

PRB SYSTEMS LTD – EWI – What it is and how does it work?

Rev 0 – 20 09 23

What is EWI?

External Wall Insulation (EWI), also referred to as Insulated Render, Solid Wall Insulation (SWI) and External Thermal Insulation Composite Systems (ETICS) and have been used in the UK for over six decades. The use of EWI systems has increased significantly in the last 10 - 15 years and they are suitable for both new build and refurbishment projects, but particularly beneficial for the aging housing stock we currently have in the UK.

The UK have approximately 12 million homes that either have no insulation or insulation that only meets the standards of 1976 or before. These poor levels of insulation could be costing homes more than £1,000 per year if there are no improvements made to the thermal efficiency of the fabric of the building.

EWI is typically a sandwich constructed system, applied externally to the substrate of the building, and provides a high level of thermal upgrade in addition to improving the internal climate and air tightness of the property. This makes EWI an excellent solution to the poor insulation of these homes, as well as providing a new fresh weather resistant appearance to the facades.

What are the benefits, advantages, and disadvantages of EWI?

EWI is an excellent and proven solution for the thermal upgrading and extending the lifetime of a property, but it may not always be the right solution. Below we look at both the advantages and disadvantages of an EWI system.

Advantages

- High levels of thermal insulation achievable with insulation thicknesses up to and over 200mm.
- Increases the internal climate comfort and can help reduce physical symptoms associated with colder, damper properties.
- Reduction of energy costs, which are dependent upon the type of property itself, but this could range from £250 per year for a mid-floor flat to over £1000 per year for a detached property.
- A reduction in CO² emissions, ranging from around 400 kg to over 1500 kg annually.
- An increase in sound reduction.
- No loss of any internal room space which will happen if internal wall insulation is used.
- An increased improvement in the weather and wind protection of the external walls.
- An increase in the durability of the external walls, providing greater longevity for the property.
- A new fresh appearance for the property with a wide range of textures and colours available.
- For large scale programs where, multiple properties are being treated, the better living conditions, the visual upgrading and refreshing of the facades can have a positive impact on the local community.
- EWI can be installed onto many different types of existing properties including non-traditional built homes.
- Following the installation of EWI, the value of the property will be increased. Surveys undertaken have shown an approximate £16,000 increase in a property's value from changing the EPC (Energy Performance Certificate)

from a Band G to E. Market research has also shown a pre and post installation value change of a property of 8% – 12%.

- No internal disruption during works.
- For landlords, EWI is more cost effective when used on multiple properties.

Disadvantages

- EWI may not be possible due to planning constraints or access. Where this is an issue, the use of internal wall insulation for solid wall properties may be the only solution.
- It is essential that the ventilation requirements of the property are assessed before the installation, as the air tightness is increased. Having the correct ventilation solutions will decrease the risk of condensation forming within an airtight building.
- Some properties may not be adequately strong enough to accept a standard EWI system.
- Whilst EWI is a more effective upgrade solution, it is also more costly compared with other thermal upgrading solutions.
- There will be a requirement to remove external fixtures and fittings, such as downpipes, cables, external lights, and satellite dishes etc. This may require new replacements, particularly when there are original cast iron rainwater or drainage pipes as these generally cannot be removed without damage.
- There may be a requirement to adjust fencing and gates which adjoin the main property as the EWI system will increase the depth of the external skin by at least 100mm.
- Plants and shrubs that grow up the walls may need to be cut back or even removed to enable an EWI installation to take place.

Landlords

Under the current standards and government proposals, landlords will have a greater obligation regarding the thermal efficiency of their housing stock.

Residential lets

Currently the requirement for a residential let is that there should be an EPC rating of E or above, which came into force in April 2020. This is proposed to change in 2025 to a minimum EPC rating of C or higher for new tenancies and in 2028 for existing tenancies.

Commercial lets

As of the 1st April 2023, it will be an offence to continue to let or rent out a property that does not have an EPC rating of at least E.

Failure to comply with the above will result in a penalty based upon the rateable value of the property and will be based upon each breach.

It has also been indicated that the government will be looking to increase this to an EPC rating of at least C by 2027 and a rating of B by 2030.

Suitable properties?

EWI is suitable for the application to numerous different substrates, to both new and old structures, but with retrofit installations, it is important that these structures are accessed to ensure that they are suitable. This may well include inspections and pull-out tests for the proposed fixings.

Pull-out tests are a range of intrusive wall tests to establish the strength and suitability of the existing substrate for the application of the EWI system. This is generally undertaken by drilling and inserting around 12-15 EWI fixings into the wall and accessing the strength of the background when these are pulled out using specialist equipment. By undertaking this we can identify the correct specification for the system, but also if the property is not suitable for this type of application.

To provide a specification, all properties would require PRB Systems Technical Department to review first, but as a guideline the following types of substrates are generally suitable.

- Single skin brickwork.
- Cavity construction with no cavity fill.
- Concrete and lightweight blockwork.
- Block / Brickwork with existing render.
- Stonework.
- Some non-traditional builds.
- Timber frame construction.
- Metal frame construction.
- Cavity wall construction with the cavity already filled would require a full assessment as to the suitability and may require the extraction of the existing cavity wall insulation – This is generally the case if old mineral wool type insulation was blown into the cavity as it can absorb moisture over time which then affects the property walls.

Thermal performance?

The thermal performance which is achievable following the installation of an EWI system is dependent upon the insulation type, existing construction build-up and the thickness of the insulation being proposed. There are minimum standards required to meet when upgrading an existing property, which we have set out below.

U-values required in England.

Domestic & non-domestic buildings using EWI.

Existing building	0.30W/m ² K
Extension to an existing building	0.28W/m ² K

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The table below is a guideline indication of the obtainable U-values using the PRB EWI system and is based upon the application to a solid 215mm single brick skin property with no allowance for thermal transmittance of the fixings. All figures are given as a W/m^2K value.

Insulation thickness	EPS	Mineral Wool
50mm	0.49	0.54
60mm	0.43	0.47
70mm	0.38	0.42
80mm	0.33	0.37
90mm	0.30	0.33
100mm	0.28	0.31
110mm	0.26	0.28
120mm	0.24	0.26
130mm	0.21	0.23
140mm	0.18	0.20
150mm	0.16	0.18
160mm	0.15	0.17

We would always recommend that a U-value calculation is performed to ensure that the specification meets the expected requirements, as changes in the wall structure can affect the final result. Along with this U-value calculation we are happy to provide a condensation risk analysis to ensure that there is no risk of interstitial condensation forming.

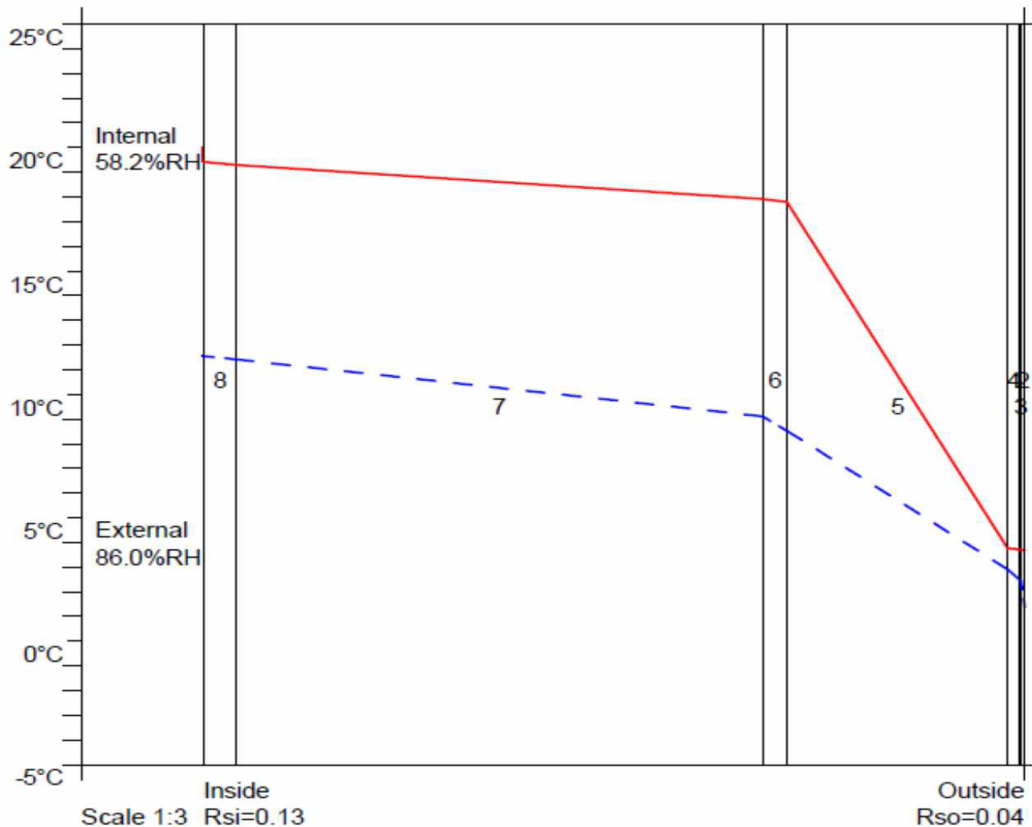
Interstitial condensation is where the moisture contained in the air forms into small droplets of water within the layers of the wall build up. Standard condensation is when the air forms into water droplets on the internal surface.

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The following diagram is a typical Glaser method U-value calculation and interstitial condensation analysis, which would indicate compliance with the required U-value of 0.30W/m²K and that there is no risk of condensation forming within the wall structure.

Construction Type		Element		External surface emissivity		Pitch		Bridge details	
Element		: Wall - Uvalue Element 1		: High		: High		Air gaps	
Internal surface emissivity		: High		External surface emissivity		: High		(Level, Delta U")	
	Thickness	Thermal	Thermal						
	(mm)	Conductivity	Resistance	(°)	(m ² K/W)				
Outside surface resistance	-	-	0.040						
Crepisix M (Topcoat)	1.5	0.870	0.002						
Crepiford for G (Primer)	0.5	0.570	0.001						
Fondisol F (Basecoat)	5.0	0.410	0.012						
EPS Graphite Enhanced	90.0	0.032	2.800					L:0 0.000W/m ² K	
Fondisol F (Adhesive)	10.0	0.410	0.024						
Brickwork single skin	215.0	0.770	0.279						
Gypsum plastering (1300 kg/m ³)	13.0	0.570	0.023						
Inside surface resistance	-	-	0.130						
Total thickness	335.0mm								



EWI system build up?

The EWI system is a sandwich construction of different layers, that have been tested to guarantee that they will perform together to provide a thermally efficient and durable outer skin for a property.

The PRB EWI system is made up of the following layers.

- 1. Adhesive – FONDISOL F** - The adhesive provides a primary high strength adhesion layer for the insulation boards when applied to the substrate and allow the insulation boards to be levelled and aligned.
- 2. Insulation** – The insulation is typically a specific density graphite enhanced expanded polystyrene (EPS 70E) which has a fire-retardant agent. This insulation is cost effective and ideally suited for many low-rise properties. Alternatively, a specific density Mineral Wool or a special Wood Fibre insulation can be used for older properties constructed of lime mortar or where higher breathability is required or where a higher fire performance is required use the Mineral Wool insulation.
- 3. Insulation Fixings** – The insulation boards are additionally secured to the substrate using specified thermally broken external wall insulation fixings, typically installed at a ratio of 6 - 7 fixings per square metre or 5 fixings per insulation board. The fixing type and length is determined by the substrate and the insulation thickness.
- 4. Basecoat – FONDISOL F** – The high-performance polymer modified basecoat is applied to the fixed and secured insulation boards.
- 5. Glass Fibre Reinforcing Mesh – AVN MESH** – The reinforcing mesh is trowelled into the basecoat to provide extra strength and to help alleviate thermal movement stress cracks from appearing on the surface.
- 6. Primer – CREPIFOND F or G** – This is required when a thin coat system finish is being applied and is applied to unify the suction of the basecoat prior to application of the topcoat.
- 7. Topcoat – THERMOLOOK (Mineral finish) – CREPISIX M, CREPOXANE F or M, CREPIXATE F or M (thin coat finishes)** – The topcoats are available in a wide range of weather resistant finishes both organic (Thin coat finishes) and mineral based (thick coat finishes), to suit all weather zones, different textures, and grain sizes, including a wide array of colours. The finishes can also include for dry dash finishes and brick slips systems.
- 8. Ancillary Items** – These include base tracks, beading, trims, sill extensions, sealing strips, fire breaks, sealants, and fixing solutions.

The PRB EWI System is installed by PRB Approved Installers only, and is subject to a PRB specification being issued, to ensure the quality of the installation and that all the correct components have been verified and used.

The installation process sequence.

The process below is a generic description of the sequences required for the installation of the EWI system. Where the project is subject to the requirements of the PAS2035 framework, then the pre-installation and installation must be mapped to the framework.

Site Survey

A site survey should be undertaken to assess the suitability of the property for the installation of the EWI system. This will enable for the correct specification to be written with any identified details or issues resolved prior to commencement on site.

The site survey can cover many items, and the list below is not exhaustive but should be included as a minimum in any survey.

- Check for rising and internal damp.
- Check for existing movement joints as a provision for these should be made with the new installation.
- Check for existing signs of efflorescence or salts.
- Test the walls for signs of any defects.
- Arrange for the fixing pull-out tests if this is required.
- Carry out a line and level survey to establish if any dubbing out will be required.
- Check on algae, lichen, or mould on the existing walls as this should be removed first.
- Review all detailing issues – particularly to roofs and other overhang locations – See below.
- Review architectural detailing and check to see if they require preserving or replicating.
- Determine if the roof overhang is sufficient for the depth of the proposed system and identify suitable solutions.
- Review any potential thermal bypass areas, such as floor zones and provide suitable solutions where feasible.
- Determine that there is suitable access.
- Prepare a full list of all fixtures and fittings that require removal and replacement.
- Prepare a list of services that will require notification to the appropriate organisations, such as the moving of gas or electric meters and telephone lines.
- All information required for the full preparation of the PRB specification, and any detail drawings required.

Specific recommendations and guidance:

When installing an EWI system it is best practice to ensure all roof overhangs are of sufficient width to accommodate the proposed EWI system. If this is not the case to all or parts of the roof, then the roof should be extended accordingly to ensure it overhangs the new EWI system at all points. This may require specialist building works to be carried out beforehand.

If a roof extension is to be carried out, this must be completed before the installation of the EWI system.

When re-fitting the gutters and downpipes, or any other external fitting, ensure they are fully cleaned before replacing and always use stainless fixings and appropriate anchoring systems designed for EWI systems. Timber backing blocks are **NOT** suitable as they compromise the EWI systems thermal performance by causing cold bridging points and over time may also rot.

Pre-treatment

Repairs should be undertaken and any dubbing-out completed. The facade should be fully cleaned down and treated where required with a fungicidal wash to remove lichen, and primed if the specification requires it for extra adhesion.

Enabling

The protection of the windows, floors, conservatories, or any areas that may be affected by the installation should be undertaken. Base tracks to be installed along with system stops, window beads, sealing strips, sills and verge trims if required.

Insulation boards

The adhesive should be applied to the rear of the insulation boards either as a full bond or as picture frame ribbon around the outside of the board with dabs at the fixing location points. Immediately after the adhesive has been applied, to ensure the adhesive does not skin over which could affect the bonding capability, the boards are pressed firmly to the surface of the wall, with L-Shape cuts around openings and with the boards having staggered joints and tied in corners.

Fixings

Once the insulation boards have been secured to the wall and allowed to cure for 24 hours, the fixings are installed through the insulation and into the substrate. These will be installed according to the PRB specification, but generally around 5 fixings per insulation board will be installed, with additional fixings to corners and openings as required, to a specific depth into the substrate, which for suspect substrates can be ascertained by the site fixing pull-out tests that have been undertaken.

PRB will issue a specific fixing pattern for the securing of the boards which must be followed.

Basecoat

The basecoat is applied to the surface of the insulation, to a general thickness of 4 - 6mm and whilst this is still fresh, the glass fibre reinforcing mesh is trowelled and embedded into the top third of the basecoat to ensure that it performs correctly with reinforcing mesh stress patches installed around all openings. The basecoat is finished smooth when receiving a thin coat system is being used and serrated when a thick mineral render finish is used.

Primer

For the thin coat systems, a primer is applied to the dry basecoat, usually by brush, or roller. The primer should have a complete coverage to ensure that the suction of the background is uniformed.

Topcoat

Where a thin coat topcoat is being applied, this is usually applied by a trowel or suitable spray equipment, to the grain thickness of the product. This is then textured by using a plastic float to a unified consistent surface appearance.

When a thick coat finish is applied directly to the serrated basecoat, a Scraped and Textured finish can be achieved and when a dry dash render or brick slip system is to be used then there will be an application of a secondary basecoat, before the dash aggregate is cast into the surface or the brick slips are installed.

Living with EWI.

The EWI system will continue to function and remain durable for more than 25 years; however, to maximise its performance over this timeframe, some periodic maintenance will be required. Routine inspections should be undertaken on all seals and junctions to check on any deterioration, and any damage that occurs to the system should be rectified by an approved PRB installer as soon as possible.

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Care and consideration should be adopted for any trades that are working on the outside of the property, so that they are fully aware of the consequences of their actions, especially regarding the fixing of items such as lights, hanging brackets etc to avoid damaging the system and the resting of ladders without spreader plates and the scraping of equipment across the surface of the system.

The EWI system should not require replacing during its lifetime but may require a cleaning or re-coating of the surface due to atmospheric pollution over time.

Always contact the PRB Systems Technical Department for advice and further information.

The information provided in this technical guidance is based upon current knowledge and experience. The user must ensure the products used are suitable for their specific application and no responsibility can be accepted, or any warranty given by our Representatives, Agents, or Distributors. Please always check with PRB or via the website that this document has not been replaced by a more updated version.