

The building should remain watertight during and after the test.

ALLOWANCE FOR MOVEMENT

6.9 - S13 Installation shall allow movement of the rainscreen cladding system and the building without causing damage or deformation

Allowance for movement e.g. at interfaces and at gaps between panels, should be provided in accordance with the design.

TOLERANCES

6.9 - S14 Installation shall achieve the design tolerances

Installation should allow for the line, level, plumb and plane of the completed rainscreen cladding system to be within reasonable tolerances for the materials involved. See Chapter 1.2 ' A consistent approach to finishes'.

Insulated Render Systems

FIXING

6.9 - S15 Insulated render systems shall be securely fixed in accordance with the design

Insulated render systems should be securely fixed in accordance with the design and the manufacturer's recommendations.

The type, size and positioning of all anchors, fixing rails, frames, fixings, fasteners and bonded joints should be in accordance with the design.

Anchors, fixings and bracketry should normally be stainless steel, suitable non-ferrous metal or appropriate plastics.

For mechanically-fixed systems particular attention should be given to:

- correct embedment, spacing and edge distances
- correct torque settings
- provision of suitable locking nuts and washers
- the isolation of dissimilar metals
- the isolation of aluminium from cementitious material.

For adhesive-fixed systems particular attention should be given to:

- thorough assessment of the backing wall to confirm adhesive fixing is suitable
- suitable preparation of the backing wall to receive the adhesive
- the provision of supplementary mechanical fixings as required by the design.

WEATHER RESISTANCE

6.9 - S16 Insulated render systems shall be correctly installed to prevent moisture entering the building

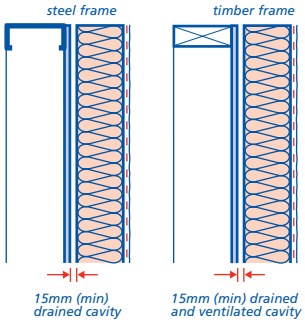
Items to be taken into account include:

(a) weathertightness
Insulated render systems should be installed correctly to ensure satisfactory in-service performance.

Insulated render systems should prevent water reaching any parts of the wall that could be adversely affected by the presence of moisture.

Where the backing wall is timber or steel framed a cavity of at least 15mm should be provided between the wall and the insulation to allow moisture to drain away.

Where the backing wall is timber framed the cavity should be ventilated in accordance with Chapter 6.2 'External timber framed walls' (Design).



Suitable precautions to resist impact damage should be provided in accordance with the design.

Where required by the design a screen should be provided to prevent birds and animals entering the cavity through the ventilation and drainage openings.

Insulated render systems can be applied direct to masonry backing walls without a cavity being provided.

Where required by the design, dpcs/dpms should be installed correctly to provide a physical barrier to the passage of moisture. Dpc/dpm arrangements which rely solely on sealant should not be used.

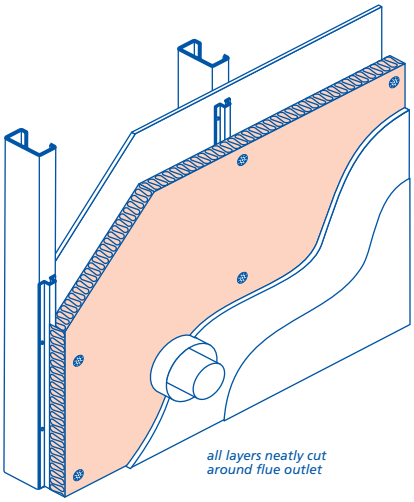
To ensure moisture is directed to the outside, dpc/dpm arrangements should be correctly formed with suitable upstands and stop ends including at the junction between the insulated render system and any other component or system.

Guidance on interfaces is provided in Appendix 6.9-A.

Appropriate tapes and sealant should be used in accordance with the design and the manufacturer's recommendations to ensure satisfactory performance.

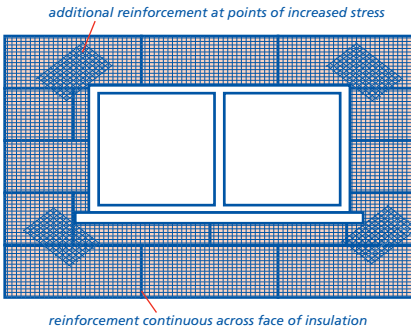
(b) insulation and condensation
Insulation should be installed in accordance with the design and the manufacturer's recommendations, ensuring that all parts of the backing wall are adequately insulated.

Insulation should be returned into window and door openings and be continuous around penetrations through the wall.



(c) air infiltration
The backing wall should be reasonably airtight before installation of the insulated render system, e.g.
- masonry walls jointed to a high standard with all joints etc filled
- framed walls with a rigid sheathing on the cavity face with all joints taped and sealed.

(d) reinforcement
Reinforcement mesh should be provided in accordance with the design taking account of the following:
- laps between sheets of reinforcement mesh should be not less than 100mm
- openings, corners, angles, interfaces and movement joints should be formed with appropriate trims
- additional mesh should normally be provided at points where there is a likelihood of increased stress in the render system, e.g. at the corners of window and door openings
- movement joints in the backing wall should continue through the insulated render system.



(e) render
The surface to be rendered should be free from contamination, dust and loose particles. The number and thickness of coats should be in accordance with the design.

Where coloured pigments are specified, batching should be undertaken with care to ensure colour consistency.

TOLERANCES

6.9 - S17 Installation shall achieve the design tolerances

Installation should allow for the line, level, plumb and plane of the completed insulated render system to be within reasonable tolerances for the materials involved. See Chapter 1.2 ' A consistent approach to finishes'.

Brick Slip Cladding Systems

FIXING

6.9 - S18 Brick slip cladding systems shall be securely fixed in accordance with the design

Brick slip cladding systems should be securely fixed in accordance with the design and the manufacturer's recommendations.

The type, size and positioning of all anchors, fixing rails, frames, fixings, fasteners and bonded joints should be in accordance with the design.

Anchors, fixings and bracketry should normally be stainless steel, suitable non-ferrous metal or appropriate plastics.

Particular attention should be given to:
- correct embedment, spacing and edge distances
- correct torque levels
- provision of suitable locking nuts and washers
- the isolation of dissimilar metals
- the isolation of aluminium from cementitious material.

Fixing systems should be accurately set out to ensure brick slips suit storey heights, lintels, corners and openings.

WEATHER RESISTANCE

6.9 - S19 Brick slip cladding systems shall be correctly installed to prevent moisture entering the building

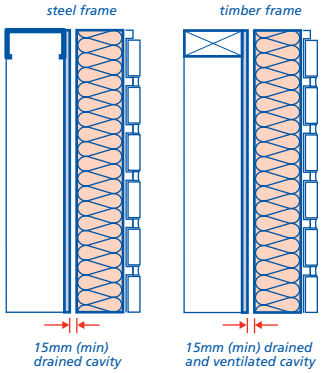
Items to be taken into account include:

(a) weathertightness
Brick slip cladding systems should be installed correctly to ensure satisfactory in-service performance.

The brick slip cladding system should prevent water reaching any parts of the wall that could be adversely affected by the presence of moisture.

Where the backing wall is timber or steel framed, a cavity of at least 15mm should be provided between the wall and the insulation to allow moisture to drain away.

Where the backing wall is timber framed, the cavity should be ventilated in accordance with Chapter 6.2 'External timber framed walls' (Design).



Suitable precautions to resist impact damage should be provided in accordance with the design.

A screen should be provided to prevent birds and animals entering the cavity through the ventilation and drainage openings.

Brick slip cladding systems can be applied direct to masonry backing walls without a cavity being provided.

Where required by the design, dpcs/dpms should be installed correctly to provide a physical barrier to the passage of moisture. Dpc/dpm arrangements which rely solely on sealant should not be used.

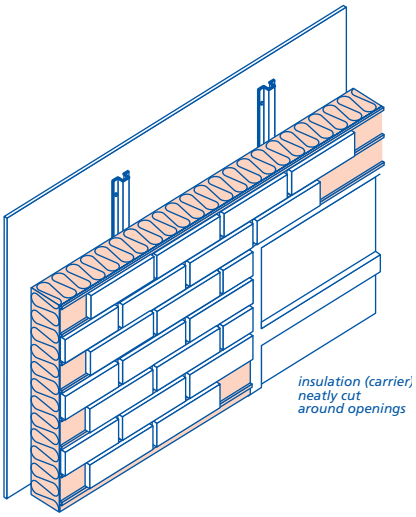
To ensure moisture is directed to the outside, dpc/dpm arrangements should be correctly formed with suitable upstands and stop ends including at the junction between the brick slip cladding system and any other component or system.

Guidance on interfaces is provided in Appendix 6.9-A.

Appropriate tapes and sealants should be used in accordance with the design and the manufacturer's recommendations to ensure satisfactory performance.

(b) insulation and condensation
Insulation should be installed in accordance with the design and the manufacturer's recommendations, ensuring that all parts of the backing wall are adequately insulated.

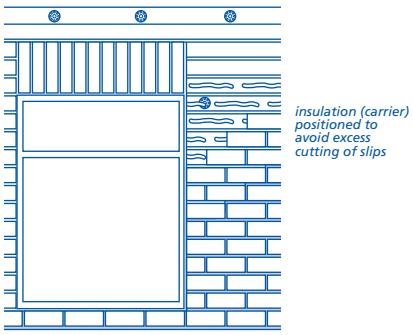
Insulation should be returned into window and door openings and be continuous around penetrations through the wall.



(c) air infiltration
The backing wall should be reasonably airtight before installation of the brick slip cladding system, e.g.
- masonry walls jointed to a high standard with all joints etc filled
- framed walls with a rigid sheathing on the cavity face with all joints taped and sealed.

(d) brick slips
Brick slips should be fixed in accordance with the design and manufacturer's recommendations, taking account of relevant height restrictions.

Excessive cutting of brick slips should be avoided.



(e) joints
Proprietary mortars and grouts should be used in accordance with the design and the manufacturer's recommendations. Each joint should be adequately filled and appropriately struck.

TOLERANCES

6.9 - S20 Installation shall achieve satisfactory appearance

Installation should allow for the line, level, plumb and plane of the completed brick slip cladding system to be within reasonable tolerances for the materials involved. See Chapter 1.2 ' A consistent approach to finishes'.

APPENDIX 6.9-A

Interfaces

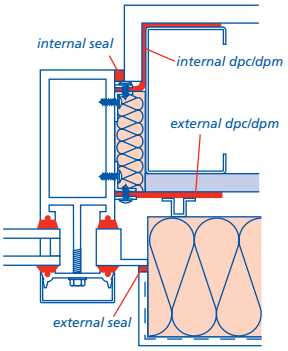
Interfaces exist:
- between different curtain walling and cladding systems, and
- between curtain walling and cladding systems and other elements of the building.

All interfaces should be carefully designed and detailed to resist water and wind penetration. External and internal air and water seals should normally be provided.

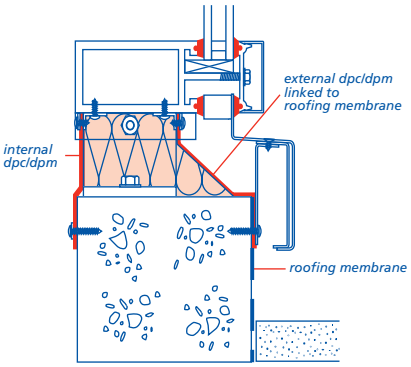
The design should take account of:
- differing profile characteristics
- movement
- continuity of insulation, vapour barriers and breather membranes
- tolerances and deviation
- the erection sequence
- planned maintenance.

The drawings and specification should indicate clearly which contractor is responsible for constructing the interface.

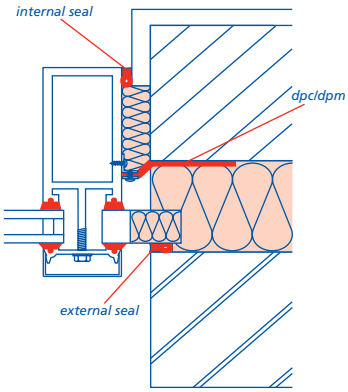
Typical interfaces
The following sketches show examples of typical interfaces and illustrate general design principles.



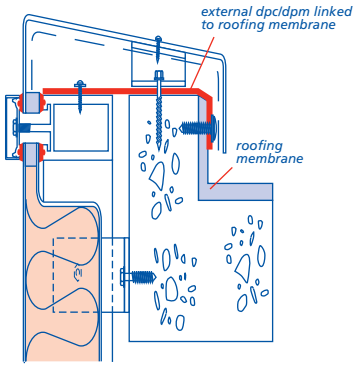
1. Curtain walling to insulated render system
Horizontal section



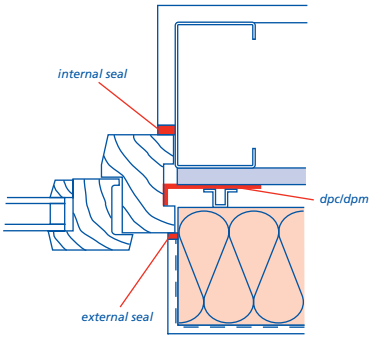
2. Curtain walling to balcony/terrace
Vertical section



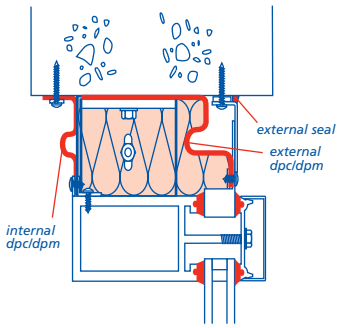
3. Curtain walling to conventional brick & block wall
Horizontal section



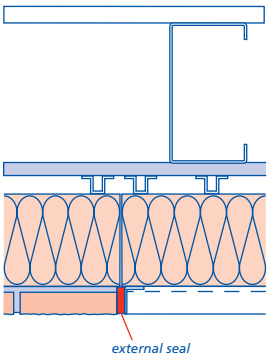
5. Curtain walling to roof including coping detail
Vertical section



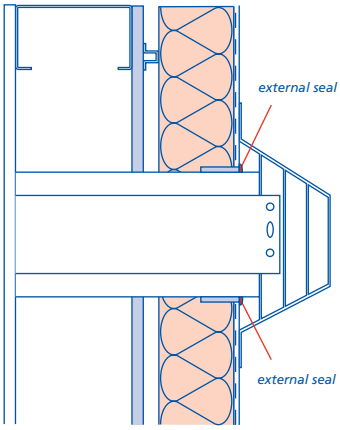
7. Insulated render system to windows & doors
Horizontal section



4. Curtain walling to soffit
Vertical section



6. Brick slip cladding to insulated render system
Horizontal section



8. Penetration of gas flue through insulated render system on light gauge steel frame
Horizontal section

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