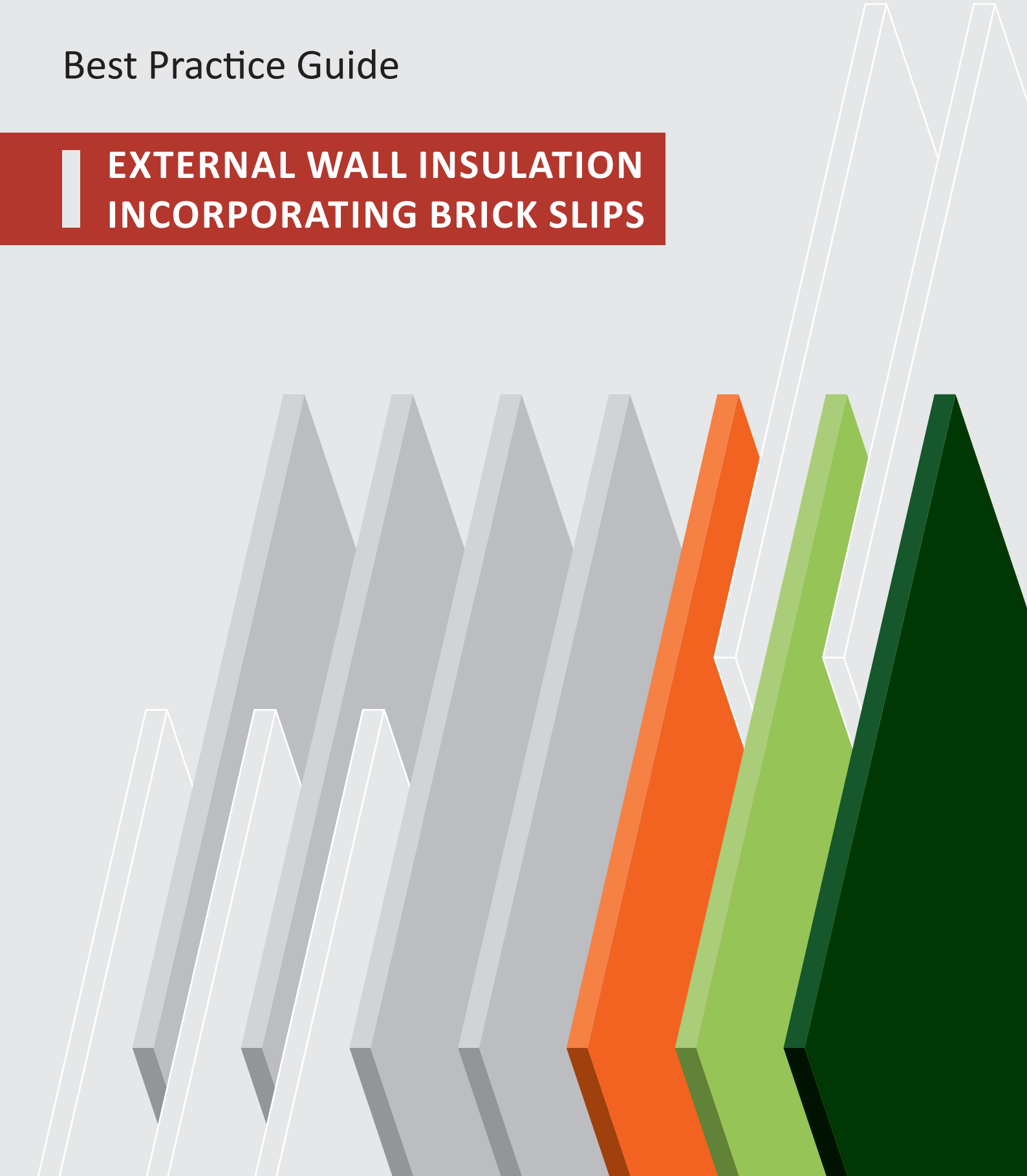
INCA

LEADING THE UK EWI INDUSTRY

Best Practice Guide

EXTERNAL WALL INSULATION INCORPORATING BRICK SLIPS



ABOUT INCA

INCA is the recognised trade association for the External Wall Insulation (EWI) industry in the UK, representing the major system designers, a nationwide network of specialist installers and the key component suppliers.

INCA is at the forefront of transforming the energy efficiency of homes and businesses in the UK – the mission: to represent members of the External Wall Insulation industry through technical excellence, effective collaboration, strong marketing and communication and member benefits.

INCA Technical Guidance Documentation:

INCA technical guidance documentation is recognised by the wider EWI industry and compiled by INCA and its membership. All INCA members meet a strict membership criteria and fully commit to the INCA Code of Professional Practice designed to engender and maintain high standards of conduct, the use of sound, compliant and accredited EWI systems and the highest quality of installation with a focus on customer satisfaction and best practice at all times.

INCA would like to thank the membership for their significant contribution to the publication of this guidance:

System Designer Members:

On behalf of the wider EWI industry INCA would like to thank the system designer membership for their contribution to the publication of this guidance.

More information and contact details: **www.inca-ltd.org.uk/find-an-inca-member/#designers**

Installation Contractor Members:

On behalf of the wider EWI industry INCA would like to thank the installation contractor membership for their contribution in the publication of this guidance. INCA Contractors have a proven track record of delivering high quality EWI projects, both new build and refurbishment, including private homes, social housing and non-residential.

Full list of INCA Contractor Members: **www.inca-ltd.org.uk/find-an-inca-member/#contractors**

INCA Associate Members

On behalf of the wider EWI industry INCA would like to thank the associate membership for their contribution in the publication of this guidance. The associate membership is made up of key EWI component suppliers along with testing and certification bodies.

Full list of INCA Associate Members: **www.inca-ltd.org.uk/find-an-inca-member/#associates**

Best Practice Guide

External Wall Insulation Incorporating Brick Slips

INCA would like to express grateful appreciation to all those who have given up their time and shared their experience and expertise so freely in the compilation of this guidance documentation.

Particular thanks to:

- All members, past and present, of the INCA Technical Committee
- Andrew Champ, CEO, Solid Wall Insulation Guarantee Agency (SWIGA)

Additional recognition:

INCA would also like to recognise and acknowledge the considerable input from Gary Peacey, Director, EWI Consultants Ltd in the publication of this guide.

EWI Consultants Ltd

EWI Consultants Ltd are at the forefront of independent technical support for EWI and render projects. Services are widespread, but include site inspections on behalf of your organisation, independent quality assurance inspections, BBA / KIWA certification project management and expert witness investigations and reports.

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Best Practice Guide

External Wall Insulation Incorporating Brick Slips

This guide is issued by INCA to give general guidance on best practice. INCA and the organisations responsible for its content do not accept any liability arising in any way from relying on this guide. If you require advice on a specific issue, you should seek your own independent professional advice.

This guide is to be referred to in conjunction with advice, accreditation's, specifications, data sheets and details from the relevant system designers.

It should be noted that each system has its variations, therefore detail information contained in this document is of a general nature.

This guide is one of three that covers the application of various external wall insulation systems. This particular document covers the installation of an EWI system with a brick slip and ceramic slip finishes. There are systems available that use a metal or insulated carrier systems; however these can be more aligned to rainscreen cladding and therefore are not included within this guide.

For the purpose of this document, brick slip finishes have been defined as follows:

- Thin cut clay brick slips.
- Thin cut ceramic slips.
- Acrylic or synthetic flexible brick slips.
- Mineral based brick slips.

Requests to use any part of this guide should be made in writing to:

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Contents

This document is designed to be read as a whole or to be use in the various sections written.

1. Introduction

The Insulated Render and Cladding Association (INCA) is the recognised trade association for the external wall insulation (EWI) industry in the UK, representing the majority of system designers, a nationwide network of specialist installers, in addition to system component suppliers and associated organisations.

External wall insulation (EWI), also referred to as Insulated Render, Solid Wall Insulation (SWI) and External Thermal Insulation Composite Systems (ETICS), have been used in the UK for over six decades, in line with the UK's commitment to reduce carbon emission and thermally upgrade existing housing stock. The use of EWI systems has increased significantly in the last 10- 15 years and is suitable for both the thermal upgrading of existing properties whilst being an effective solution for new build projects.

INCA is unrivalled when it come to providing EWI experience and INCA members apply the latest skills, innovations and techniques to deliver high quality projects in both the domestic and non-domestic sectors. INCA has established a wide ranging body of technical, installation, training and component information to promote industry best practice, raise awareness and increase the quality standards.

This document aims to outline best practice guidelines for the EWI industry, so that EWI systems are fit for purpose and installed to a high quality standard to reduce any risk of failures. This document sets out the accepted minimum standard for all installations, looks to standardise many details that occur on site, and provides useful information on the components that contribute to a finished EWI system.

The objective of this guide is to ensure:

- *That works undertaken are of a quality that will enable the EWI system to provide a thermal envelope or upgrade, be aesthetically pleasing, and last for the design life that it has been assessed to achieve.*
- *That the industry's clients, including architects, contractors and local authorities, are well informed to enable the correct choice of system for the relevant substrate, so that every project, whatever the size is delivered to the right standard.*
- *Planning, systems and products, design and detailing and installations are of a high quality, in addition to highlighting the importance of the whole system concept.*

EWI systems are a key measure in delivering and improving the thermal performance of buildings, but they are only as good as the planning, design, detailing and installation, and whilst this documents aims to set out the minimum standards, it is encouraged to exceed these standards by adding further improvements to details where appropriate.

Thermal bridging or cold bridging as it is known, must always be considered when designing an EWI system. Access and / or budget constraints may prevent delivering a completely thermally efficient facade, and if this is the case then the client must be made aware of the potential consequences of this, which may lead to issues of localised surface condensation and also the reduced effectiveness of the reduced insulation.

NB: This document will refer to system designer, which can also be referred to as system supplier or system manufacturer and should not be confused with being the project designer or principal designer, whose role is to provide the properties overall retrofit design.

This document refers specifically to the use of brick slips, ceramic slips or a similar decorative finishes onto the EWI system, whilst the use of renders, other decorative thin coat finishes and the vented drained cavity systems are covered by their own best practice guides, and should be referred to in their entirety.

2.01 Planning Permission

The criteria for planning permission set out on the Government's Planning Portal indicates that for external walls:

You do not need to apply for planning permission for repairs, maintenance or minor improvements, such as painting your house.

If you live in a listed building, you will need listed building consent for any significant works whether internal or external.

If you live in a Conservation Area, National Park, Area of Outstanding Natural Beauty or the Broads, you will need to apply for planning permission before cladding the outside of your house with a brick, stone or tile finish.

Outside these areas, cladding may be carried out under permitted development rules, without having to first apply for planning permission provided the materials are of a similar appearance to those used in the construction of the house.'

It is recommended that the Local Authority Planning Office is contacted to ascertain if there is a need to apply for planning permission. For larger schemes, the Housing Association should be able to provide advice if a Planning Application has been submitted and granted.

2.02 Building Regulations

Information on Building Regulations applications is also contained on the Planning Portal and again advice should be sought from the Local Authority, however general advice is as follows:

If you want to use brick slips and this includes some re-rendering or replacement of timber cladding as part of to external walls, building regulations may apply depending on the extent of the work.

Where 25 per cent or more of an external wall is re-rendered, re-clad, re-plastered or re-lined internally or where 25 per cent or more of the external leaf of a wall is rebuilt, the regulations would normally apply and the thermal insulation would normally have to be improved.

EWI is suitable for both new build construction and refurbishment of existing buildings. This document is designed to provide guidance on types of application; however, some details and information will only be suitable for either new build or refurbishment, and where this occurs, this will be highlighted to prevent confusion.

EWI is a highly effective thermal facade solution for new buildings, and is suitable for installation onto a wide range of substrates. For applications onto residential timber and steel frame constructions, then please refer to our Vented Drained Cavity System Best Practice Guide, for direct application onto framed structure where a drainage cavity is not required, then this will be covered by this document.

Different types of backgrounds suitable for the application of an EWI system to.

- New masonry including blockwork, brickwork and concrete
- Suitably approved sheathing boards fixed to timber and steel frame structures.
- Suitably approved sheathing boards fixed to steel frame infill panels.

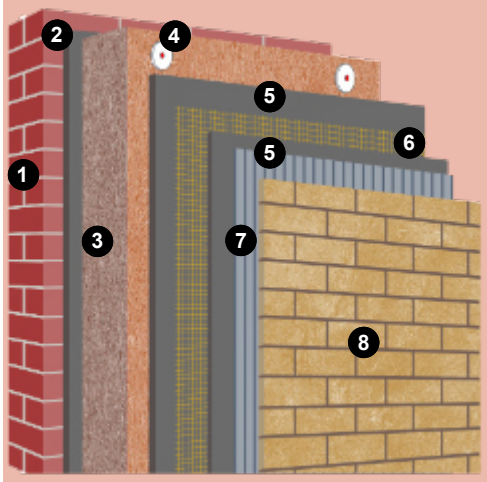
EWI is one of the most effective solution for the thermal upgrading retrofit market, with the ability to significantly reduce heating bills in addition to providing a better internal climate. There are many different types of existing properties in the UK, utilising brickwork, stonework, concrete, render and also the non-traditional houses.

Whilst the installation of a EWI system is suitable for a vast majority of these, we would always recommend that you contact the system designer for further information and clarification of suitability, as some of the existing structures may require a structural survey before any works could be considered.

Where the project is mapped to PAS2035, then we would recommend referring to the INCA document PAS 2035-2030 + A1 - What you need to know. For high-rise properties approval of the Building Safety Regulator (BSR) for what you need to know should be obtained before commencement of works.

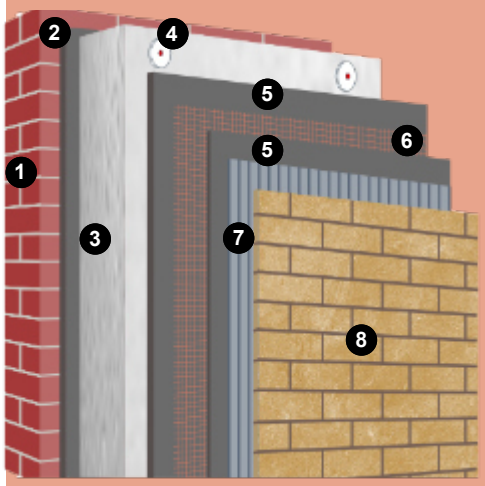
4. EWI System Types

The images below provide an overview of the components used in all EWI systems. Each system can vary, therefore the system designer should be consulted to determine the build and sequence for the components relevant to their system. Other systems can be viewed in 5.14.



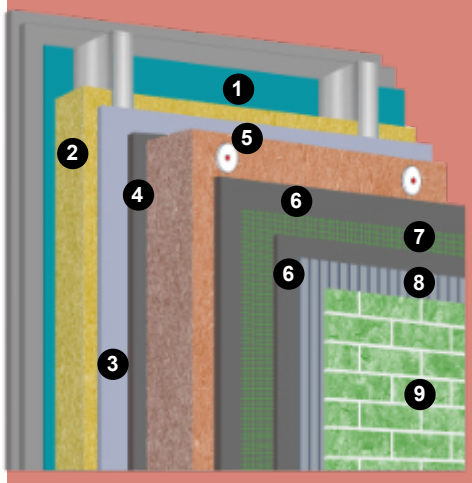
Masonry - Mineral Fibre

1. Substrate with fungicidal wash, and / or primer if appropriate
2. Adhesive - if applicable to the system
3. Mineral fibre insulation
4. Fixings through insulation - alternatively fixing through mesh
5. Basecoat
6. Embedded reinforcing mesh
7. Slip adhesive
8. Brick or ceramic slip



Masonry - Thermoplastic / Thermoset based insulation

1. Substrate with fungicidal wash, and / or primer if appropriate
2. Adhesive - if applicable to the system
3. Foam based insulation - EPS, XPS, Phenolic, PIR
4. Fixings through insulation - alternatively fixing through mesh
5. Basecoat
6. Embedded reinforcing mesh
7. Slip adhesive
8. Brick or ceramic slip



Framed structures (commercial) for domestic please see the INCA Best Practice Guide for Vented Drained Cavity systems.

1. Steel or timber structure
2. Suitably approved external sheathing board with breather membrane if applicable
3. Adhesive - if applicable to the system
4. Insulation board
5. Fixings through insulation - alternatively fixing through mesh
6. Basecoat
7. Embedded reinforcing mesh
8. Slip adhesive
9. Brick or ceramic slip

5. System components

Each EWI system comprises a number of components which are common throughout the sector, but are carefully selected to ensure system compatibility.

INCA supports the system loyalty approach and this is considered to be the best practice. Each component should be supplied by the system designer, to the project specification. This ensures that only products tested and approved by statutory test centres and accreditation bodies are used, and that safeguards are in place throughout the supply chain and for the general performance of the system.

Components required for each system can generally be found listed on either the system designer's project specification, price list or system accreditation documents.

Each EWI system should consist of the following generic components, however, always refer to the system designer specification and accreditation for the system build up.

- Insulation
- Mechanical anchors / fixings
- Adhesive mortars
- Reinforced basecoats and reinforcing mesh
  - Polymer modified cementitious or organic non-cementitious basecoats
  - Polypropylene / alkali resistant glass fibre mesh, metal lath
- Slip adhesive
- Brick, ceramic, flexible slips and pointing mortars
- Tracks, beads, trims and flashing
- Expanding foam sealing tapes

Depending upon the project specification, other EWI system components which may be used, but not limited to, may include:

- Fire breaks
- Water resistant renders for below dpc application
- Post installation fixings and securing points
- Sealants
- Pre-treatments and Coatings

5.01 Insulation

The insulation forms the main thermal layer as well as being the background for applying the basecoat and slips to.

Various types and thicknesses are available (see section 6), with the choice

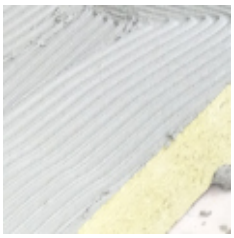
being dependant on the required thermal and fire performance, zoning, location and cost.

Insulation boards are secured to the substrate either directly with adhesive, with mechanical anchors / fixings, also known as dry fix or a combination of both.

The system designer should provide existing and proposed U-value (thermal) calculations to verify that the chosen insulation will meet the Building Regulation and/or clients requirements.

In addition to the U-value calculation, the system designer may also produce a condensation analysis as an indication that the addition of the thermal layer does not adversely affect the moisture transference and breathability of the overall wall construction.

5.02 Adhesive mortar



Adhesive mortars are used in conjunction with adhesively fixed systems or as a supplementary adhesive to mechanically fixed systems. Adhesive mortars are applied to the rear of the board in either a dot and dab method, with the perimeter of the board being coated, (typically with a minimum coverage of 40%) or with a serrated edge trowel to the entire back area of insulation board.

Not all EWI systems will require the use of an adhesive mortar and the system designer will advise accordingly, depending upon the exact circumstances of the project and any appropriate guarantees.

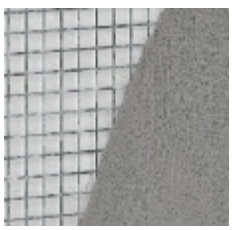
5.03 Mechanical anchors / fixings / fire-resistant fixings

Mechanical anchors form a key element of most EWI systems. Fixings are specified to suit the existing substrate, the height and shape of the building, its location and elevation, and proximity to other buildings.

Fixings should be specified by the system designer, and calculations made to check the pull-out value of the specified fixings. All mechanical anchor suppliers will provide printed literature with characteristic pull-out values and these can be used to specify the fixings; subject to the substrate being compliant with the standard substrates listed in the fixing data sheet. Best practice would be to check the on-site or sheathing board pull-out value and carry out wind and fixing analysis calculations based on these findings against localised conditions. This is the approved method to ensure the correct fixings and quantity are used.

It is then critical the correct specified quantity and pattern of fixings is used on site. When using dubbing or levelling coats, care should be taken to ensure that the minimum embedment depth of the fixing is maintained. In some cases a longer fixing maybe required. Fixings should be of an approved type, and should have a minimum washer diameter approved by the system designer. Note the NHBC requirement is for 1 fire-resistance fixing per board, not per m^2.

5.04 Reinforcing basecoats & reinforcing mesh / lath



Reinforcing basecoats are generally polymer modified cement or cement free based renders, and have been formulated to be thinner than standard sand and cement renders, whilst achieving an acceptable bond strength to the insulation boards, which is proven by testing.

These basecoats are weatherproof and can accommodate varying degrees of thermal movement; however, the inclusion of movement joints is advised, but this is project specific and further recommendations should be sought from the system designer.

Thicknesses will vary dependant on the EWI system, however general guidance would be for an overall minimum finished thickness of 5-8mm, which may be built up in a single or a double layer, with the inclusion of the reinforcing mesh.

Fabric reinforcing mesh should generally be installed in the top third of it's accompanying basecoat layer, whether this is the first layer within a double layer application or as part of a single layer application process.

Reinforcement basecoats are used to carry a mesh or reinforcement lath over the top of the insulation layer. The reinforcement layer can be used to enhance the overall weatherproofing, provide extra impact resistance to the system and assist with spreading all stresses across the façade surface into the insulation below.

Reinforcement basecoats vary considerably across the market for EWI systems; however, generally only a Alkali resistant / glass fibre reinforcing mesh is used with clay and flexible slips.

Thin coat polymer cement render with glass fibre mesh: clay / ceramic slips

- Many systems in the UK use this method.
- Typically 6mm-10mm thickness, although organic basecoats vary.
- Polymers used to improve strength and provide more effective stress transfer into mesh and insulation.
- Many reinforcement mortars are often the adhesive as well.
- Requires water and mixing.

Thin coat polymer render with glass fibre mesh: flexible slips

- Supplied ready mixed in pails.
- Typically 4mm-6mm thickness.
  Check with the system designer and their accreditation certificates.
- Flexible and highly impact resistant.
- To keep thickness lower substrate must be flat (EPS rasped).
- Check with the system designer for suitability over highly breathable insulation, such as mineral wool.
- Air-dried so needs protection in winter period (low temperature grades available).

It should be noted that higher levels of impact resistance can be achieved with higher density meshes, additional mesh layers or using non-cement based basecoats.

The requirement for the finishing of the surface of the basecoat, prior to the application of the slip adhesive, may vary depending upon the specification and the system designer's recommendations. This may include a sponged light finish or a light ribbed finish where an extra key may be required.

5.05 Slip adhesive

The slip adhesive is a key component as this adheres the slip itself to the basecoat. It is imperative that system designers specification is followed in its entirety when using the adhesive and the following should be complied with, although may not be limited to.

- Do not use the adhesive under the recommended minimum thickness.
- Do not use the adhesive above the recommended maximum thickness.
- Ensure that the adhesive is applied with the correct tools, such as a serrated trowel.
- Where instructed, ensure that any ribbons formed in the adhesive follow the correct vertical or horizontal formation, depending upon the orientation of the proposed slips.
- Only apply the adhesive to a small working area, as the drying of the adhesive will cause a reduction in the slip adhesion.
- The back of the slips should receive a full layer of adhesive, and therefore there should not be any gaps behind the slip.

5.06 Clay / Ceramic / Flexible slips

The range of slips used in conjunction with EWI systems are generally separated into the following three categories. Some lightweight slips are available on preformed wrapped grids.

Clay slips

Clay slips are either pre-formed slips to replicate standard bricks or cut faces of bricks to provide the slip. These slips are generally around 7-15mm in thickness and available in standard UK brick sizes in addition to some slips being available in alternative sizes.

Ceramic slips

Ceramic slips can be manufactured in a matt or glazed in appearance, and can be provided a wide range of colours, effects and sizes. Glazed tiles can also provide extra resistance to dirt pick up as it provides a surface that will disperse rainwater more quickly.

Flexible slips

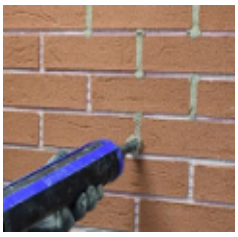
Flexible slips are manufactured from synthetic resin and / or mineral based materials to provide a thin lightweight alternative to brickwork. The moulded slips are designed to replicate traditional and modern brick facades, in addition to some system designers being able to offer a matching service.

Pistol / corner slips

With most brick slip systems, preformed pistol slips are supplied to form the external corners.

Each system designer will have its own range of slips which will have a specific criteria on the application, location, fire performance, and environmental suitability. The system designer will provide their best advice for the particular scheme and the most suitable solution whilst meeting the specification requirements of the project.

5.07 Pointing mortar / grouts



Pointing mortars or grouts are used to form the finished joints between the brick slips. For brick and ceramic slips, the pointing mortar is generally supplied as a bagged dry mix material, which requires the addition of water on site and then the application through a mortar gun. Some pointing mortars may be available ready mixed or for ceramic slips applied by a trowel and sponge.

For the flexible brick slip system the adhesive generally provides the pointing mortar and may be coloured to provide the mortar colour, or a specific ready mixed grout can be supplied.

5.08 Tracks, beads & trims

All EWI systems require the use of beads and trims. These will be dependant on the design and particular project. In general terms the beads, trims and roofline closure systems form the junctions to the system, therefore it is imperative that these are specified and installed correctly.

It should be noted that specific brick slip base tracks should be used with brick and ceramic slip systems.

Most beads and trims are available in UPVC, aluminium, galvanised or stainless steel and can also be polyester powder coated. High-rise buildings may require the use of metal only beads.

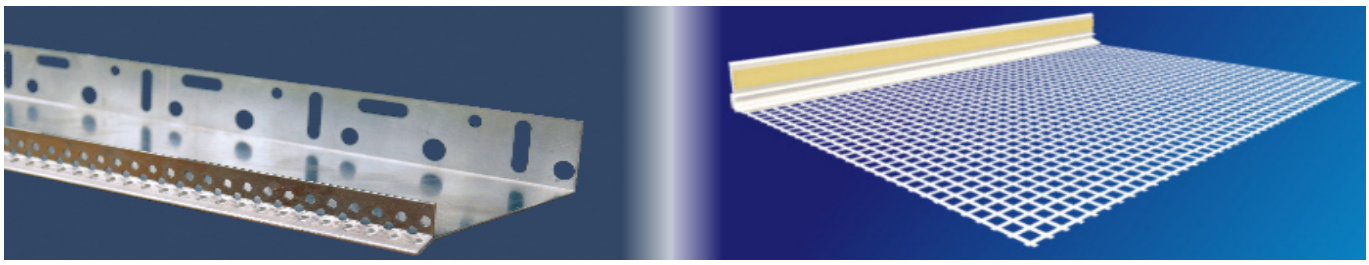
Key junctions such as starter tracks should always be present and elevations with large expansive areas of EWI should allow for movement joints or expansion beads. These beads should be in accordance with system designer guidance or replication where present in substrate.

Detailing of window reveals should indicate if a stop bead is required. Sills and flashings should be installed so that they provide sufficient overhang to shed water away from the face of the finished system. Best practice is for a minimum 40mm overhang to the throat or drip for standard exposure and 50mm for high exposure zones. For more information refer to ‘BS13914:1:2016’.

Detailing of these elements is critical, and if a detail occurs on site that requires bespoke-designed trims the installer should contact the system designer for advice.

In coastal locations, due to the increased airborne salts, it is recommended that stainless steel starter tracks are used, and exposed beads are either stainless steel or PVCu. Each system designer should be contacted to provide guidance for coastal applications.

Where the specification of the system or fire legislation recommends that all component parts outside of the tested system should meet a non-combustible class, then the use of PVCu beads, trims and will not be permitted. Other bespoke systems are available, however these additional items should be discussed with the client / owner, and costs adjusted.



5.09 Expanding foam hydrophobic sealing tapes

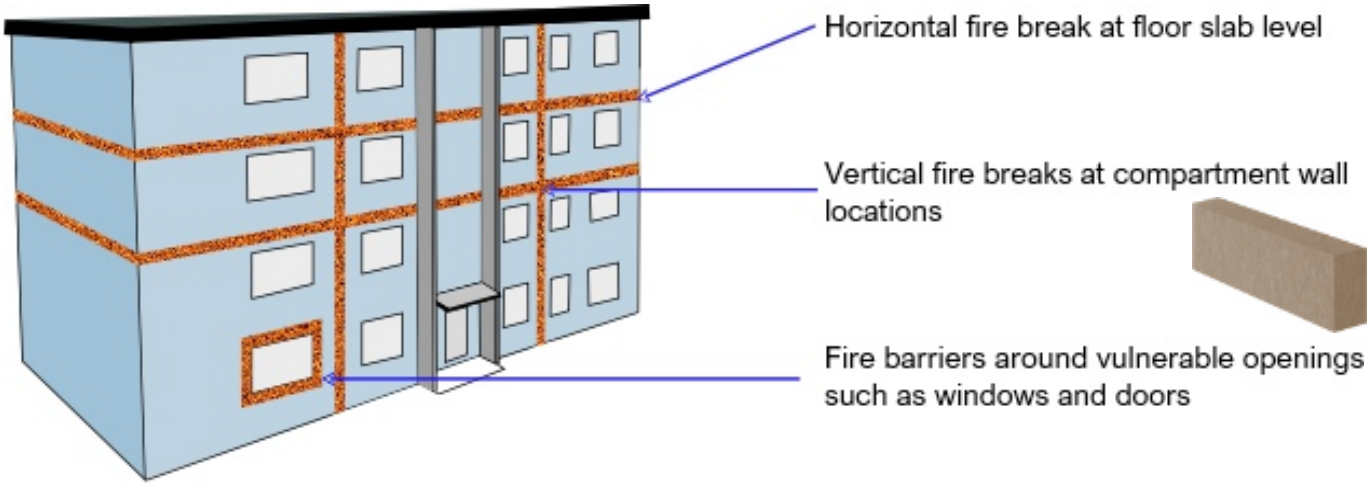
Expanding foam sealing tapes are used underneath window sills and at junctions with other components to help provide a watertight seal against moisture ingress, in addition to helping to accommodate slight movement between the EWI system and any other building element.

These tapes are manufactured from impregnated foam and provide effective protection against driving rain and draughts and can be considered a primary weather seal for an EWI system, whereby a silicone sealant would only be considered a secondary seal.

The foam tapes are installed in their compressed state and depending upon the exact tape itself, will expand to around 6mm or greater.

5.10 Fire breaks

Fire breaks are non-combustible elements designed to be incorporated horizontally or vertically within a Thermoplastic or Thermoset insulated EWI system, to prevent or limit external spread of fire between floor levels, over compartment lines or from one dwelling to another. Advice from the competent designer / fire engineer should be sought if using combustible materials to determine if fire breaks are required, and if so, their locations on the building in compliance with BR 135.



Typical example of fire break and fire barrier locations

5.11 Below dpc application

Brick slips can be used below the dpc level; however a break will be required where the dpc is located. It may be that the design will require a rendered finish to the plinth area and this can be provided with highly water resistant renders, applied typically in a single or dual coat method.

The system designer will advise on the most suitable solution they have based upon the issued project design details or PAS requirements.

5.12 Post installation fixings and securing points

There is a range of post-installation fixing and securing points for the retrofitting of light, medium weight and heavy fittings to the EWI system. These may well be specialist anchors, fixings including stainless steel or support tubes, and for use on buildings under 11 metres in height, insulated securing point pattresses which are manufactured from high density foams are available. Advice should be sought from a fire engineer regarding this.

5.13 Sealants

Sealants are an important part of the overall completion of the EWI system and some system designers will specify the type of sealant which is acceptable for use with their system. Sealants provide a secondary seal against moisture ingress and should be used in conjunction with a primary seal, where possible.

Always contact the system designer and sealant manufacturer for their recommendations and joint details.

5.14 Coatings

There are a wide range of coatings that can be used with bricks and brick slips; however, always contact the system designer for their recommendations, as the incorrect use a coating may invalidate any applicable warranties and fire requirements in addition to possibly causing issues with the system.

5.15 Other brick slip systems

There are a range of different types of brick slip systems and unfortunately this document is unable to provide detailed information on each of them. The most commonly used systems by INCA members are the ones set out in this document; however, we have provided a brief overview of other systems that are available.

Ribbed insulation systems

Ribbed systems utilise high density EPS with preformed ribs to allow for the installation of the clay or ceramic brick slips on a course by course level. An adhesive is generally used between the ribs and the brick slips are pressed firmly into place. Once the adhesive has set the pointing is applied in the traditional manor.

Metal sheet systems

Metal sheet systems are preformed with ribs designed for the clipping in of clay or ceramic brick slips on a course by course level. This system is not generally recognised as part of the EWI portfolio of the systems as they are more aligned to external cladding systems.

Mechanical bracket systems

Mechanical bracket systems utilise stainless steel rails with clips to enable the preformed brick slips to be located over the clips. These systems are usually applied to a suitable sheathing board and are not generally recognised as part of the EWI portfolio of the systems, as they is more aligned to external cladding systems.

Wrapped slip systems

Wrapped slip systems have a number of lightweight brick slips prefixed to a meshed panel which are pressed into an adhesive. Wrapped systems also have corner and soldier profiles prefixed to the mesh. The method for pointing this type of system is specified by the system manufacturer.

Modular slip systems

Modular slip systems is a recognised terminology but is not a system in itself, as they are a mix of the aforementioned systems, including those in this section, which are used in off-site manufacturing. Brick slip systems are a very popular finish for modular builds as they provide a seamless appearance once the units are installed on the site.

The key component within an EWI system is the insulation material itself and each insulation has its own installation requirements, in addition to the technical performances in relation to fire, (refer to individual system performance), the lambda value and vapour resistivity.

Its important to understand the advantages and disadvantages of each of the insulation boards used for the specific project it is being used on.

The system designer specification and accreditation for the system build up.

- Expanded Polystyrene (EPS)
- Mineral (Stone) Wool
- Phenolic (PfH)
- Polyisocyanurate (PIR) & Polyurethane (PUR)
- Extruded Polystyrene (XPS)
- Cork
- Wood Fibre
- Aerogel

6.01 Expanded polystyrene (EPS)

Product Description

Expanded Polystyrene (EPS) is a lightweight, rigid closed cell plastic foam insulation, which is a cost effective and easy-to-use insulation board for EWI applications. The structure of EPS insulation boards is 98% air, and therefore is deemed non closed-cell as a board. EPS is non-toxic, moisture resistant and rot proof and maintains its initial thermal properties throughout its working life.

Products Available

EPS insulation boards are available in both white and grey. The grey boards, which are also known as graphite enhanced, generally have a lower lambda value, therefore are slightly more thermally efficient than their white counterparts when compared at the same thickness. EPS boards are available in a wide range of thickness to achieve the thermal values required.

Advantages

- Lightweight and easy to install.
- Cost effective compared to other insulation products.
- Suitable for use on most buildings up to 11 metres, when used with suitable firebreaks.
- 100% recyclable.
- Durable and not affected by short-term exposure to UV or rain.
- The surface can be rasped to remove level differences in the boards.
- Can provide good thermal values and reduce board application thickness.
- Generally when used within an EWI system, has a Euroclass B classification.

Disadvantages

- EPS EWI systems despite containing fire retardants are restricted in their use.
- EPS has a Euroclass E fire Classification.
- The boards can be easily damaged prior to installation.
- Limited breathability and may present an increase risk of condensation with frame structures.

6.02 Mineral (Stone) wool

Product Description

Mineral (Stone) Wool insulation is manufactured from molten rock or silica sand, which is heated and blown to form thin fibres with binders and oils. The board is then compressed into slab form to provide good thermal properties, and superior fire resistant performance.

Products Available

Mineral Wool is available as single or a dual density slab, with a large range of thicknesses and varying thermal values.

Advantages

- Non-combustible insulation and can provide a Euroclass A1 or A2 classification.
- Open structure and breathable.
- Suitable for use on any height of building.
- Resistant to mould and mildew.
- Good acoustic performance.
- Can be recycled.

Disadvantages

- Mineral Wool is not biodegradable.
- Can be more costly than other types of insulation
- Greater thickness may be required to achieve U values equivalent to other insulation types.
- Should not be left exposed to the elements.

6.03 Phenolic (PhF)

Product Description

Phenolic foam insulation is a rigid, high thermal performance, thermoset insulation board which can achieve high thermal levels at reduced thicknesses. Phenolic foam is formed through a process of evaporation and has a paper coating on each side. Foil faced insulation is not suitable for EWI applications.

Products Available

Phenolic foam is available in a range of thicknesses, and the thermal conductivity of the product will vary depending upon the thickness of the board.

Advantages

- High levels of thermal performance.
- Suitable where reduced thicknesses of insulation are required.
- Lightweight.
- CFC and HCFC free.

Disadvantages

- Phenolic EWI systems despite containing retardants are classed as combustible and restricted in their use.
- Must be kept dry and not exposed for long periods of time to direct sunlight.
- Non-breathable and high toxicity in the event of a fire.

6.04 Polyisocyanurate (PIR) & polyurethane (PUR)

Product Description

Polyisocyanurate (PIR) & Polyurethane (PUR) are both rigid, closed cell foam insulation products derived from Polyurethane. The PIR product is a further development of PUR providing better thermal stability and flame resistance.

Both products provide good thermal values, with the PIR product generally performing slightly better.

Products Available

PIR & PUR are available in a range of thicknesses to provide low U-values.

Advantages

- High levels of thermal performance.
- Suitable where reduced thicknesses of insulation are required.

Disadvantages

- Although PIR is better than PUR with regard to fire, a PIR EWI system would still be deemed as combustible and therefore will have limitation in its application on buildings.
- Not suitable for use below the damp proof course level.
- Non-breathable and high toxicity in the event of a fire.

6.05 Extruded polystyrene (XPS)

Product Description

Extruded Polystyrene (XPS) is a rigid closed cell plastic foam, which can be produced with a high compressive strength, making it robust and highly resistant to water absorption. Although not used too often as a facade board as part of an EWI system, XPS is suitable for use below the damp proof course, line or when the when EWI Systems require taking down into the ground.

Products Available

XPS is available in a good range of thicknesses.

Advantages

- Suitable for applications below dpc level and into the ground.
- Lightweight and easy to install.
- High compressive strength.
- Very low water absorption.
- Superior load-bearing performance.
- Can provide a good K-values and reduce board application thickness.
- Generally when used within an EWI system, has a Euroclass B classification.

Disadvantages

- XPS EWI systems despite containing fire retardants are classed as combustible and are restricted in their use.
- More costly than standard EPS solutions.
- Chemical processing during manufacturing makes it less environmentally friendly.
- Non-breathable.

6.06 Cork

Product Description

Cork insulation is 100% natural with a cellular structure which makes it a natural insulator. Cork has natural fibre inhibitors making it fire-retardant, but still classified as a combustible system. Cork insulation is sustainable and suitable as part of a lime based EWI system due to its high levels of breathability.

Products Available

Cork EWI insulation systems are not as common as others, therefore there may be some limitations on the available thicknesses.

Advantages

- Eco Friendly.
- Breathable.
- Good acoustic performance.

Disadvantages

- Only suitable for low-rise properties.
- Can be easily damaged.

6.07 Wood fibre

Product Description

Wood fibre insulation is manufactured from waste material and doesn't contain the levels of petrochemicals that other insulation products do. Whilst wood fibre is deemed environmentally friendly, it's technical performance is inferior to other products when comparing thermal values and fire-resistance.

Products Available

A wide range of thicknesses are available.

Advantages

- Breathable.
- Manufactured from waste softwood.
- Good acoustic performance.
- Good thermal mass.

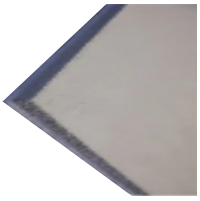
Disadvantages

- Only suitable for low-rise properties.
- Poor fire performance as wood fibre has a Euroclass E classification.
- Generally manufactured in Europe and not as cost effective as other systems.
- Combustible.
- Limited number of systems available.

6.08 Aerogel

Product Description

Aerogel is a new technology derived from NASA and is now just being introduced into EWI systems, but only on a very limited basis. Aerogel provides very high thermal values and very low thicknesses, but full testing of EWI systems incorporating this type of insulation is still ongoing.



Products Available

Very limited as this type of insulation is relatively new to EWI.

Advantages

- The lowest thermal conductivity of any solid insulating product of 0.015W/mK.
- Reduce thicknesses.
- Suitable for reducing thermal bridging around junctions and reveals.

Disadvantages

- Limited availability and not tested with many EWI systems.
- High cost.

Insulation Thermal Conductivity Comparison Table

Insulation Type	Thermal Conductivity
Expanded Polystyrene	0.030 - 0.040W/mK
Extruded Polystyrene	0.025 - 0.040W/mK
Phenolic	0.018 - 0.023W/mK
Polyisoctanurate (PIR)	0.021 - 0.027W/mK
Polyurethane (PUR)	0.025 - 0.035W/mK
Mineral (Stone) Wool	0.033 - 0.038W/mK
Cork	0.035 - 0.043W/mK
Wood Fibre	0.038 - 0.043W/mK
Aerogel	0.010 - 0.015W/mK

The above table is based upon information available at the time of production. Variations to the thermal conductivity table may occur from specific manufacturers and products and this information should only be used for guidance purposes only.

Please note that not all of the above insulation products are currently used with brick slips systems.

EWI systems are a set of component products designed to function as a system and therefore each component must be compatible with the others, and must perform together to the expected requirements with regard to the following:

- Thermally.
- Fire.
- Adhesively.
- Vapour resistance and breathability.
- Expansion and contraction.
- Hydrophobic.
- Flexural strength.
- Impact resistance

EWI system designers undertake a wide range of in-house and independent testing before a system reaches the market place. Confidence is further assured by independent third party accreditation along with UKTA certification.

7.01 Independent accreditation schemes

There are currently two main independent organisations that provide the independent accreditation certification for EWI systems within the UK. To provide an accredited certificate, the organisation themselves must be formally accredited by an accreditation body such as UKAS (United Kingdom Accreditation Service).

The accreditation process involves extensive testing and evaluation of data to ensure that the performance of the components that make up the system, and that of the system itself is suitable for use with regard to the Building Regulations, British Standards, best practice and the environment that they are intended for. Alongside this there are generally site audits to review the installation process and administration checks of the agreed chain supply.

The output from this evaluation is an independently issued certificate which will generally be valid for three years, whereby a further evaluation is required to maintain the certification.

Both the British Board of Agrement and KIWA can assist with the certification.

7.02 UKTA

UKTA (United Kingdom Technical Assessment) is a route for ETA's (European Technical Assessments) to be evaluated and reviewed for use in the UK, without the need to apply for a full accreditation. ETA certificates were commonly accepted pre-brexit but under the new rulings, a UKTA certificate will be required for non-harmonised products to achieve a UKCA (United Kingdom Conformity Assessment) marking, which is the UK version CE marking.

An additional mark UKNI may be used in Northern Ireland.

7.03 Approved installers

The installation of an EWI system should always be undertaken by a specialist external wall insulation installer, deemed competent by the system designer. Most system designers will have a list of approved installers around the country and many of these installers will have identification cards with their training status.

Some approval bodies run accredited installer schemes for those who wish to demonstrate a further level of competence.

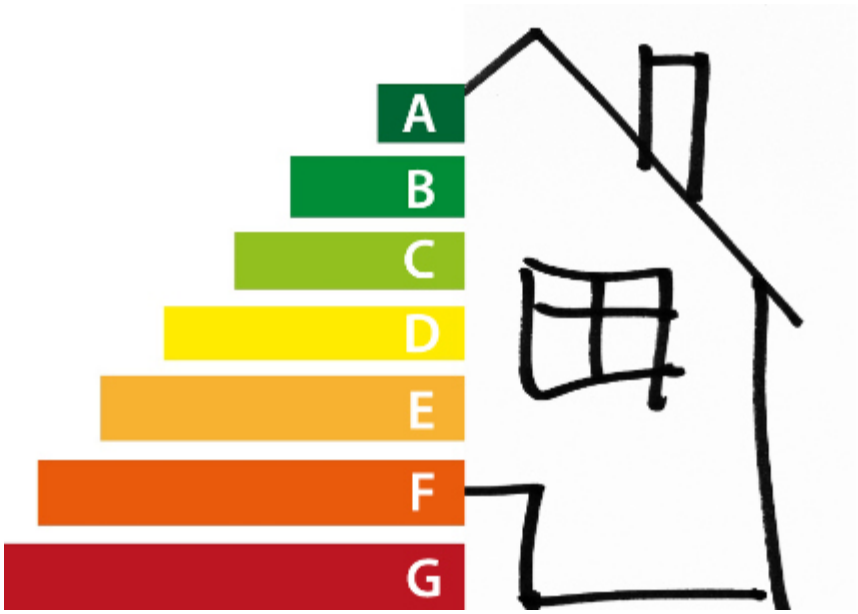
7.04 PAS (Publicy Available Specification) 2030

PAS 2030 is a British Standards Institute (BSI) standard, which establishes the requirements for installing, commissioning and handing over of energy efficiency measures, including EWI for retrofit projects. All installers who wish to be involved in the installation of EWI for publicly funded schemes, such as ECO must be assessed to PAS 2030 to access these schemes.

There are a number of organisations who can provide the PAS 2030 assessments and will also support an installer with documentation and processes.

In general the process will involve:

- A review of administration and quality management procedures.
- A review of works undertaken
- Overall compliance with the PAS 2035 framework



8.01 Pre-works inspections

Installer

The installation is to be completed by an approved installer organisation, using suitably skilled and experienced operatives. Operatives from the approved installer organisation must be trained, assessed and approved by the EWI system certificate holder / system designer for each specific system they apply.

The installer must hold any relevant current assessments, such as PAS 2030, should the scheme require these.

Site Survey, Pre-Installation Survey and Preliminary Work

Survey and preparation of the building is key to obtaining a successful specification and finished installation. If this is done incorrectly the success of the EWI system and / or the existing fabric will be at risk.

To correctly specify which insulation system to use, the existing or proposed wall construction should be determined and understood, to allow an U-Value to be calculated meeting the requirements of the Building Regulations Approved Document Part L, along with an interstitial condensation calculation to be performed. Where required, a more comprehensive, WUFI modelling calculation can be undertaken, especially at areas where thermal bridging may occur.

Ensure that appropriate wind loading calculations have been undertaken in addition to a substrate assessment for the pull out of the EWI system fixings.

For refurbishment projects a structural assessment by a suitably qualified person should be undertaken, to ensure the substrate is capable of taking the fixing and loads, to determine what remedial work needs to be carried out (if required) prior to the EWI Installation starting.

For new build schemes it is important to review all available detail drawings to ensure that there are no issues with junctions and that the EWI system can be adequately installed to the designers proposals.

Preparing the substrate in order to receive the chosen EWI system is extremely important, if the substrate is not prepared to receive the chosen system as intended then this can have severe implications on the performance and aesthetics of the system i.e. if the wall is not straight or plumb then the overall finish will not be straight or plumb as the system will follow the contour of the existing substrate.

It is always recommended that a minimum of the following is undertaken prior to the application of an EWI system (Refurbishment):

- Check for rising damp and the causes.
- Check for existing movement joints and make provision to reflect this in the new installation.
- Check for efflorescence (lime bloom) and treat accordingly,
- Test the walls for any defects, including wall ties.
- Test the existing substrate for pull out loads so that fixing type and quantities can be determined.
- Carry out a line and level survey to determine if a dubbing out or levelling coat is required.
- Remove moss, lichen, mould, and treat with an anti-fungicidal wash if required.
- Identify any unusual detailing issues.
- Determine if any architectural features need preserving or re-replicating in order to be

repositioned and placed within / on the new EWI system.
- Evaluate access to the property, heights of the building and security of tenants.
- Contact the local planning department to evaluate if planning permission is required, particularly if the property is situated in a conservation area or area of outstanding natural beauty or if the property is listed etc.
- Position of fire barriers if using a combustible insulation.
- Check that high-rise building have received BSR approval.
- Contact local building control authority, unless using an installer organisation who is part of a SWI Person Scheme (CPS) who can self certify their work complies with building regulations without the need for a separate assessment by building control.
- Discuss brick slip colours and textures with the client / interested parties.
- Ensure that the contractor is aware that the eaves and roof zone should have adequate insulation to avoid thermal bridging at these junctions
- Evaluate the need for repositioning of or temporary removal and / or extension of services such as overhead electricity, TV, telephone and broadband connections / equipment, gas or oil pipe work, electricity or gas meters, lights, rainwater goods etc.

It is always recommended that a minimum of the following is undertaken prior to the application of an EWI system (New Build):-

- It is advisable to attend site to check on the condition of the build prior to commencing works, to ensure that any unforeseen issues can be identified and rectified.
- Ensure that all design details have been reviewed and if required, specific details have been issued to the design team for non standard situations.
- Check the substrate specification for suitability and fixing pull out test information obtained.
- Where a sheathing board may be involved, check on the suitability, line and level, especially at floor zones and that it has been installed to the manufacturer's recommendations.
- Carry out a line and level survey to determine if a dubbing out or levelling coat is required.
- Check that deflection and movement has been accounted for in frame structures and allowed for in the design.
- Check that high-rise building have received BSR approval.

Once the design review and surveys has been completed, drawings and specifications for each elevation that is to receive an EWI system are to be prepared and instigated prior to the project starting.

The drawings and specification would include some or all of the following:

- Position of starter tracks and beads.
- Position and amount of reinforcement scrim, corner mesh and scrim patches for corners / corners of openings.
- Detailing around doors, windows, eaves, penetrations, projecting balconies, coping details and special details such as abutments, extensions (robust standard solution / typical design details are available from the system certificate holder / system designer).
- Damp proof course level and detailing.
- Location and type of weather seals to be used.
- Areas where silicone sealants are to be used.
- Type of system to specify.
- Location of movement joints.
- Location and positioning of beads and trims.
- Window, door sills and flashing details.

- Architectural features i.e. quoins, external cornicing , stringers, keystones, window headers, window sills, window architraves , corbels, arches, flat bands, raised or recessed bands, ashlar cuts and columns etc.
- Coping details and special details such as abutments, extensions.
- Attachments such as gates and fences, clothes lines and satellite dishes.
- Any bespoke thermal bridging details.
- Any below damp proof course details.

The EWI systems should be continuous, as any breaks can cause a thermal bridge and junctions are a potential weak zone for moisture ingress. It is encouraged that the system designer engages with the installer and the site, to provide site inspections on the installed system.

Utilities and Services

Where existing services require moving, replacing or repositioning, then this should only be undertaken by suitably qualified personnel, with service provider permission. It is important that these measures are well planned, as there can be a delay in the works, in addition to potential extra design detailing to accommodate the requirements of the utility / service company.

8.02 Cleaning and pre-treaments of the substrate

Before applying an EWI system, the wall should also be checked for dirt, grime, algae etc, and measures taken to clean the surface. Once cleaned with a power washer, and if required mild detergent, the wall should be allowed to fully dry out. Once dry the wall is ready to accept the EWI system, or (if specified) a primer, to allow for increased adhesion for adhesive renders.

New build substrates should be cleaned down to remove any dirt, dust or debris, especially anything that may affect the adhesion of an adhesive only or mechanically fixed system with supplementary adhesive.

8.03 Checking existing render finishes

If a building has an existing rendered finish, guidance from the system designer should be sought. If the render is in a poor condition, then it is best practice to remove the render using a hammer drill. If areas of render are thought to be loose then these should also be hammer tested and render removed locally. Any rendered areas that have been removed, should be made good in accordance with the system designers recommendations.

Guidance should always be sought from the system designer in case the existing render is damaging the existing wall by trapping water, transmitting damp, and not allowing the existing building to breathe.

8.04 Pull-out testing of mechanical anchors

Prior to commencing a project, it is recommended that pull-out tests for specified fixings are undertaken. In discussion with the system designer and fixing manufacturer, it may be that the fixings used into a common solid wall can be accepted by the approved technical tabulated data; however, good practice is to ensure that mechanical anchors / fixings are checked for Suitability. Pull-out tests are carried out using a Hydrajaws fixing tester, or similar, to test the load or pull out value of the fixing. It is recommended that a minimum of 15 tests are carried out per substrate type, or an acceptable spread of results for larger projects. Allow for a suitable period of time for these tests to be completed.

8.05 Pull-off testing for adhesive fixed systems

The test is to measure the maximum tensile strength of the overlying materials on the substrate and to provide evidence to assist with the number of fixings used and their pattern. The test sample is subjected to increasing tensile stress until failure occurs. The weakest path could be along an interface between two layers or a cohesive fracture within one layer or a combination of these.

The test method is generally seen to be conducted using a 50mm diameter plate with the adhesive render applied, to which a load measure is applied and the pull off value taken at failure. This test should be undertaken when using adhesive only fixed systems, or where fixings are used the assessment is on the fixings only and the adhesive is supplementary.

8.06 Working sequences

It is crucial that an installer plans the working sequence in line with site requirements, resource, system specification, and weather conditions. Combustible insulation must be stored away from the building.

Checks should be made on the line and level of any existing building, and recommendations made to the client. Should it be found that, if directly fixed, the system will suffer due to the uneven surface of the wall, this should be noted prior to commencement of works.

The site operatives should familiarise themselves with the project specification and details prior to works commencing. An assessment of the building should be undertaken to ensure all relevant details have been provided, and reviewed. Should there be reason for additional details, then the installer should notify the system designer for advice.

At the completion of each day's work, or whenever work is interrupted for extended periods of time, board edges and joints should be protected from inclement weather .In addition to the normal reasons why works may be interrupted, such as weekends, public holidays, programming considerations etc. adverse weather conditions can also be a factor.

Some components of EWI systems have limitations on temperatures between which they can be installed, and additional requirements which can involve limiting exposure to precipitation or strong sunlight during installation to control rates of drying, or prevent excess moisture being trapped within the system. Therefore, to protect unfinished systems during a break in works, or from on-going adverse weather conditions temporary weather protection may be required to protect installed components which are not fully weatherproofed.

The precise nature of this protection may vary depending on the cause of the requirement for the temporary protection (e.g. to provide shading, or to protect from precipitation). The area of system required to be protected and the expected timescale over which it would be expected should be identified before the protection is provided. Typical protection may include the use of items such as opaque tarpaulin / damp proof membranes or rolls of nylon-reinforced polyethylene plastic, which is temporarily restrained to the structure or scaffolding. In practical terms the actual protection provided will vary based upon the specific nature of the project and construction site, and responsibility in this regard should be managed by the project team in consultation with the EWI system designer.

Basecoat application should only be carried out when the weather is fine and free from rain. It is recommended to carry out a daily check on the weather forecast, for a minimum of 48 hours.

Cementitous basecoat render application should be in one or two coats and incorporate a scrim reinforcement layer and be completed with a finishing coat. All render coats should be strictly applied in accordance with the system supplier's accreditation and their current application guidance, paying particular attention to thickness and cure times between layers.

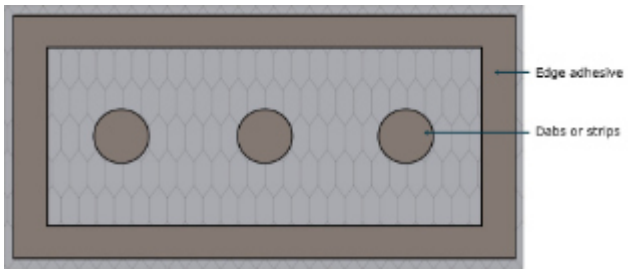
Minimum total render thicknesses should not generally drop below 6mm. However, this advice is not intended to supersede or negate existing advice from the system certificate holders / system designers / suppliers.

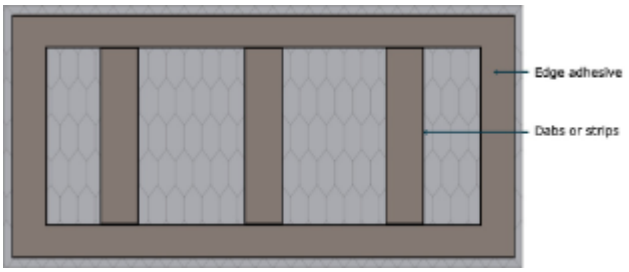
Adhesive coats should be applied out of direct sunlight, and shielded from direct heavy winds, to prevent skimming of the adhesive surface.

8.07 Bonding of insulation

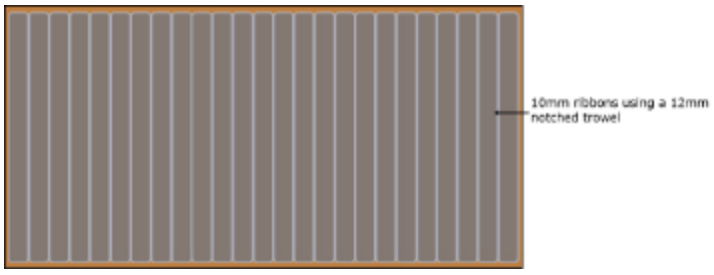
Boarding works should only take place in dry conditions, and boards should be protected from adverse weather, direct sunlight and possible impact damage. Care should be taken when moving the boards, not to damage the surface or the edges and damaged boards should not be used unless as a short cut, where the damage area can be discarded.

If required, adhesive mortar should be applied to the reverse of the board in either a picture frame method, with dabs or strips, with a recommended minimum coverage of 40%.





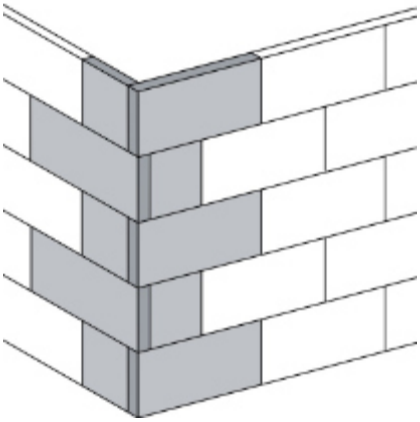
or a full bond method using a serrated / notched trowel.



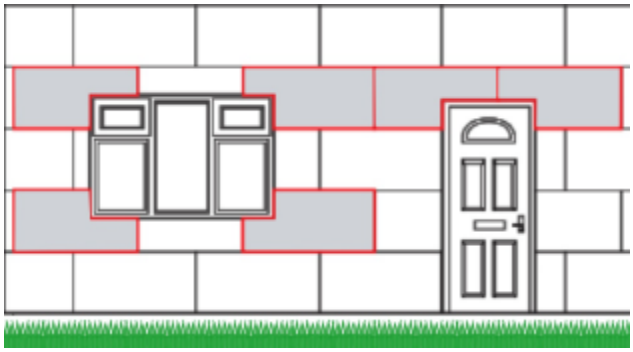
Adhesive methodologies are subject to the system designer's recommendations.

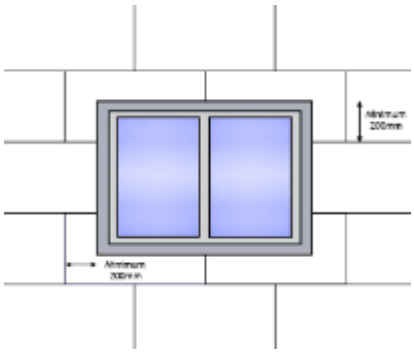
Note: Each board should be sealed with no continuous cavities and with no adhesive on the edge of the boards.

Boards should be laid in a staggered pattern, and should be staggered at the internal and external corners of buildings, so that they form a toothed finish, to prevent the possibility of straight-line cracking from occurring.



Generally boards should be cut in a L-Shape around the corners of all openings, and small cuts of boards should not be allowed. Minimum cuts will vary from system supplier; however, it would be best practice to limit cuts to a minimum of 200mm.





Gaps between the boards should be avoided; however, if there are gaps, then these should be filled with slivers of the insulation or if absolutely necessary for Thermoset and Thermoplastic insulation boards only, the use of a suitable fire retardant expanding foam is permitted.

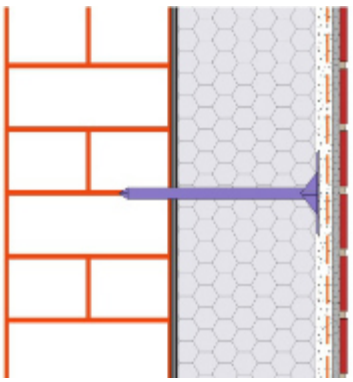
Boards should be level so that the basecoat and decorative finish are installed on a flat true surface. Levelling of boards can be undertaken with adhesive renders or dubbing out renders, and should be assessed at contract stage and allowed for within the contract costs. For expanded polystyrene boards the surface of the boards can be rasped to eliminate small steps at the edges of the boards. If rasping does take place, then all the surface EPS dust must be removed prior to the application of the basecoat.

8.08 Fixing of insulation

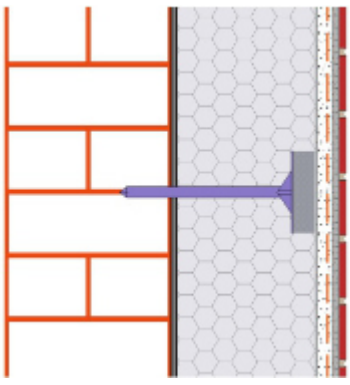
Mechanical anchors must be as those specified within the project specification, and must comply with the system designers project specific fixing pattern. Fixings should be installed at a true 90^{o} angle from the wall face, with the washer head sitting flush and not over compressed into, or proud of the board surface. Fixings that are seen to be installed at an angle should be assessed and may have to be discounted and additional fixings installed.

Some EWI systems incorporate recessed fixings, the head of which will sit approximately 20mm into the insulation, with these types of fixings an insulation plug should be installed flush with the board over the hole created by the recessing process. Recessed fixings are not suitable for dual density mineral wool insulation without suitable over-washers.

Fixing set flush to the surface



Fixing recessed into in the insulation



8.09 Basecoat application

Basecoat application should only be carried out when the weather is fine and free from rain. It is recommended to carryout a daily check on the weather forecast, for a minimum of 48 hours prior to the proposed application of the system.

The basecoat should be applied in strict accordance with the system designers specification or technical documentation, and should never have a thickness below the minimum or above the maximum stated.

Depending upon the system designer's technical requirements, the basecoat may be applied in a single or double layer, with the incorporation of the glass fibre reinforcing mesh and should be finished level and and true with any ridges removed, unless a comb line is required by the system designer.

Ensure that the basecoat is left for the required number of days to dry, before the application of the primer or subsequent layer.

8.10 Glass fibre reinforcing mesh

The application of any mesh should take place at the first basecoat stage, when using a thin coat system. Meshes for the thick coat systems can also be of metal lath type and are fixed to the insulation prior to first basecoat.

Polypropylene or glass fibre meshes should be installed into the wet basecoat, using the back of a steel trowel and pushed in, so that they sit in the top third of the applied thickness. Meshes should be continuous, and should have a minimum 100mm overlap with the adjacent mesh. Any meshes that are integral to beads and trims should also allow for 100mm lapping. This ensures strength and continuity of the basecoat.

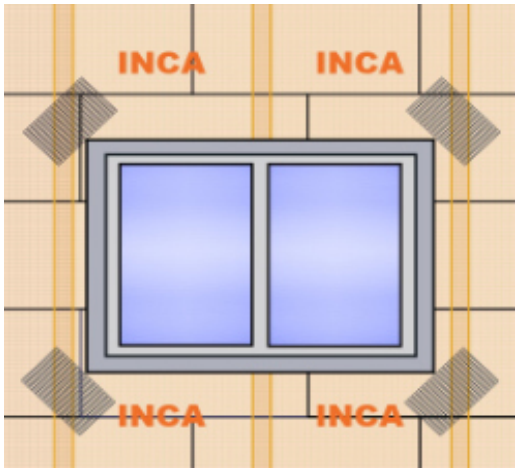
Reinforcing mesh should be applied without any ridges and ideally with any company branding name facing outwards or mesh without branding being installed so the mesh does not curve outwards when trowelled into the basecoat.

A second basecoat is then applied, and there should be no visual sign of the mesh once this is applied.

8.11 Reinforcing mesh stress patches

Reinforcing mesh stress patches must be installed at the corners of all openings to help provide greater resistance to stress cracking. The size of the reinforcing patch will be dependent upon the system designer's specification and it is important that any stress patches are not below the minimum specification.

All patches should be installed at a 45^{o} angle and be free of ridges and wrinkles.



8.12 Brick slip adhesive

Once the basecoat has been applied, it should be left to cure in its appropriate state to receive the adhesive application and this should only be carried out when the weather is fine and free from rain. Always check the system designer's specification as these can vary and may require the application of a primer. If a primer is required then follow the system designer's instructions fully and allow the primer to dry before continuing works.

Generally the brick slip adhesive is applied vertically to the basecoat with a serrated trowel. The size of the serrated trowel should be specified by the system designer, especially with the difference between the application of a clay or ceramic slip, which may require a large size serration compared to the flexible slips. With clay and ceramic slips, ensure that the adhesive does not protrude through the brick slip joints, so that it can affect the application of the pointing mortar.

Where specified, apply an adhesive layer to the reverse of the slip before firmly pressing the slips into the adhesive ensuring that a full contact is achieved. There should not be any gaps around the edges of the slips.

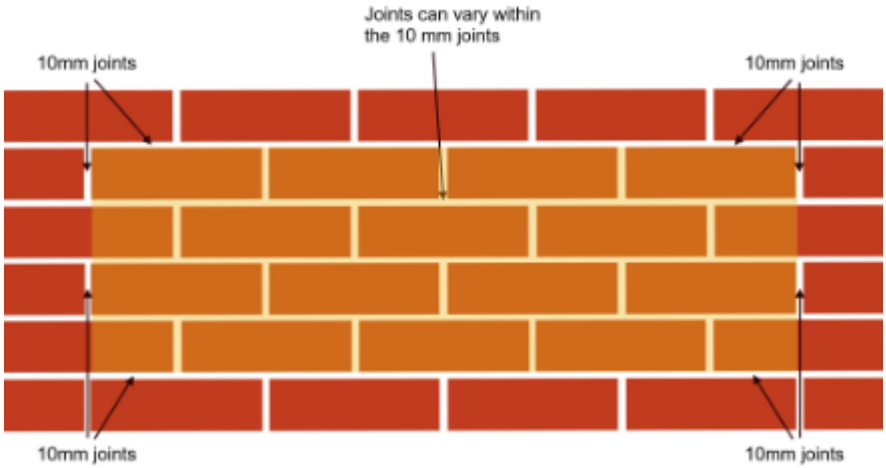
Where soldier courses are installed, it might be required that the application of the adhesive should be in a horizontal direction to allow for more contact on the surface of the slip.

8.13 Installing the slips

Its good practice to mix up the slips of the same colour as this will help keep a random nature to the facade as certain slips can have variations in the texture and colour as part of the manufacturing process.

It is important to plan the position of the slips and the joint alignment, especially around openings, features and soldier courses before commencing the installation.

Below is the setting out of the slips using a 4 x 4 methodology.



Set out to a working gauge of 4 slips horizontally and vertically, ensuring that these joints are at a width of 10mm. The 3-4 joints in between then can be set at varying thicknesses to

compensate, but these joints should ideally be a minimum of 8mm and a maximum of 12mm, but generally try and keep them to 9-11mm. The 4 x 4 setting out is the optimum method to create a uniform visual appearance as this creates an optical uniformity. Depending upon the design, it may be better to work from one corner to another.

All vertical and horizontal joints must be maintained in a straight line, failure to do this with the vertical perp joints will lead to a visual bending in the joints, whilst a dipping or rising in the horizontal joints will be seen.

For clay and ceramic slip systems, always use the appropriate packers to form the correct size joints and this may require the use of multiple size packers. These are colour coded for ease of use and should be remove only once the adhesive has set.

With the flexible slips system plastic spacers can be used to form the joint widths.

8.14 Flexible slip pointing

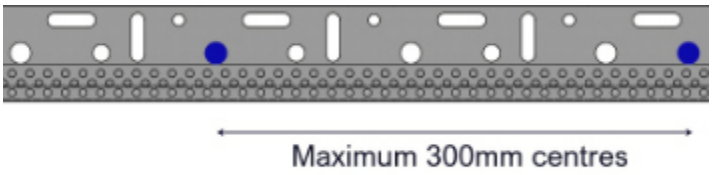
The adhesive for the flexible slips is generally used as the pointing mortar, and should be formed immediately, using a flat, dampened small brush, the size of which should suit the joint width. Clean away any excess material immediately.

8.15 Clay & Ceramic slip pointing

Clay and ceramic slips can be pointed in the traditional method using a specified gun grade pointing mortar. This should be struck using a suitable tool to provide the desired joint. Clean away any excess material immediately.

8.16 Tracks, beads and trims

All tracks, beads and trims should be in accordance with the system designer's specification or written requirements. Base tracks and system stop profiles should be fixed at 300mm maximum centres with a fixing installed at the edge of each single profile.



When using a clay or ceramic slips system, then it will be necessary to use a Brick Slip Base profile. These profiles have a lip edge to allow for the depth of the slips in addition to extra support.

All profiles should be installed straight and checked constantly for their level. Where required use plastic connectors between base rails to prevent over-riding. All trims should be butt jointed where installation instructions dictate and connection pieces should always be used if supplied.

Good practice would be to mitre cut the internal and external corners and not overlap the tracks as this can cause alignment issues and difficulties with the clip on profiles.

Where roof closure systems are to be used, it is imperative that a long-term watertight seal is provided and if a specific system is to be installed, please ensure that all the installation instructions are followed correctly.

If there is not a suitable trim to overcome a particular site situation, then a bespoke watertight profile and closure system design should be designed and manufactured.

8.17 Sealants, foam bands and junctions

Where possible specific window beads and powder coated system stop profiles should be used, where this is not possible the use of a low modulus neutral cure external grade silicone sealant can provide an adequate secondary weather seal. Where mastic sealant is used around windows, sills or other trims, a primary weather seal strip, such as an expanding foam tape should be installed first. Mastic sealants generally require replacing after a few years and therefore can be considered an ongoing maintenance issue.

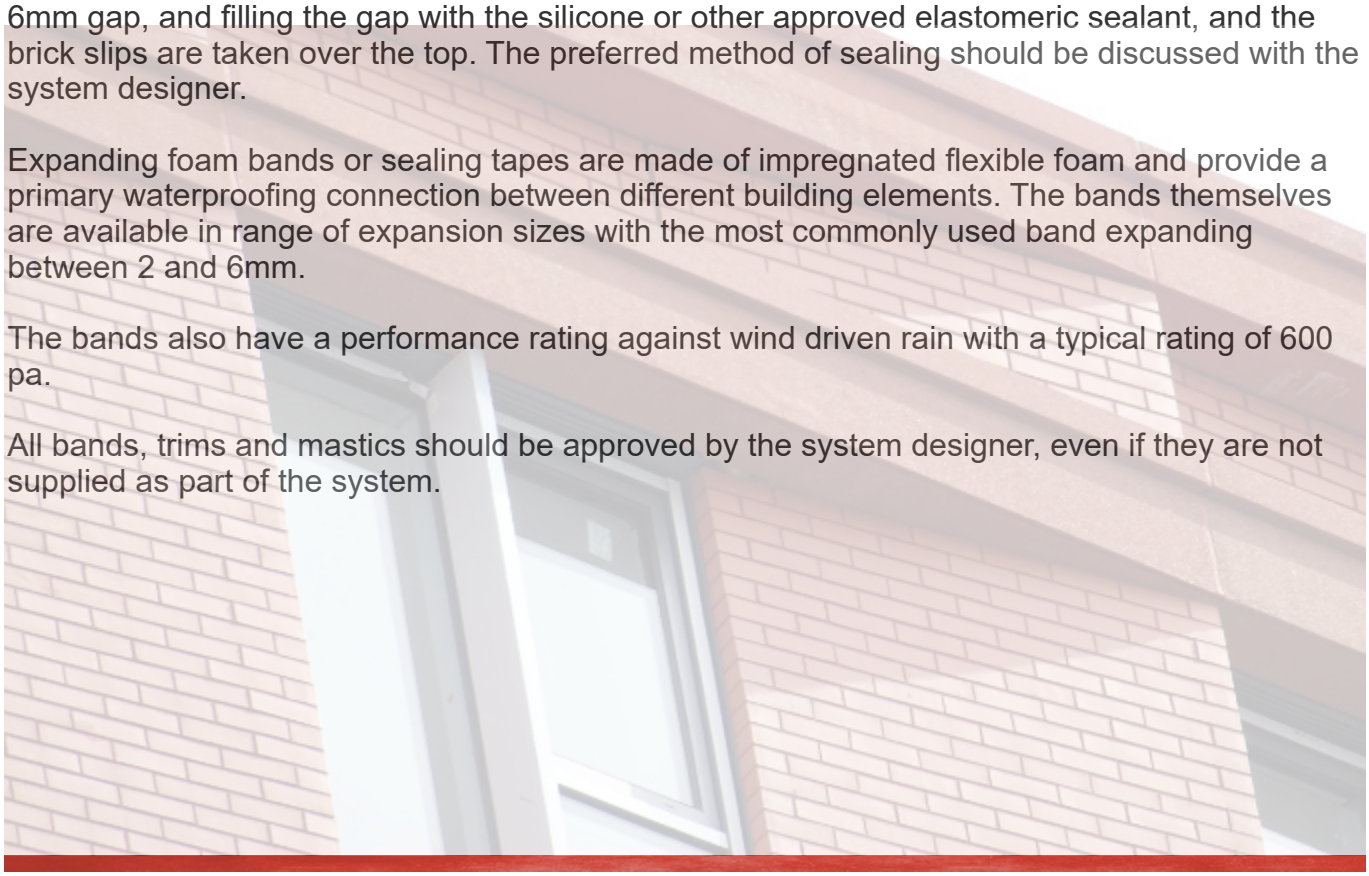
Low modulus silicone sealant offers less resistance when stretched making it a better choice for areas between dissimilar materials which move at different rates.

Silicone mastic sealants can be installed either ‘within’ the brick slip finish or as detailed by the sealant manufacturer. General good practice would be to apply the silicone into a prepared 5 / 6mm gap, and filling the gap with the silicone or other approved elastomeric sealant, and the brick slips are taken over the top. The preferred method of sealing should be discussed with the system designer.

Expanding foam bands or sealing tapes are made of impregnated flexible foam and provide a primary waterproofing connection between different building elements. The bands themselves are available in range of expansion sizes with the most commonly used band expanding between 2 and 6mm.

The bands also have a performance rating against wind driven rain with a typical rating of 600 pa.

All bands, trims and mastics should be approved by the system designer, even if they are not supplied as part of the system.



This section provides generic details of the installation of an external wall insulation, and should be used as a baseline for best practice. The following details aim to provide a consistent approach to on-site installation and also aims to promote good workmanship.

Always refer to the system designer's details for a project, as they may well look to improve on these generic details, but also use these as a minimum for the installation of the system.

All these details are indicated using mechanical fixings and an adhesive bond, but these details can be transposed to mechanically fixed only and adhesive only systems. Whilst this best practice guide also refers to the direct application to a framed structure, details showing this have not been included in this edition, but many of the details can be used with this type of application.

For direct application to framed structures, it is important that a full set of design details is obtained from the system designer.

All substrates and structures shown within these details are indicative only and should not be

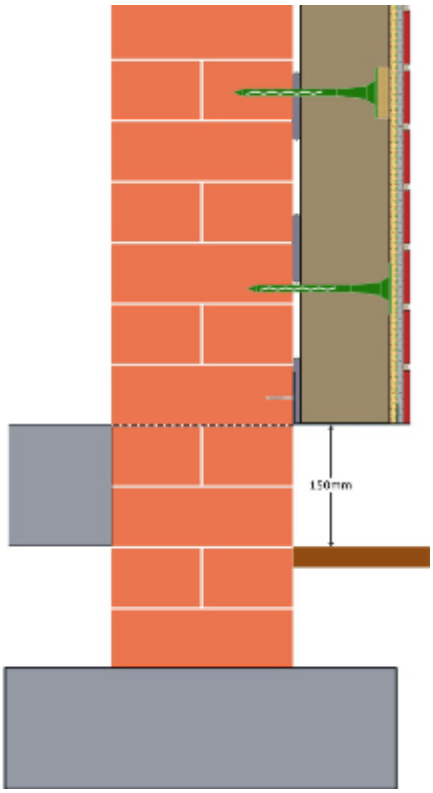
Plinth and Starter Tracks

An external wall insulation system, can either be adhesive only, adhesive and mechanically fixed or mechanically fixed only, and this is dependent upon the individual system designer.

The specified starter track should be installed at dpc level or at a suitable level identified upon the project drawings. Starter tracks should be installed against a flat surface; however, the use of packers can be used for uneven substrates, but there should not be an open gap left between the substrate surface and the starter track. Alternatively dub out the substrate to a flat surface to enable full contact of the starter track.

Starter tracks should be set at a minimum of 150mm above the ground level or above the dpc line on a sloping site, to help prevent discolouration from rainwater splash-back from the ground. Where this is not possible, the system can be taken down to 10mm from the ground and it is recommended that a gravel trap or suitable drain is provided to assist with the dispersion of the localised water.

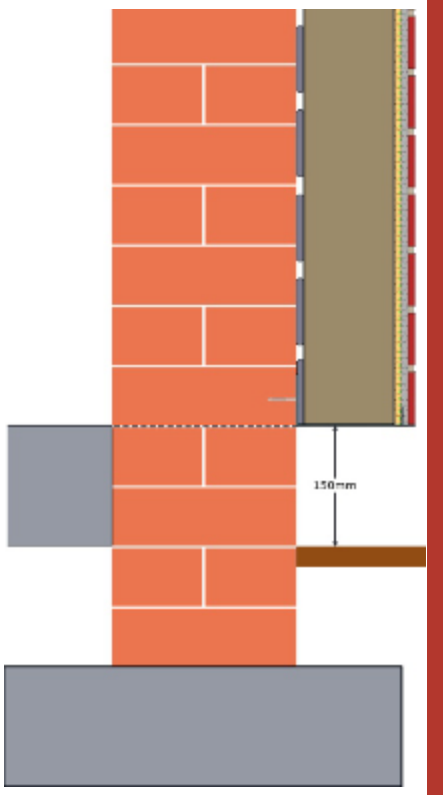
DPCs should not be bridged by the EWI system, and where properties do not have a dpc, it is recommended that the substrate is reviewed for the installation of an injection dpc before any works continue.



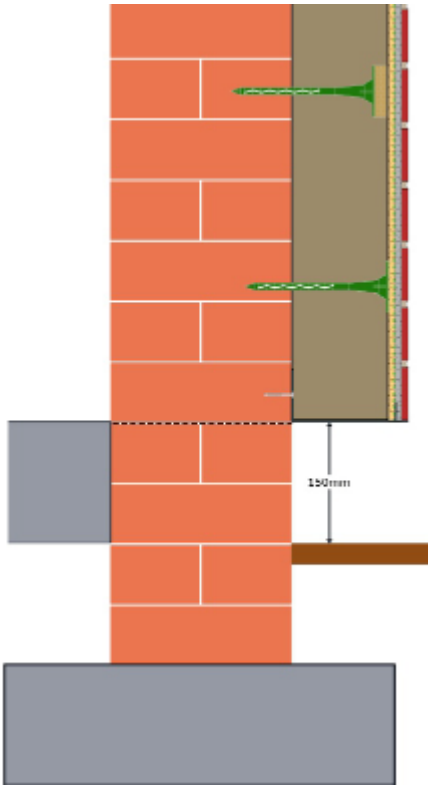
Detail 01 - adhesive / mechanical fixed system - Plinth

For insulation below the dpc, the insulation must have low moisture uptake properties and the thickness can be less than the main insulation, or the same thickness if to comply with PAS2035. With either solution an adequate drip should be formed to help maintain the appearance.

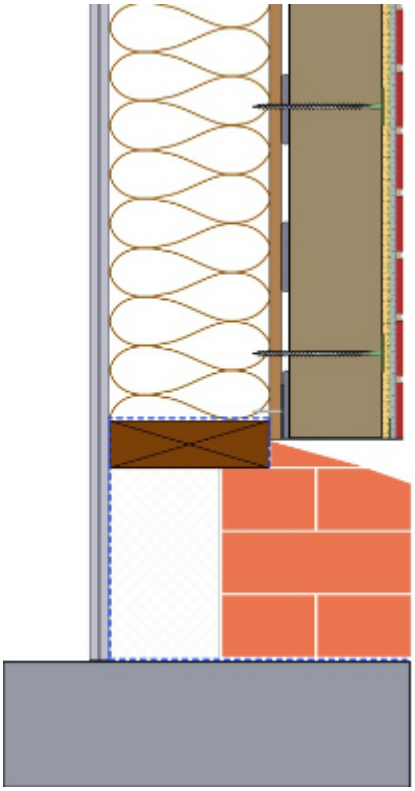
It is recommended that the area adjacent to the plinth is removed of any grass, or soil, and replaced with paving slabs, brick paving, stone chippings, and if the water content of the ground is high, an allowance for a land drain or soak away should be considered.



Detail 02 - adhesive only system

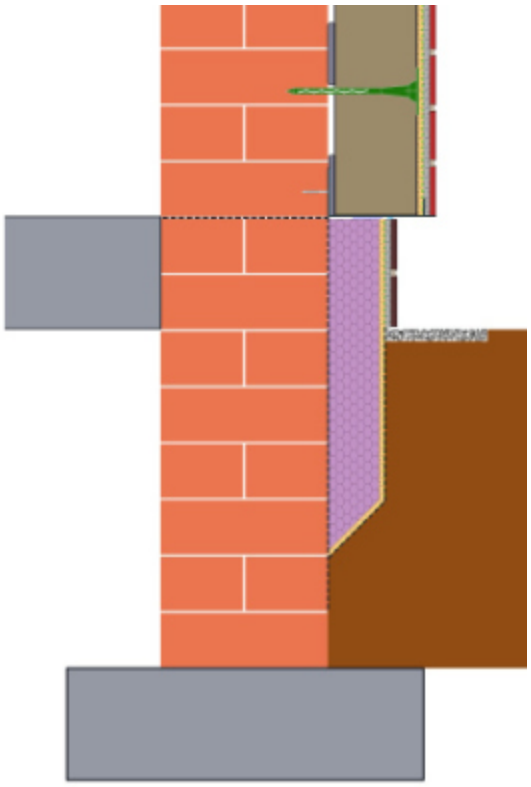


Detail 03 - mechanically fixed system



Detail 04 - directly fixed to a framed structure

Plinth detail with insulation taken into the ground



For insulation below the dpc, it is recommended that the insulation thickness is less than the main insulation, to create a step and drip between the two elements. It is also recommended that the plinth insulation board has low moisture uptake properties, and is suitable for use below the ground.

It is advisable that the area adjacent to the plinth is removed of any grass, or soil, and replaced with paving slabs, brick paving, stone chippings, and if the water content of the ground is high, an allowance for a land drain or soak away should be considered.

The system designer should be consulted regarding their requirements for the type of finish to be used on the plinth insulation board, as this may may be a specialist render or alternative brick slip finish..

Detail 05 - EWI system taken below the ground level

Window Sills

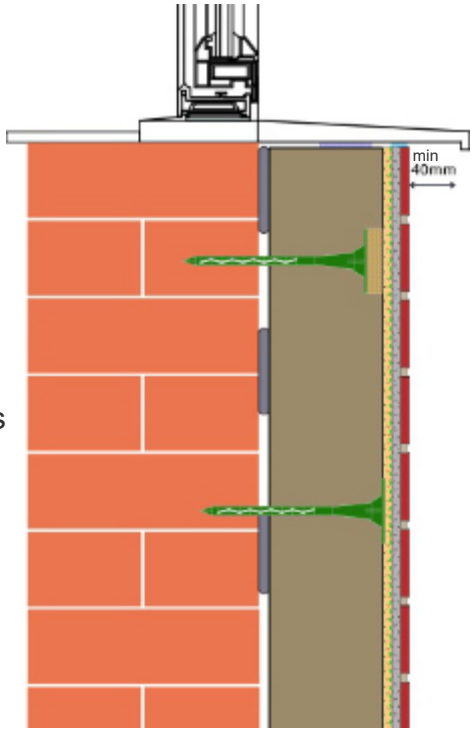
New sills

Should the project incorporate new replacement windows, the frames and sills should be designed to take account of the thickness of the EWI system to be applied.

Any new sills should be sized so that they allow for a min 40mm (50mm in exposed areas) overhang to the face of the finished EWI system, and all new windows should be installed prior to the installation of the EWI system. Refer to BS13914 : 1:2016.

It is recommended that the EWI system is taken over the edges of the sill and frame, so that the lapping provides a sound seal, low modulus silicone mastic or similar should be applied (see reveal details).

Some specialist sills are available, which are designed to be installed during the EWI installation process, where these are to be used then the manufacturer's installation instructions must be followed in addition to confirmation from the system designer of the suitability of the sill.



Detail 06 - new integral window sill

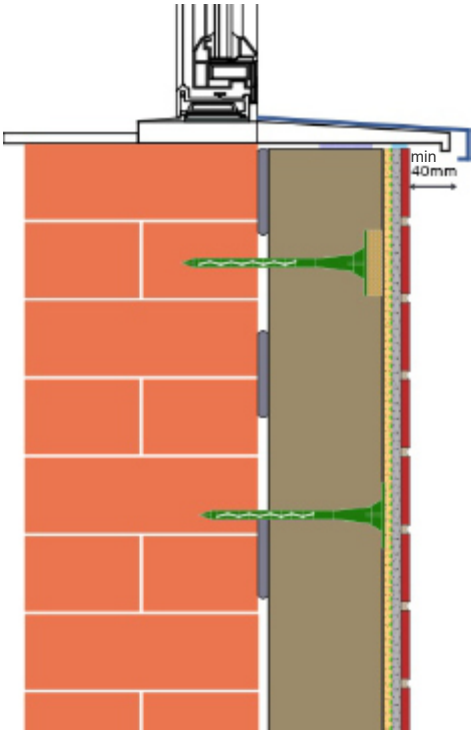
New over sills

Should the project retain the existing windows, it is generally noted that the existing sills will have an insufficient overhang to allow for a adequate shedding of water away from the face of the finished system

Should this be the case, then a new over sill profile can be installed. These should be cut to suit each window, and ideally have upstand wings, to enable the render to overlap and provide a weather tight seal. The sills should be installed so that there is a minimum of 40mm (50mm in exposed areas) overhang from the face of the finished system. Refer to BS13914:1:2016.

All junctions should be finished with a low modulus silicone mastic seal or similar. (see reveal details).

Note:
When installing any over sill profile, it is important to consider existing weep hole frame drainage, and the frame should be either drilled to create new weep holes, or the under sill (detail 8) should be used. Any retrospective drill holes should not be in line with the windows internal weep holes to avoid water penetration to the inside.



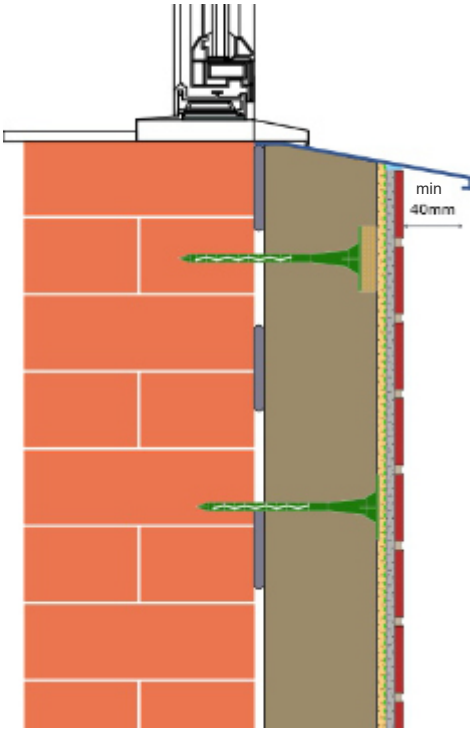
Detail 07 - new over sill

Window Sills

New under sills

Should the project retain the existing windows, it is generally noted that the existing sills will have an insufficient overhang to allow for a adequate shedding of water away from the face of the finished system.

Should this be the case, then a new under sill profile can be installed. These should be cut to suit each window, and be mechanically fixed to the substrate. There should be a minimum of 40mm (50mm in exposed areas) overhang created from the face of the finished brick slip and any junctions should be finished with a low modulus silicone mastic or similar sealant. Refer to BS13914:1:2016.



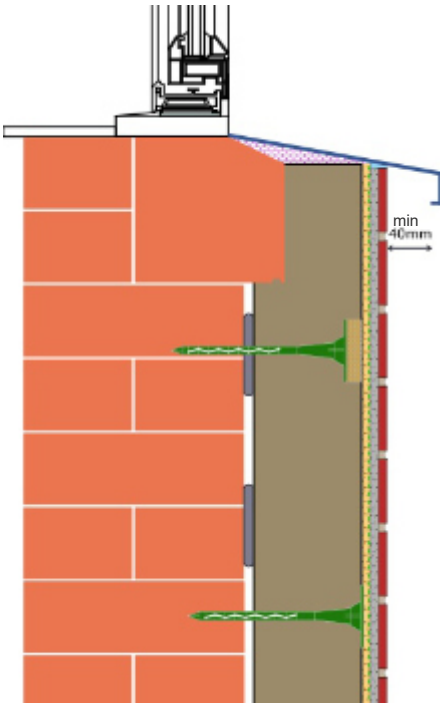
Detail 08 - new under sill

Existing feature sills with retained windows

Should the project retain existing windows and there is evidence of an existing feature either of a stone sill, or brick feature, it would be recommended that a new sill be installed over the existing feature and any voids filled with expanding foam.

The new insulation should be locally cut to deal with the projecting feature, or a thinner board be used. It should be noted that these details can vary considerably on site, and there is a chance of a localised thermal bridge occurring.

Clients should seek further guidance from the system designer.



Detail 09 - existing feature over sill

Window Sills

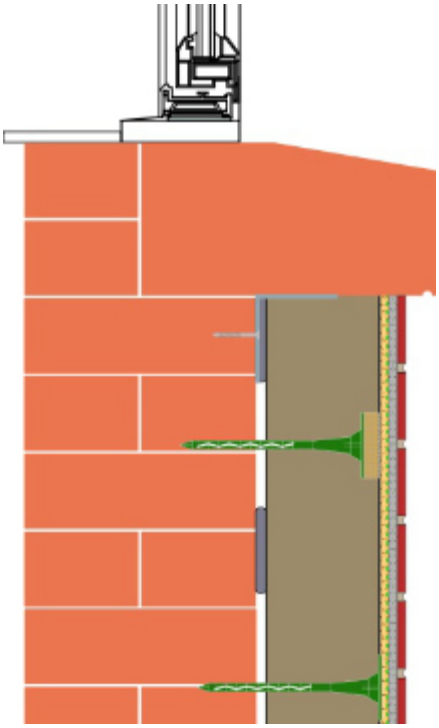
New sills

Should the planning conditions indicate that there should be a replication of an existing stone sill, it should be considered how to deal with a localised thermal bridge.

It may be possible that the existing stone sill is removed, or cut back and a new insulated GRP or similar ‘dummy’ sill is installed, which will enable a reduction in the a thermal bridging effect.

It is not recommended to form sills from the insulation boards themselves, as this will be a weak sill, which is prone to damage and water ingress.

It is critical with all sill details that the junction between the sill and the EWI system has a suitable weather-tight seal and is reviewed in accordance with the system designer’s maintenance instructions.



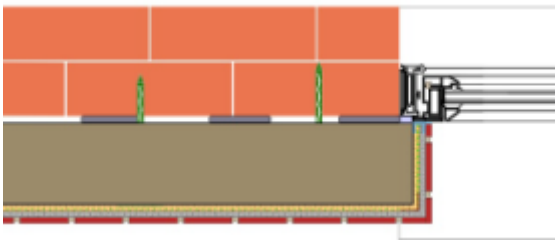
Detail 10 - new feature sill

Reveals

Reveals set flush

Where the window / door frames are set flush with the face of the substrate, then the insulation board should over-sail the frame by a minimum of 20mm or to a point that does not obstruct the opening of the window.

The brick slip finish should be returned onto the frame with a suitably approved junction detail, such as a frame seal bead, stop bead, hydrophobic band and / or a suitable silicone sealant applied to a struck joint or hidden basecoat joint.

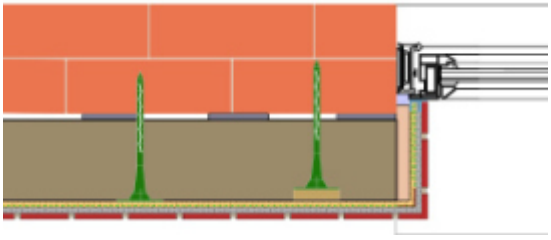


Detail 11 - flush reveal

Recessed reveals

Where the window / door frames are recessed, then the use of an insulated reveal should be used providing the frame has sufficient space for the depth of the boards, adhesive (if required), basecoat and slips. This detail is designed to reduce the risk of thermal bridging.

The brick slip finish should be returned onto the frame with a suitably approved junction detail,such as a frame seal bead, stop bead, hydrophobic band and or a suitable silicone sealant applied to a surface struck joint or hidden basecoat joint.

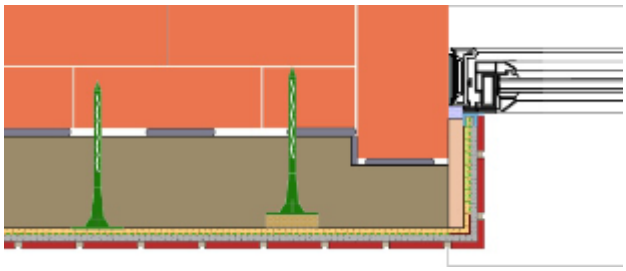


Detail 12 - recessed reveal

Reveals

Reveals with a projecting feature

Should the project retain existing windows and there is evidence of an existing feature, it would be recommended that the insulation is reduced in its depth to compensate, unless this feature is to be kept and replicated. This will reduce the thermal efficiency slightly at this point.

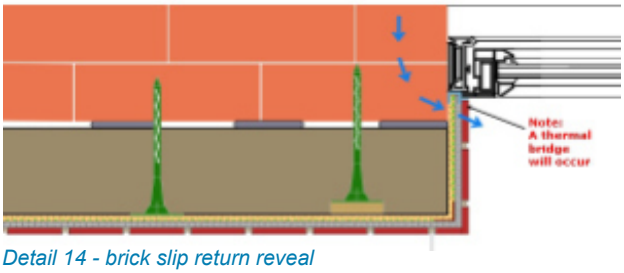


Detail 13 - feature reveal

The brick slips should be returned onto the frame with a suitably approved junction detail, such as a frame seal bead, stop bead, hydrophobic band and/or a suitable silicone sealant applied to a struck joint or hidden basecoat joint.

Reveals with a brick slip only return

Where the window / door frames are set, so that there is not sufficient space to return any form of insulation on the reveal, then a brick slip only return is the only available option. This detail will provide a thermal bridge scenario; however, it is recognised that in certain circumstances that this is unavoidable.



Detail 14 - brick slip return reveal

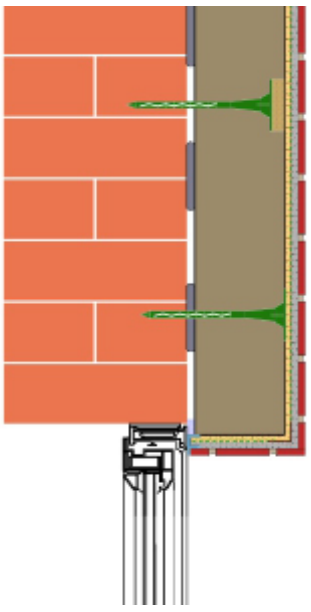
Purpose made thin insulated reveal trims are available and may assist with this situation and should be considered if there is enough space on the frame of the window.

Window / Door Heads

Heads set flush

Where the window / door heads are set flush with the face of the substrate, then the insulation board should over-sail the frame by a minimum of 20mm or to a point that does not obstruct the opening of the window.

The brick slips should be returned onto the frame with a suitably approved junction detail, such as a frame seal bead, stop bead hydrophobic band and/or a suitable silicone sealant applied to a struck joint or hidden basecoat joint.



Detail 15 - brick slip return head

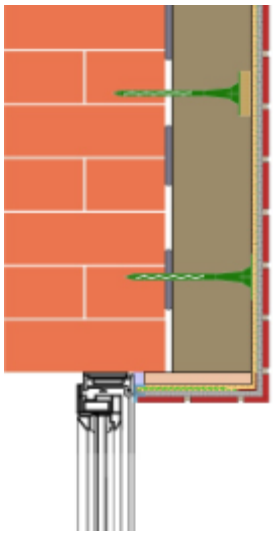
Window / Door Heads

Recessed head

Where the window / door heads are recessed, then the use of an insulated panel should be used providing the frame has sufficient space for the depth of the boards, adhesive (if required),basecoat and slips.

This detail is designed to reduce the risk of thermal bridging

The brick slips should be returned onto the frame with a suitably approved junction detail, such as a frame seal bead, stop bead hydrophobic band and or a suitable silicone sealant applied to a surface struck joint or hidden basecoat joint.



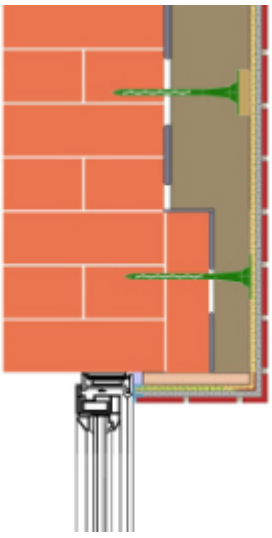
Detail 16 - recessed head

Heads with a projecting feature

Should the project retain existing windows and there is evidence of an existing head feature, it would be recommended that the insulation is reduced in its depth to compensate for the feature, unless this feature is to be kept and replicated.

This will reduce the thermal efficiency slightly at this point.

The brick slips should be returned onto the frame with a suitably approved junction detail, such as a frame seal bead, stop bead, hydrophobic band and/or a suitable silicone sealant applied to a struck joint or hidden basecoat joint.

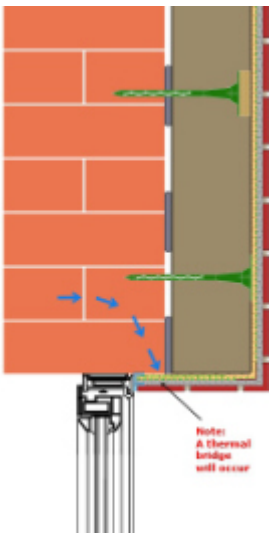


Detail 17 - feature head

Heads with a render only return

Where the window / door heads are set, so that there is not sufficient space to return any form of insulation on the reveal, then a slip only return is the only available option. This detail will provide a thermal bridge scenario; however, it is recognised that in certain circumstances that this is unavoidable.

Purpose made thin insulated reveal trims are available and may assist with this situation and should be considered if there is enough space on the frame of the window.



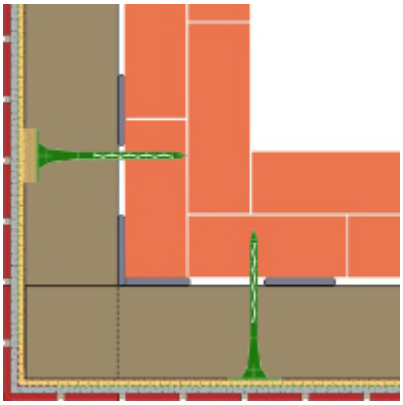
Detail 18 - render return head

Corner

External corner

It is important that all external corners have the insulation boards interlocked to prevent any vertical joints in the system, which can contribute to straight-line cracking.

All corners require a corner bead, which can be reinforcing mesh bead or a PVC wing meshed bead, the specification of which will be the responsibility of the system designer and the type of finish chosen. The corner profiles should have the reinforcing mesh overlapped by a minimum of 100mm and should be secured by the adhesive.

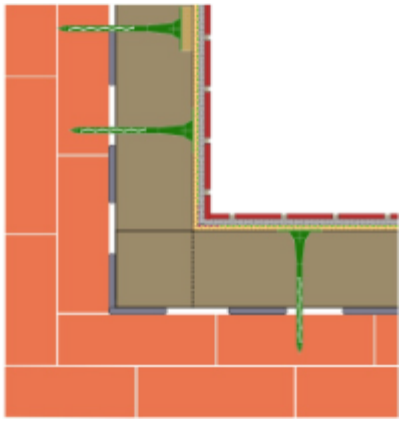


Detail 19 - external corner

Internal corner

It is important that all external corners have the insulation boards interlocked to prevent any vertical joints in the system, which can contribute to straight-line cracking.

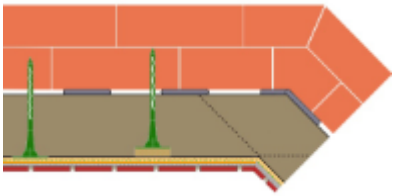
All corners require a corner bead, which can be reinforcing mesh bead or a PVC wing meshed bead, the specification of which will be the responsibility of the system designer and the type of finish chosen. The corner profiles should have the reinforcing mesh overlapped by a minimum of 100mm and should be secured by the adhesive.



Detail 20 - internal corner

Splayed corner

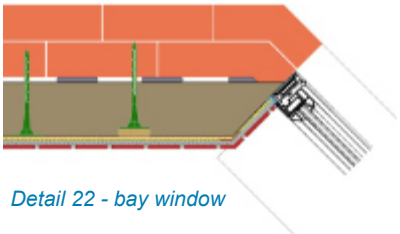
It is important that the starter tracks are cut on site to form the correct angle, ensuring that the starter track base is consistent and the insulation is fully protected. Care must be taken in cutting the insulation to ensure an adequate interlocking of the boards. Where this is not possible due to a shallow angle, then a vertical joint can be cut in, but it is recommended that a movement joint is provided to prevent the possibility of cracking.



Detail 21 - splayed corner

Bay window

An assessment from the system designer is required for all bay windows, as construction and design can vary. The insulation board should over-sail the frame by a minimum of 20mm or to a point that does not obstruct the opening of the window. The brick slips should be returned onto the frame with a suitably approved junction detail, such as a frame seal bead, stop bead, hydrophobic band and/or a suitable silicone sealant applied to a struck joint or hidden basecoat joint.



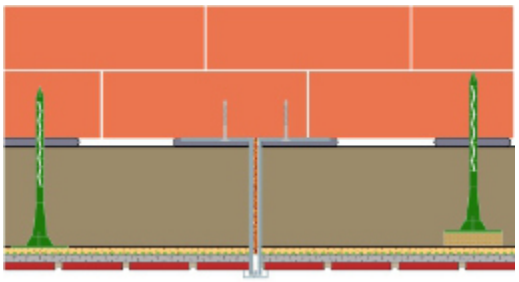
Detail 22 - bay window

Movement / Expansion joints

Full system

Full system movement / expansion joints must be provided where there is a structural joint in the building or where indicated on the design drawings.

Full system joints will require the separation of the insulation boards behind and the use of a full system movement joint profile, or a surface mounted movement joint with the appropriate hydrophobic bands, backing rods, infill insulation as detailed by the system designer.

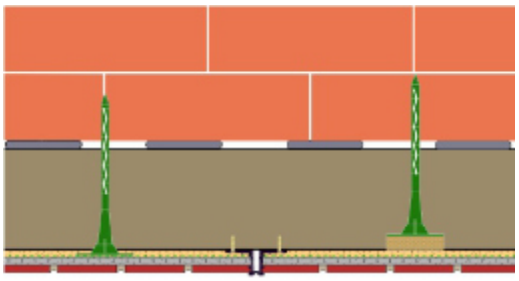


Detail 23 - full system movement joint

Surface mounted

Surface mounted movement joints should be provided in accordance with the system designers recommendations and that of the design drawings.

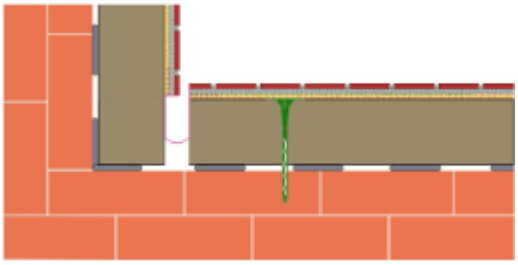
Surface mounted movement joints can also be used as demarcation between different slips if required.



Detail 24 - surface mounted movement joint

Internal corner joint

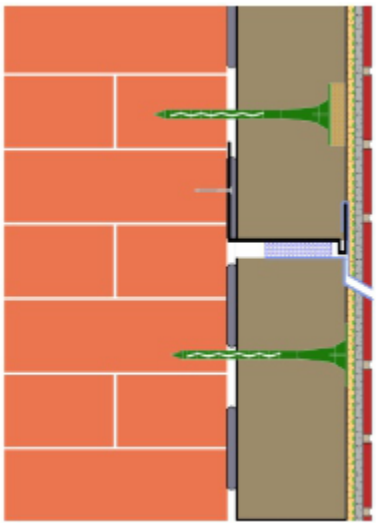
Where an internal corner movement joint is required, then this should be provided by means of a specific internal corner profile for EWI systems. Follow the system designers requirements for any appropriate hydrophobic bands, backing rods and insulation infills.



Detail 25 - internal corner movement joint

Horizontal joint

Where a horizontal movement joint is required to accommodate the possibility of structural movement, then a full system horizontal movement joint profile will be required. This is generally a three piece profile which can also allow for the closing up of the joint, which is especially effective with the directly applied EWI systems to framed structures, where movement and deflection are more common than in masonry backgrounds.



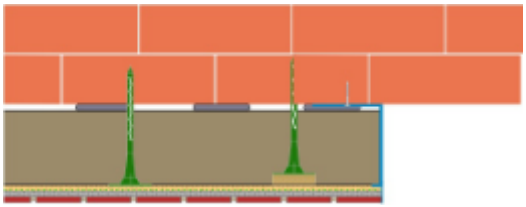
Detail 26 - horizontal movement joint

Termination details

Full system stop profile

Where the EWI system has to be terminated due to a boundary, party wall or any other reason, then a full system stop profile can be used to cap off the edge of the system. This should be mechanically fixed to the substrate with any specified hydrophobic bands and a suitable silicone sealant.

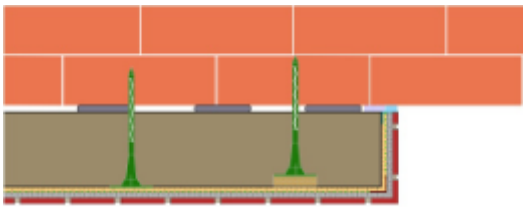
These profiles can be colour powder coated, and should be used if the adjacent property is going to have an EWI system installed in the future.



Detail 27 - full system stop profile

Brick slip return edge

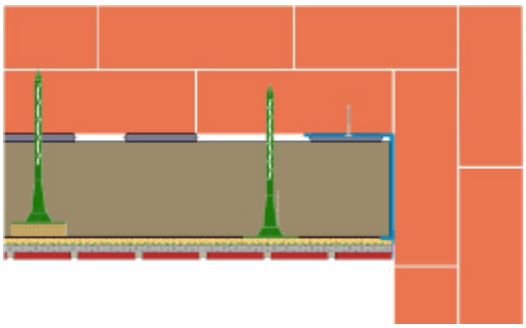
A full slip return edge can be installed against the substrate. The appropriate hydrophobic bands and a suitable silicone sealant should be used as part of the termination junction.



Detail 28 - brick slip return edge

Return onto a uninsulated wall

Where the EWI is to terminate on a 90^{o}uninsulated return wall, then a full system stop profile should be used along with any hydrophobic bands specified and a suitable silicone sealant.

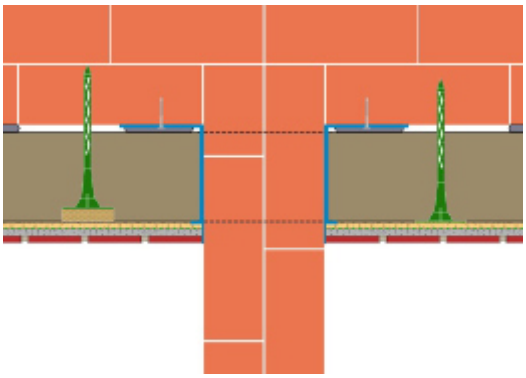


Detail 29 - return onto an uninsulated wall

Wall abutment

Where the EWI system abuts a shared wall, whereby the system is to be used on both buildings, then this should be terminated using a full system stop profile, in addition to appropriately specified hydrophobic bands, and a silicone sealant.

The EWI system should be taken over the head of the wall using the stater track, this can be set 150mm above the wall to help prevent rainwater splash-back, but this will increase the thermal bypass at this point.



Detail 30 - wall abutment

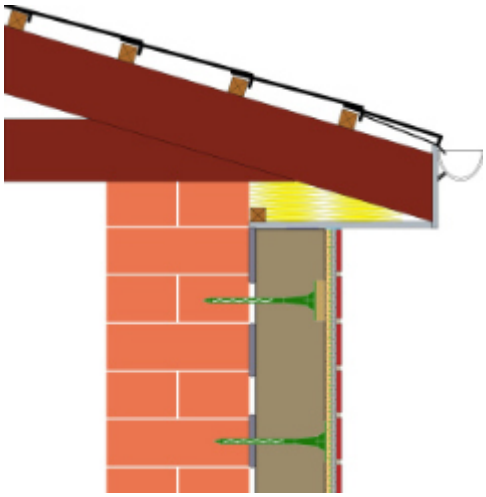
Roof and soffit details

Overhanging soffit

Where there is an overhanging soffit, the system should be taken tight up against the underside, with appropriately specified hydrophobic bands, and a silicone sealant.

With an existing soffit, it is imperative that the contractor / client checks to determine if there is evidence of any existing insulation within the roof void, which would ensure that a thermal bridge will not occur.

Failure to check this may result in localised condensation and mould growth to the top of the internal walls.

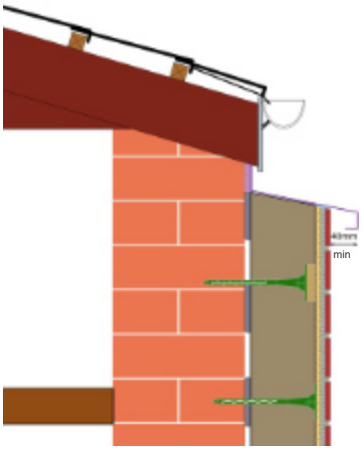


Detail 31 - overhanging soffit

Flush fascias

Best practice would be to remove and extend the roof line sufficiently to accommodate the new EWI system. Where the fascia board is to be retained, install a new mechanically fixed verge trim, and sealed with silicone mastic. To comply with PAS2035, an approved roofline closure system should be installed, if there is no roof extension.

Trims should have a minimum of a 40mm overhang clearance from the face of the finished system, (50mm in severe / very severe exposure sites) and any joints connected with proprietary jointing clips. Joints should not be infilled with silicone mastic.



Detail 32 - flush fascia

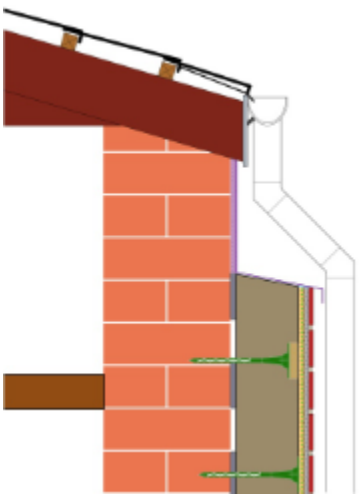
Flush fascias - swan neck pipe

When the existing flush fascias are retained, the existing gutter is also generally retained, along with the down pipe outlet.

It is therefore recognised that the down pipe needs to be adjusted using a swan neck connection. Where this occurs there should be sufficient protection to the edges of the insulation and also a drip profile introduced to ensure water is directed away from the face of the finished system.

Proprietary box profile systems are available and should be used, or a series of trims installed to create a sealed unit. It is preferential that a proprietary insulated system is installed.

Flush fascia details re not recommended and should only be used where there is no alternative



Detail 33 - swan neck pipe

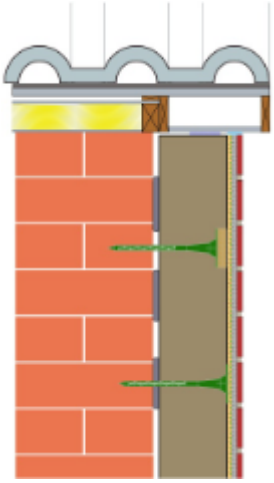
Roof and soffit details

Overhanging verge

Where there is an overhanging verge, the system should be taken tight up against the underside, with appropriately specific hydrophobic bands, and a silicone sealant.

With an existing verge, it is imperative that the contractor / client checks to determine if there is evidence of any existing insulation within the roof void that will ensure that a thermal bridge will not occur.

Failure to check this may result in localised condensation and

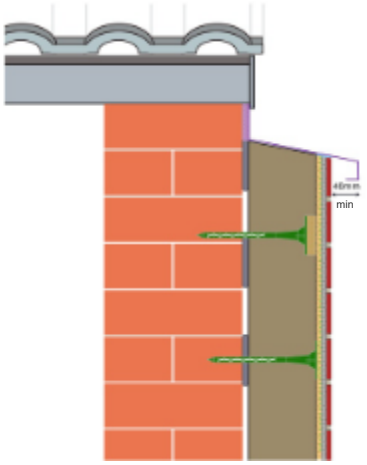


Detail 34 - overhanging verge

Flush verge

Best practice would be to remove and extend the roof line sufficiently to accommodate the new EWI system. Where the fascia board is to be retained, install a new mechanically fixed roofline closure, and sealed with silicone mastic. To comply with PAS2035, an approved roofline closure system should be installed, if there is no roof extension

Trims should have a minimum of 40mm overhang clearance from the face of the finished system (50mm in severe / very severe exposure sites) and any joints connected with proprietary jointing clips. Joints should not be infilled with silicone mastic.



Detail 35 - flush verge

PAS 2035

Any scheme which is being mapped to the PAS 2035 retrofit standards framework, may have specific requirements for details. These details may vary from the standard details issued, therefore the system designer must be informed if the details required are for a PAS2035 mapped scheme.

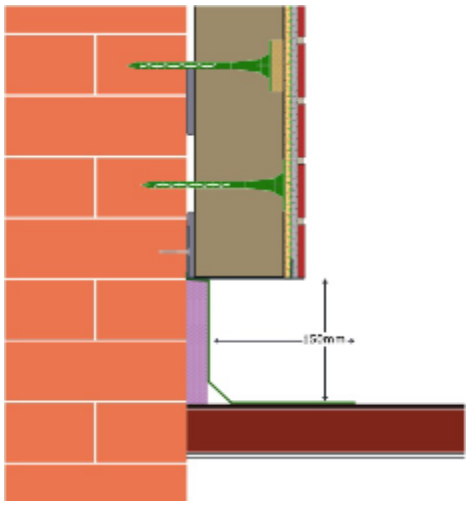
Roof abutments

Flat & pitched roof abutments

Where systems are taken over existing flat or pitched roofs, the system should be installed so that there is a minimum of 150mm above the existing finish. A 20mm high K-value insulation board, or a proprietary upstand solution should be installed below the starter track.

A new flashing should be installed to provide a minimum of a 150mm upstand and a minimum of 150mm laps are required to the roof, which should be securely adhered.

This detail will reduce the risk of a thermal bridge and potential condensation and mould growth to the internal wall.

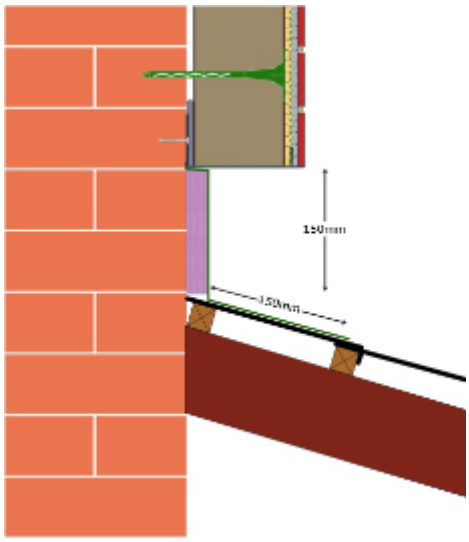


Detail 36 - flat roof abutment

New Build

With new build construction, an insulated upstand may not be required, as the construction may already have compensated for any potential thermal bypass, within the wall or frame.

The detail design drawings should be checked to confirm if there is any possibility of a thermal bridge, and if one is discovered then this ideally should be rectified within the structure, before looking to use an upstand solution or similar.



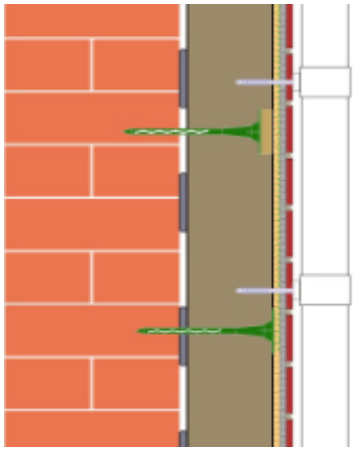
Detail 37 - pitched roof abutment

Fixtures and fittings

Lightweight items

For the fixing of lightweight items, such as rainwater pipes, lightweight signs, etc, then the use of proprietary spiral anchors or specialist EWI proprietary fixings should be incorporated.

These should be installed as recommended by the system designer and the fixing manufacturer.



Detail 38 - fitting lightweight items

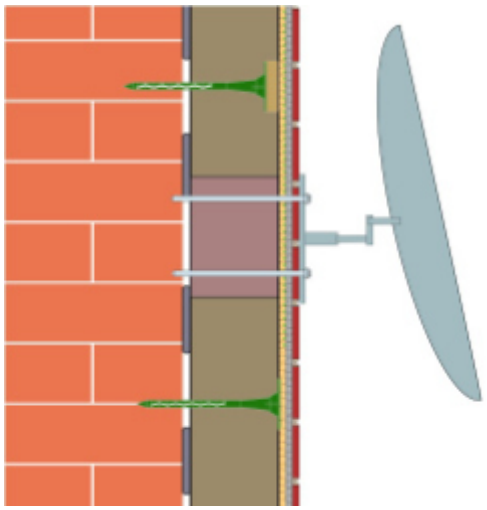
Fixtures and fittings

Heavyweight items

Pattresses

Any heavyweight items should be identified by the contractor and an allowance provided for an approved proprietary pattress to be installed, or the use of a specialist proprietary EWI fixing system. High density polystyrene pattresses are not suitable on high-rise buildings.

Where a proprietary fixing pattress is to be used, then the fixing instructions from the manufacturer of the pattress should be followed. The insulation should be applied tight up to the edge of the pattress, followed by the application of the basecoat and reinforcing mesh. It is also advisable to install an additional reinforcing mesh patch into the basecoat, extending a minimum of 100mm beyond the edge of the patress. Once the topcoat has been applied and dried, the fixtures can then be fixed into the pattress with appropriate fixings.



Detail 39 - fitting heavyweight items - pattresses

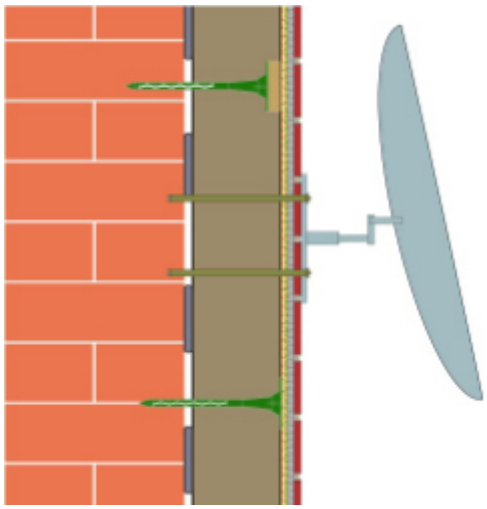
The type an size of the pattresses can vary; however, it is recommended that there is a minimum clearance of 50mm from the fixing point into the pattress and the edge of the pattress.

It is not recommended to use timber as a pattress within the system, as this will cause a thermal bridge.

Specialist fixing solutions

The alternative to the use of pattresses, is to use specialist proprietary EWI fixing solutions. These can be used after the completion of the installation of the EWI system as there are a range of fixings for different applications.

The fixing instructions from the manufacturer should be followed at all times, along with the correct fixing solution for the weight of the item being installed.



Detail 40 - fitting heavyweight items - fixings

Fixings items back to the substrate with the appropriate fixings is also acceptable; however, this does cause a small thermal bypass of the EWI system with each fixing used. The counterbalance of the fixings should also be considered if this method is adopted and should be calculated accordingly.

Whether the proprietary pattresses or EWI fixing solutions are being used, it is imperative that they are compliant with the system designers specifications and recommendations.

Flues and vents

Air vents

The client / contractor should advise if any existing air bricks are ‘live’. If they are to be retained, then they should be extended using a proprietary UPVC airbrick extension profiles.

All junctions should be fully sealed with silicone mastic sealant and any voids in the insulation filled with insulation or expanding foam, if appropriate. The brick slip finish should be taken tight to the sides of the unit and sealed with a silicone mastic sealant.

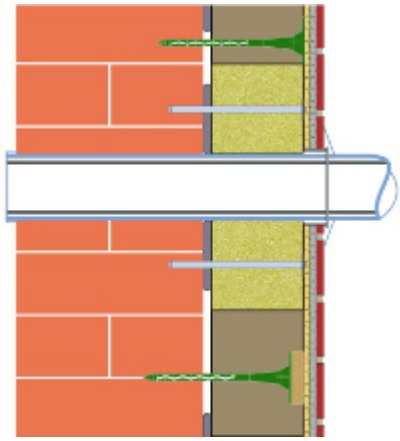
Note: It is the responsibility of the client / main contractor to identify which air bricks are in use and which can be covered.

Detail 41 - air vents

Hot extract flues

Existing hot extract flues should be extended using a proprietary extension pipe to a minimum of the depth of the new EWI system. The extension pipe should be secure and fully sealed against the existing substrate.

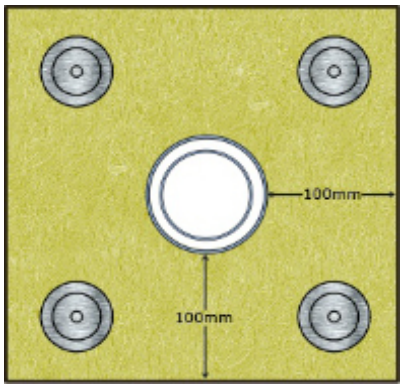
If the insulation system used is not classed as non- combustible, then a non-combustible insulation should be provided around the hot extract flue, with a minimum coverage of 100mm to each side of the flue, and fixed with appropriately specified fire resistant fixings.



Detail 42 - hot extract flues

Note:

It is the responsibility of the client / main contractor to assess the existing extract ducts, and extend the flues. Any works to boilers should be carried out by a Gas Safe or Corgi registered engineer.



Detail 43 - non-combustible insulation around a hot extract flue

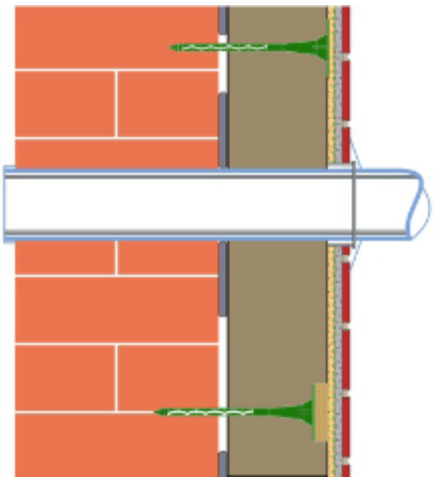
Flues and vents

Cold extract flues

Existing cold extract flues should be extended using a proprietary extension pipe to a minimum of the depth of the new EWI system. The extension pipe should be secure and fully sealed against the existing substrate.

Where existing balanced flue extract pipes cannot be extended, there should be an allowance to return the insulated brick slip system back into the wall to create a recess, and provide a sill to assist shedding of water. This should only be considered where there are no other options available.

Refer to HHIC Guidance document on gas appliances.



Detail 44 - cold extract flues

Gas, electric and telecommunications

Telecommunications cables

The rearrangement of external telecommunication cables must only be undertaken by the appropriately approved engineers. This in the main is the responsibility of BT Openreach and Virgin Media; however, the service provider should be contacted in the first instance to notify that the EWI works will be taking place.

Never undertake works on telecommunication cables yourself as this may have health and safety implications and is also it is against the law to damage the BT Network.

There is a 3 step process for the rearrangement of cables.

Step 1 - Acknowledge

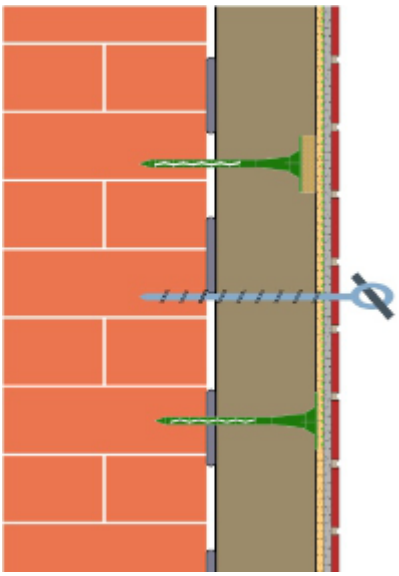
Notify the service provider as early as possible.

Step 2 - Survey

The service provider will arrange for an assessment / survey of the works required and prepare a quotation for the works.

Step 3 - Works

Once payment is received the works will be scheduled and completed.



Detail 45 - telecommunication cables

Gas, electric and telecommunications

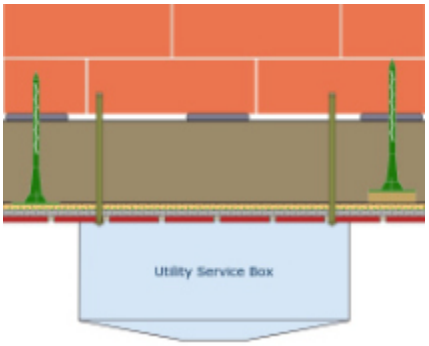
Utility service boxes

Surface mounted

Only approved engineers should undertake works on utility service boxes.

Utility service boxes should be moved when EWI works are due to take place, as leaving the box in place will create a substantial thermal bridge in the system, and therefore may result in localised condensation and mould growth. Insulated electric meter box covers are available and may help avoid the repositioning of the electric meter.

Boxes should be secured to the substrate using suitably approved thermally broken fixings and / or proprietary EWI fixings, or proprietary pattresses, as described in section 5.

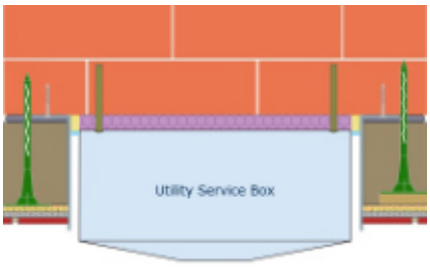


Detail 46 - surface mounted utility boxes

Recessed with access to the regulator valve

Many gas boxes are required to be removed, so that access to the regulator valve can be provided. Access to the regulator valve using a stub screw driver or spanner can be achieved in a dimension of 50-60mm. The valve is generally lower than the box cover therefore a dimension of 50mm should be sufficient to enable access.

Recessed boxes should have a high performance insulation layer within the service box, or behind if the box is being re-positioned but is unable to be set on the surface of the EWI system due to restrictions.

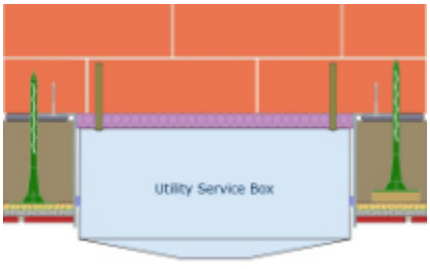


Detail 47 - recessed utility boxes with regulator valves

Recessed with front opening access

Front opening access recessed boxes should have a high performance insulation layer at the rear within the service box, or behind it, if the box is being re-positioned but is unable to be set on the surface of the EWI system.

No gap is required to the edge of these boxes and the EWI system should be finished with full system stop beads, with the appropriate hydrophobic bands and suitable silicone sealants.



Detail 48 - front opening recessed utility boxes

Gas, electric and telecommunications

Gas pipes (risers) / electrical cables

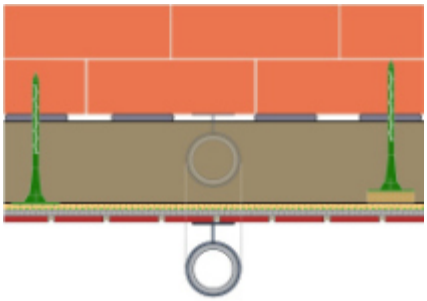
Wherever possible, gas pipes and electrical cables should be relocated to the front of the new EWI system.

Where it is not possible to move the gas pipe or electrical cables, then insulation should be provided, where practical to the back of the service enclosure to reduce the thermal bridge.

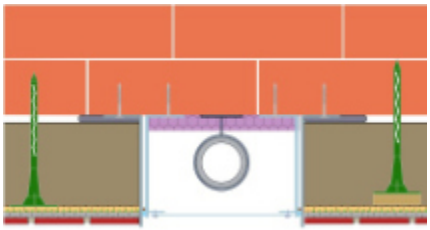
The service enclosure should be sealed against the EWI system with backing rods and suitable silicone seals. For gas pipes, the enclosures must have a ventilated cover in accordance with the *'Specification for the installation of external wall insulation ensuring safety and operation of fuel burning appliances March 2024.'*

The EWI system should be fully sealed to prevent gas entry into the system.

Also refer to the gas providers own information for their requirements regarding gas enclosure boxes.



Detail 49 - gas pipe risers and electrical cables - surface mounted



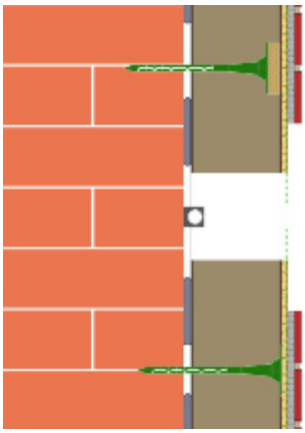
Detail 50 - gas pipe risers and electrical cables - recessed

Cable relocation during works

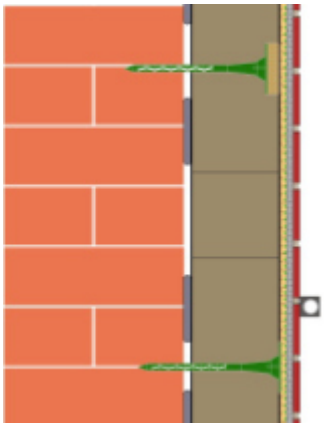
If the agreed detail is to relocate the cable during the works, the system should be installed with a trough carefully measured to minimise patching effect. The brick slip system should be left short of the insulation board with the reinforcing mesh left exposed on all edges by a minimum of 100mm.

When installing the brick slips leave at least one slip out all around the opening, therefore exposing the basecoat.

The cable should be removed or unclipped from the wall and relocated to the outside of the new system. The gap in the system should be filled with insulation, and the basecoat and reinforcing mesh lapped with the existing installed system, before the brick slips are applied.



Detail 51 - cable relocation step one



Detail 52 - cable relocation step two

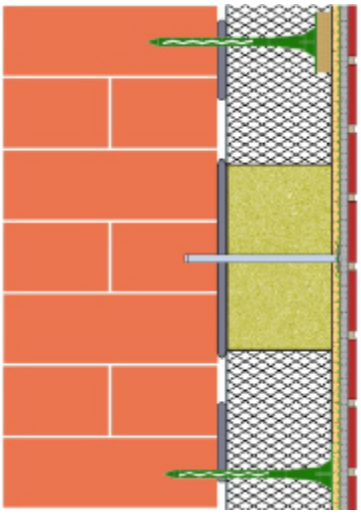
Firebreaks

Horizontal fire break

For thermoplastic or thermoset EWI systems, there is a requirement to include non-combustible vertical and or horizontal fire breaks within the system and around openings.

Fire breaks should be installed at each floor level above the first-floor level i.e., starting with the second storey, and at the line of individual compartments as stated in BR 135 section 6.3.4.

The fire breaks or fire barriers, as recommended in BR 135 should comply with the tested EWI system, commonly 200mm high and form a continuous band through the entire full thickness of the insulation layer. Advice should be sought from a suitably qualified person to determine if fire-stops are required around window and door openings on low-rise buildings.



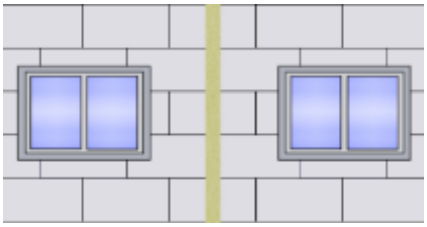
Detail 53 - section of firebreak

Vertical fire break

Vertical fire breaks should be installed to compartmentalise between separate dwellings or apartments. The vertical fire breaks should comply with the tested EWI system and continue the full height of the apartment or dwelling.It is critical with any fire break installation that the fire breaks are butt jointed with no gaps and and fixed with the appropriately specified fire fixings.

Firebreaks around openings

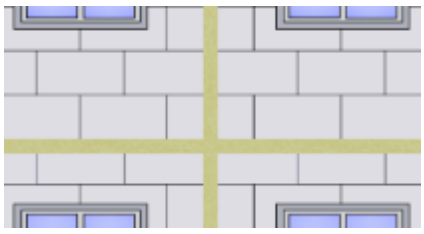
Firebreaks may be required around all openings in the facade, including windows and doors. These firebreaks should comply with the tested EWI system and form a continuous band around the opening.



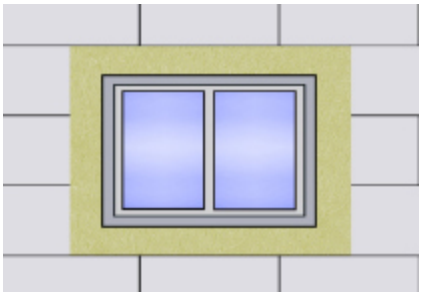
Detail 54 - vertical firebreaks

Further information

For further information regarding firebreaks and the use of external wall insulation in relation to fire and the Building Regulations, please refer to BR135 *fire performance of external thermal insulation for walls of multi-storey buildings and* the INCA Guidance Document - Fire Performance Requirements for EWI Systems.



Detail 55 - compartment firebreaks



Detail 56 - firebreaks around openings

10.01 Inspecting the finished EWI system

When inspecting finished EWI systems, there are tools available to every client, installer or system designer that can be used to determine if the finished system is to an acceptable standard.

The final aesthetics can be very subjective, and reference to 'BS EN 13914-1:2016 can provide some assistance, but the following sections should be viewed as the best procedure.

10.02 Viewing conditions

When inspecting a finished external wall insulation surface, it should be viewed in daylight, Whilst standing at the ground level, and from a generally accessible viewing position. Where possible, the surface finish should be viewed at a distance of 10 metres to the facade, with the sunlight, if any, not falling onto the surface in a glancing condition.

It should be expected that the brick slip systems will have a slight unevenness due to the texture and joints which can cast shadows and is an acceptable tolerance in the finish. Viewing the finish whilst there is any glancing light conditions, will exaggerate the shadowing for a short period of the day and therefore is not deemed acceptable as an inspection method.

It is also acknowledged that pointing mortars can suffer from drying-out cracks or fissures, which although at the time can appear unsightly, they do not have any adverse effect on the overall performance of the system. Brick slips should not have any significant cracks, chips or damage in their facings greater than 15mm in diameter, unless this is a feature of the selected slip.

Tolerances for the brick slip system are the same as for fair faced masonry and are indicated within the National House Building Council (NHBC) Standards Document, chapter 9.1 'A consistent approach to finishes', which is a good aid to assessing the final tolerance.

General checks should be made at the following areas:

- At the base of a starter track, at the rear to ensure no gaps occur which vermin can access behind the system.
- To the front of a starter track to ensure the brick slips are neat and tidy.
- General appearance of the brick slips should be reasonably uniform in texture, finish and colour, including pointing mortar, using the guidance above.
- Tolerances using the guidance indicated in section 9.1.2.
- All weatherseals including junctions at window reveals, sills and heads to be checked to ensure they are sealed correctly.
- Overhang of the window sills to the face of the surface finish to be a minimum 40mm.
- Junctions at eaves or soffit level to be fully sealed, whilst with verge trims ensuring jointing clips have been used and the junctions are fully sealed.
- Parapet level to ensure this is sealed correctly.
- Rear of a parapet, to ensure it has the correct flashing has been provided.
- General tidiness of the work.
- Finished work against project details.

10.03 Acceptable tolerances

When checking accepted tolerances the following guidance should be adopted.

It would be recommended that a site retained sample panel, or pilot house be completed, and approved as a benchmark for future the application. Baseline guidance can be seen below, and should be used for general assessments. Where EWI systems are being applied to existing buildings, the system will follow the original line of the building, unless this is identified and agreed in writing with the client beforehand.

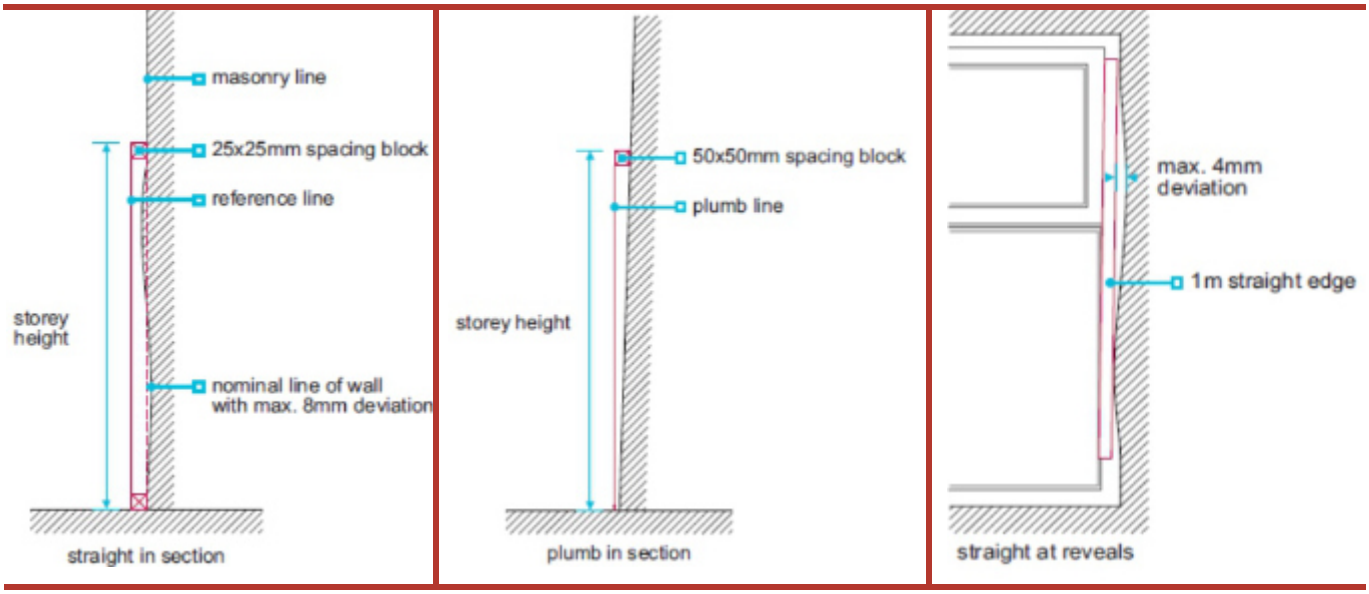
Flatness

The maximum permissible straightness in plan deviation from flatness (excluding features) of the finished system, in any 5 metre section is +/- 8mm.

Flatness of the EWI system should be measured in a similar way to straightness on plan and plumb for masonry. Areas which are in close proximity to features, should be excluded from the acceptable tolerance.

Set two equal spacing blocks, 5 metres apart and line through to ensure the front edges are straight. The back edge of the spacing blocks should establish the reference line and from this line the variation in the finish system should not be any greater than +/- 8mm.

Straightness in section should have a tolerance of +/- 8mm per storey height up to 3 metres. For taller buildings there should be a maximum of 8mm from plumb per storey and 12mm in total.



For reveals and heads the maximum allowable deviation using a 1 metre straight edge is +/- 4mm.

Perpend joints should not cumulatively displace in the same direction for more than 5 joints. The centre line of any perpend joint should generally be within +/- 15mm of the centre line of the next 5 successive perpend joints.

Details taken from NHBC standards document

For bed joints the thickness of the individual bed joint should not vary from the average of the next 8 successive joints by by a maximum of +/- 1.5mm.

Measure and add 8 successive bed joints and by 8 to determine the average size.

Example

11+10+12+10+11+9+11+10mm = 84mm divide by 8 = 10.5mm.

Therefore the acceptable range for the 8 measured bed joints should be 9-12mm.

Appearance

The appearance of the finish should be considered for the entire wall area, a panel section, junctions and for material interfaces, and not individual areas. The finish should be viewed in accordance with section 10.02 of this document.

The use of rustic or heavily textured brick slips may be outside of these tolerances, but this is acceptable due to the nature of the slip facing.

10.04 Reference documents

The following documents can be referenced when preparing contract specifications and reviewing competed works.

- NHBC Standards : A consistent approach to finishes.
- LABC Technical Manual.
- Premier Guarantee Technical Manual.
- BS EN 13914-1 : 2016 (Design, preparation and application of external rendering and internal plastering.
- BS EN 998-1 : 2016 (Specification for mortar for masonry - Rendering and Plastering mortar

EWI systems do not only provide a warmer internal climate in the property, but the insulation will also reduce the air leakage, and therefore ventilation is very important. Maintaining adequate ventilation in the property to prevent the build-up of condensation is critical, and this includes during the winter months, where the opening of vents and windows is encouraged along with the use of any relevant extraction fans. Insulation boards have varying performances regarding breathability and this should be considered on a project by project basis.

Projects mapped to PAS 2035 will have a full ventilation survey to ensure that there is sufficient movement of air to help prevent the build up of moisture within the property. With refurbishment schemes outside of PAS 2035, it is recommended that a survey is undertaken and also that the information within this section is followed to help ensure that a healthy internal climate is maintained.

Condensation

What is condensation?

Condensation is the most common form of dampness that generally occurs internally, when air moisture turns into small droplets of water.

There are numerous forms of dampness and these can include:

- Rising damp from the ground, generally associated with an ineffective damp proof course or in some older buildings, no damp proof course at all.
- Penetrating dampness which can occur for a number of reasons, such as poor seals around junctions of windows and doors, or moisture penetrating through walls due to external ground levels being higher than the damp proof course.
- Defective plumbing, leaking pipes, worn or damaged elements such as shower trays and toilets that lead to direct internal dampness.
- Defective roof covering, inadequate mortar pointing, bridged damp proof courses, blocked or broken gutters and cracks in the external skin of the property.

Moisture within air, quite often cannot be seen and condensation forms when the amount of moisture that the air can hold, falls to a point whereby the water vapour turns into a liquid.

The cooling of the water vapour usually initiates the condensation process, therefore this is why condensation is seen on windows and doors, or where where the surface temperature is colder than other areas.

Mould

Mould is the common term used for fungi, which is a micro organism that grows when the environmental conditions allow for it. These conditions will involve dampness, mould spores, a food source, such as plaster, cotton and wood, in addition to darkness, warmth and oxygen.

Mould can manifest itself in a number of colours, like green, black, brown, yellow and pink and is a definite indicator of excessive damp within a property, which is quite often present in areas of condensation.

Condensation analysis

With all EWI system installations, it is recommended that a condensation analysis is performed to establish if there is a possible risk of the formation of condensation. Whilst this type of analysis can give a good guide of any potential risk, it cannot account for unusual or unrecommended occupant usage.

There are generally two methods for carrying out an interstitial condensation analysis on a wall.

The Glaser Method.

This is the traditional method for assessing moisture balance through the various layers that build up the wall area, but this is only a 2 dimensional steady state analysis and cannot reproduce individual short-term events or allow for rain and solar radiation.

The Glaser method is used as the default calculation process for the EWI Industry and can be produced at the same time that the U Value calculation is performed.

WUFI Modelling

WUFI performs dynamic simulations of heat and moisture transfer through materials, and is the optimum method to determine the risk of condensation, but also includes for realistic hygrothermal conditions in building components and buildings under actual climate conditions. WUFI can measure driving rain, wind and solar gain and is far more complex to undertake than the Glaser Method and requires an extensive amount of data to perform.

WUFI has the advantage of modelling around certain points in the wall build up, such a fixings and junctions, and provides an analysis on a day-by-day basis.

Thermal bypass / cold spots

Cold spots or areas of thermal bypass, have the potential to lead to the forming of condensation on the inside surface.

A thermal bypass or cold spot is where there are areas of the EWI system, which are not continuous or complete and leave a void behind the insulation. This can occur with an uninsulated cavity, where no provision for sealing the cavity has taken place and the benefit of the EWI system is lost due to the thermal bypass rising up the cavity and entering the roof space. It is important to correctly detail all junctions, penetrations and fixtures to limit the potential for thermal bypass in accordance with system designer's recommendations or in line with section 9 (Detail Drawings) of this guide.

Solid and cavity walls

EWI systems are suitable for use on both solid wall and cavity wall construction, and it is important to understand the nature of these construction types and any potential issues that may result following the installation of the system if best practice has not been followed.

Solid wall construction

Solid wall or single skin construction will have no existing thermal insulation properties, and these types of construction are generally of an aging nature and thermally inefficient. Many of these properties will not have damp proof course and it is recommended that if that is the case, then an injection dpc should be installed before the installation of the EWI system.

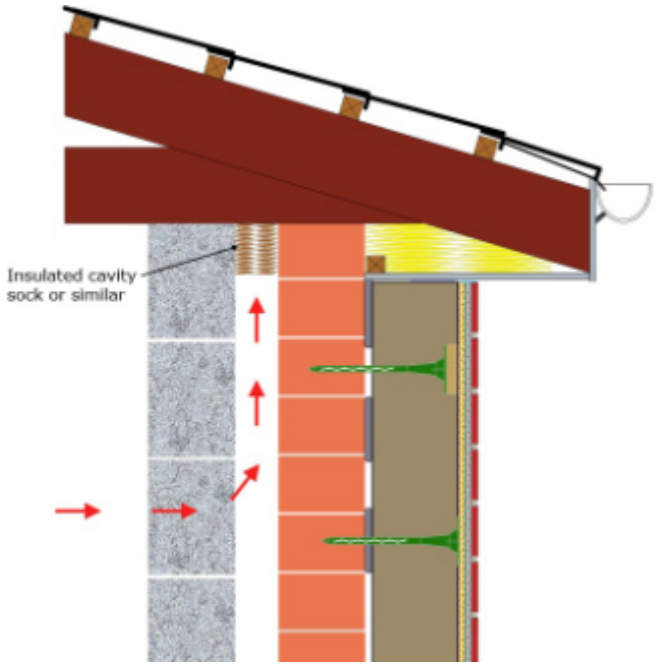
A solid wall or single skin construction without a dpc could allow for rising damp to penetrate the floor area. The reduced air movement within the building due to the EWI system may lead to internal damp and mould being formed.

Cavity wall construction

Cavity wall construction must be assessed for any signs of damp internally or within the cavity, prior to the installation of the EWI system. If there are any signs of damp, including any insulation within that cavity, then appropriate measures must be taken to remove the damp fully before works can commence.

If the insulation within the cavity is damp, this must be fully removed and the cavity allowed to fully dry out before installing the EWI system. The duration for the drying out of the cavity will be dependent upon the degree of damp identified, but this should be expected as being weeks and not days.

With any cavity wall construction, which has an unfilled or extracted cavity, it is imperative that the top of the cavity is sealed to prevent a thermal bypass (heat loss) through the cavity to the roof void. This can be undertaken with the installation of an insulated cavity wall sock or similar.



An intrusive cavity wall inspection should only be carried out by a suitably qualified or experience person.

Signs of water within the cavity, dampness in any insulation present, signs of corrosion on wall ties are all signs that the EWI installation cannot proceed until appropriate remedial action has been undertaken.

Maintaining a healthy internal climate.

The information below is assist with maintaining a healthy internal climate and to limit any potential for moisture build up. The below is purely a recommendation, as this is not part of the EWI installation process.

As-built ventilation

Good ventilation is key to maintain the internal climate. Air bricks and ventilators, such as trickle vents should remain clear at all times and it is good practice to check on these once a year to ensure that nothing is blocking the ventilation route.

Mechanical ventilation

The inclusion of a mechanical ventilation system or a heat recovery ventilation system is ideal for properties with high levels of insulation. These are not always possible due to the costs, but adequate ventilation can be provided by other means.

Manual ventilation

Regularly open window and air vents as this helps reduce excessive moisture build-up within the property, especially during the colder months. Resist the urge to keep all windows closed during the winter months, but allow for a small opening to maintain the ventilation.

Cooking

Always use the extraction hood if there is one installed, if not, cook with the pan lids on and reduce heat once the pan reaches boiling point as this will decrease the amount of steam. Ensure that doors to any internal rooms are closed and if possible open door and windows to ventilate to the external environment.

Bathing

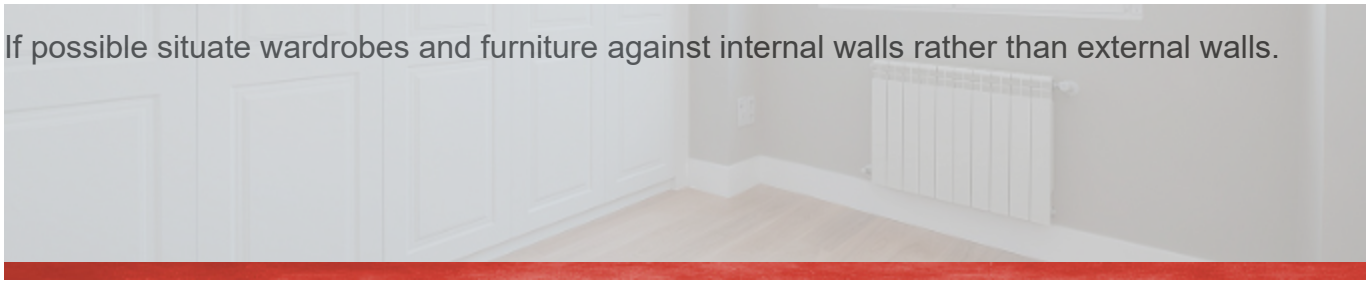
Close all internal doors and ensure any extractor fans are on. Open windows whilst bathing or showering and for a period of time afterwards to fully vent the bathroom. When filling a bath, run the cold water first rather than the hot as this can reduce the production of steam by up to 90%.

Laundry

Avoid drying laundry inside of the property. If using a tumble dryer, ensure that it is vented to the outside.

Furniture

Allow for air circulation of furniture and cupboards by leaving a gap between the furniture and the wall or opening cupboards and wardrobes to ventilate. Try not to overfill wardrobes and cupboards as this restricts air circulation.



12. Maintenance

It is important to realise that maintenance is a large part of preserving the condition of an EWI system, to ensure that it retains its thermal performance and visual appearance for as long as possible.

EWI systems should remain durable for a minimum of 25 years; however, within this period there will be a need for periodic maintenance, including the replacement of mastic seals. The EWI system itself should not require any form of replacement if maintained correctly during this time and thereafter; however, periodic assessment of the system will help identify any areas that need to be addressed to maintain longevity.

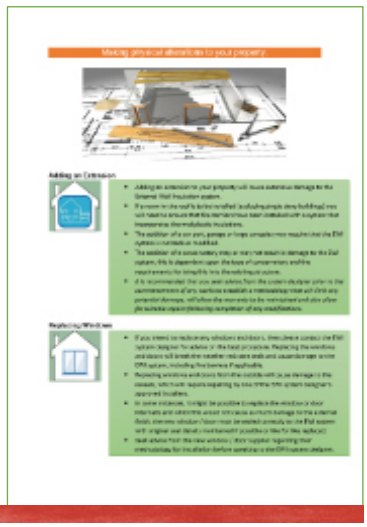
The visual appearance of the EWI system as a whole or on certain elevations may change over a period of time depending upon many factors such as:

- Type of surface texture of the slips.
- Atmospheric pollution.
- Proximity to traffic, industry, transport hubs.
- Proximity to foliage and open water.
- Design of the building.
- Shading, especially on the Northern elevation.

It is important that the client or home occupier is fully aware of their responsibilities with regard to maintaining the EWI system, and many EWI system designers will provide a maintenance guidance to assist with this.

It is also important that items such as gutters and sealants are maintained, as they will help with the overall longevity of the system and the appearance of the slips.

INCA have also produced a generic industry document entitled ‘INCA Technical Guidance Document 05 - External Wall Insulation Maintenance Guidance Manual’ which offers a lot of good advice on how to maintain the system, in addition to appropriate procedures to adopt when damage has occurred to the system.



This document has been produced as a reference tool to establish a baseline for best practice when installing and assessing EWI systems on new build constructions and for the refurbishment of existing properties.

The installation of EWI should be undertaken where the detailing carried out is both technically and feasibly achievable; however, this should not be used as an excuse for poor detailing both on paper and on site.

The installation of EWI, if undertaken correctly, will enhance both the thermal and aesthetic properties, in addition to helping extend the durability of the facades on existing properties in line with the system designer's guarantees.

With new build installations, the EWI system can provide an exceptional thermal solution, including to passive house standards when used with other appropriate measures. The range of finishes and colours can create an endless pallet of opportunities for the designer, whilst also having the added benefits of potentially improving acoustics, thermal mass, detailing and weather protection.

Poor installation of EWI systems, can lead to issues such as mould growth through thermal bridges, water ingress, and a poor appearance. It is important that all EWI installations are undertaken by approved installers of the system designer, to help maintain a high quality threshold.

It is also important that contractors and clients have a full understanding of the EWI process, as bad planning, rushed programs and incorrect or restricted access, can all have an adverse affect on the quality of the system installed.

The guidance contained within this document, aims to assist site detailing, and provide a commonality between systems, to reduce the variation in detailing observed on many building sites where EWI system are being installed.

This best practice guide is one of three, the others of which cover EWI incorporating renders and EWI incorporating a vented drained cavity system. This guide should also be referenced when installing a vented drained cavity system with a slip finish.

Documents reviewed in the process of writing this best practice guide.

- The Building Regulations, England and Wales incorporating 2022 amendments.
- Northern Ireland Technical Standards 2022.
- Scottish Building Standards 2022 edition.
- NHBC Standards : A consistent approach to finishes.
- LABC Technical Manual.
- Premier Guarantee Technical Manual.
- BS EN 13914-1 : 2016 (Design, preparation and application of external rendering and internal plastering.
- BS EN 998-1 : 2016 (Specification for mortar for masonry rendering and plastering mortar.
- UK Government Planning Portal www.planningportal.gov.uk.
- INCA Technical Guidance Document GD01 - Fire Performance Requirements for EWI Systems.
- Specification for the installation of external wall insulation ensuring safety and operation of fuel burning appliances March 2017.
- EWI specification for weathering and thermal bridge control.
- PAS2035/2030:2019+A1:2022

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Further INCA Technical Guidance documentation can be found at:
www.inca-ltd.org.uk/knowledge-hub/guidance/