



April 2012

Section 3.2.1

External Wall Insulation



energy saving



warmth



quietness



fire protection



sustainability

External Wall Insulation

External Wall Insulation (EWI) design



Introduction

External Wall Insulation (EWI) systems involve the installation of an insulating layer to the external fabric of an existing, or new building, the system is usually finished with a render coat, brick slips or clad with timber boards or tiles.

EWI systems should not be used to isolate or hide moisture penetration or damp problems in the existing structure. In accordance with Building Regulations, new solid walls should prevent moisture ingress arising from exposure to rain and snow without moisture penetrating to the inside and damaging the building.

Unless an existing building is already rendered or clad the installation of EWI can dramatically alter and improve the appearance of the external facade. Particular attention will need to be made to window sills, jambs, rainwater goods and the roof eaves as structural changes may be required to accommodate the thickness of the external wall insulation system.

When deciding which EWI system is most appropriate for the circumstances there are several issues that need to be considered.

However, the most important issues are the level of thermal performance to be achieved, the insulation type and which finish is the most suitable.

A wide variety of insulation types can be used in EWI systems, however, the best solutions are usually comprised of rock mineral wool or expanded polystyrene (EPS) and each has its own merits. For instance, both rock mineral wool and EPS products have excellent thermal insulation performance, whilst rock mineral wool products are non-combustible which negates the need to install fire barriers and EPS has the advantage of being lightweight. Therefore, the differentiating characteristics of insulation products can dictate where, when and why one product is specified or preferred over another.

Thermal comfort

An EWI system makes use of the thermal mass of the wall which in turn helps to provide less peaks and troughs in the internal environment. This is particularly beneficial in buildings such as hospitals and retirement homes which are often continuously heated and can allow the heating system to be turned down overnight as the energy absorbed by the wall during the day is released back into the internal environment overnight.

Air leakage

Buildings can suffer from excessive air leakage which, if not treated, can lead to high energy costs, occupant discomfort from draughts and external noise, as well as a reduction in indoor air quality. The installation of an EWI system can deliver an airtight structure and reduce draughts and heat loss as any cracks and gaps in the external fabric of the building will be covered and sealed by the system.

Condensation

Interstitial condensation occurs when warm, moist air from inside a building penetrates into the fabric of a structure and meets a cold surface, where it cools, reducing its ability to carry water vapour and increasing the risk of condensation forming within the construction.

Installing an EWI system prevents interstitial condensation from forming because the dew point temperature is moved closer to the external face of the insulated structure. Installing a vapour permeable insulation product can further reduce the risk of condensation forming as it will offer negligible resistance to the passage of water vapour and in effect allows the wall to 'breathe' if used in conjunction with a vapour permeable render coat.

Surface condensation is prevented from forming on internal wall surfaces as the structural wall is on the warm side of the insulation which will always be above the dew point temperature.

Thermal bridging

Thermal bridging can be greatly reduced in existing buildings and almost completely removed in new buildings by installing an EWI system, as the insulation layer forms as complete a layer as is possible around the building. Therefore, overlaying the existing thermal bridges (such as those at external wall to party wall junctions) with insulation removes any significant thermal bridge, reduces heat loss and prevents condensation from forming.

Careful design detailing is required at junctions such as those at window and door reveals, roof eaves and verges and where the EWI system starts close to ground level. The treatment of existing features such as balconies, handrails and satellite dishes also needs careful consideration.

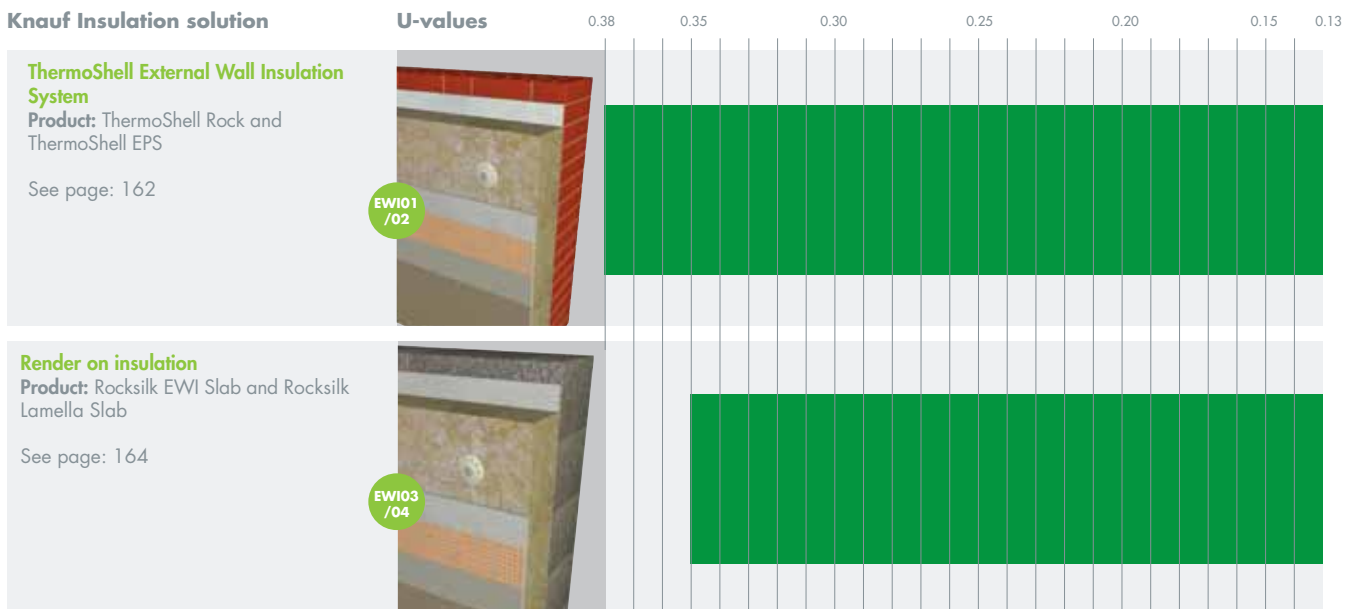
Dampness in walls

The most common causes of dampness in existing solid masonry external walls are, penetrating damp (often caused by deterioration of the existing mortar, blocked gutters or faulty rainwater goods), rising damp and condensation, particularly surface condensation.

For instance, missing or damaged render should be reinstated, faulty or missing flashings should be repaired or replaced and areas suffering from mortar deterioration should be re-pointed with a suitable mortar mix.

Dampness can have a negative effect on the physical properties of the materials used to construct a wall and best practice is to cure any damp problems before installing an EWI system onto an existing wall. This is not a problem for new build walls as they will not be subjected to the potential problems caused by long term exposure to the elements although the EWI system finish will need to be maintained to ensure the long term protection of the facade.

Solution optimiser and pathfinder



Key

- Thermal insulation achievable by constructions within this document.
- Find online. Visit knaufinsulation.co.uk and key in construction code to find the most up to date information on your chosen solution.

External Wall Insulation

ThermoShell External Wall Insulation System

ThermoShell Rock/Rock Plus and ThermoShell EPS



EWI01

EWI02

- Breathable system allows moisture vapour to pass through the construction removing the risk of condensation forming
- Can improve the appearance of an existing building whilst providing upgraded thermal performance
- Can accommodate wall imperfections to provide a high quality finish
- Installed externally with minimal disruption to occupants of existing buildings

ThermoShell Rock/Rock Plus

- Non-combustible with a Euroclass A1 reaction to fire rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)



Products

ThermoShell Rock/Rock Plus are high impact strength rock mineral wool slabs with a water repellent additive specially developed for external wall insulation systems. Their manufacture has a very low impact on the environment.

ThermoShell EPS is a lightweight expanded polystyrene board with high thermal efficiency, designed for easy handling and speedy installation.

Typical construction

Existing or new solid masonry wall insulated with ThermoShell Rock/Rock Plus or ThermoShell EPS finished with either a mineral or silicone render.

Installation

ThermoShell Rock/Rock Plus are easily cut with a large bladed knife or saw, ThermoShell EPS should ideally be cut with a hot wire knife. Remove all loose and flaking materials from the wall, making good all hollow areas to provide a smooth, stable substrate.

Mechanically fix the starter track at damp proof course level.

ThermoShell Rock/Rock Plus or ThermoShell EPS are bonded to the substrate using TS-Bond. A maximum thickness of 20mm of TS-Bond can be used to even out localised undulations in the substrate.

ThermoShell Rock/Rock Plus or ThermoShell EPS should be installed in a stretcher bond pattern. Before the TS-Bond has set, mechanically fix the insulation slabs/boards with TS-Fixings.

Typically, 4 fixings per m² are required at low level increasing to 6 fixings per m² for high level applications.

Apply TS-Bond to a minimum thickness of 5mm over surface of the insulation slabs/boards and level out using a straight edge. Trowel a layer of TS-Reinforcing Mesh into the fresh mortar and gently push the mesh just below the surface of the TS-Bond.

Ensure that the TS-Reinforcing Mesh is overlapped by a minimum of 100mm in all instances and trimmed back so none is visible.

TS-Primer should be applied prior to the installation of the topcoat in order to provide better adhesion, control background suction and

prevent a pitting effect on the topcoat.

The background should be dry before application of the TS-Primer.

Prior to application of the topcoat the background should be level, dry and free from dirt and dust. Apply TS-Silicone or TS-Mineral topcoat by hand or spray and ensure that the freshly applied topcoat is protected from the weather to avoid 'wash offs' from occurring.

Note: Do not apply when air temperature is at or below 5°C on a falling thermometer or below 3°C on a rising thermometer, or when the temperature of the air, or wall surface is above 30°C and the surface is not protected.

Performance

Thermal performance

ThermoShell Rock has a thermal conductivity of 0.036W/mK.

ThermoShell Rock Plus has a thermal conductivity of 0.038W/mK.

ThermoShell EPS has a thermal conductivity of 0.032W/mK.



Installed by approved installers.
For details visit ThermoShell.co.uk

Table 15 - U-value table for existing walls and the ThermoShell External Wall Insulation System

Thickness* (mm)	U-values (W/m ² K)								
	225mm solid brick wall (1)			215mm solid block wall (2)			250mm brick/block cavity wall unfilled (3)		
	0.038	0.036	0.032	0.038	0.036	0.032	0.038	0.036	0.032
200	0.17	0.17	0.15	0.17	0.16	0.14	0.17	0.16	0.15
190	0.18	0.17	0.16	0.18	0.17	0.15	0.18	0.17	0.15
180	0.19	0.18	0.16	0.18	0.18	0.16	0.19	0.18	0.16
170	0.20	0.19	0.17	0.19	0.19	0.17	0.20	0.19	0.17
160	0.21	0.20	0.18	0.20	0.20	0.18	0.21	0.20	0.18
150	0.22	0.21	0.19	0.22	0.21	0.19	0.22	0.21	0.19
140	0.24	0.23	0.21	0.23	0.22	0.20	0.23	0.22	0.20
130	0.26	0.24	0.22	0.24	0.23	0.21	0.25	0.24	0.21
120	0.27	0.26	0.24	0.26	0.25	0.23	0.26	0.25	0.23
110	0.29	0.28	0.25	0.28	0.27	0.24	0.28	0.27	0.25
100	0.32	0.31	0.28	0.30	0.29	0.26	0.31	0.29	0.27
90	0.35	0.33	0.30	0.33	0.32	0.29	0.33	0.32	0.29
80	0.38	0.37	0.33	0.36	0.35	0.32	0.37	0.35	0.32



(1) Lambda value of brickwork - 0.77W/mK
(2) Lambda value of block - 0.45W/mK
(3) Lambda value of block - 1.13W/mK
*Other thicknesses are available

Typical specification

Mechanically fix ThermoShell starter track every 300mm using SDK 085 fixings, use base rail connectors to fix starter tracks together.

Fix ThermoShell Rock*/Rock Plus*/ThermoShell EPS*..... mm thick to the substrate with 10mm TS-Bond and TS-Fixings. TS-Reinforcing Mesh to be fixed through the insulation into the substrate using TS-Fixings atper m². Embed TS-Reinforcing Mesh in 5mm TS-Bond reinforcing coat.

Apply TS-Primer Coat to dry reinforcing coat prior to application of TS-Silicone* or TS-Mineral* render. (*Delete as appropriate.)

Install ThermoShell stops and drip beads around openings, at corners, at base of insulation and at damp proof course level. Where a structural movement joint occurs form with back-to-back starter-tracks or with movement joint profiles.

Form expansion joints using ThermoShell approved beads and trims at minimumm horizontal andm vertical centres.

Alternatively, consult the National Building Specifications, Standard version clause/clauses... M21/210.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Table 16 - U-value table for new build walls and the ThermoShell External Wall Insulation System

Thickness* (mm)	U-values (W/m ² K)								
	215mm solid block wall (0.34W/mK)			215mm solid block wall (0.19W/mK)			215mm solid block wall (0.16W/mK)		
	0.038	0.036	0.032	0.038	0.036	0.032	0.038	0.036	0.032
200	0.16	0.15	0.14	0.15	0.14	0.13	0.15	0.14	0.13
190	0.17	0.16	0.14	0.16	0.15	0.14	0.15	0.15	0.13
180	0.18	0.17	0.15	0.16	0.16	0.14	0.16	0.15	0.14
170	0.18	0.18	0.16	0.17	0.16	0.15	0.17	0.16	0.15
160	0.19	0.18	0.17	0.18	0.17	0.16	0.17	0.17	0.15
150	0.20	0.19	0.18	0.19	0.18	0.17	0.18	0.18	0.16
140	0.21	0.21	0.19	0.20	0.19	0.17	0.19	0.18	0.17
130	0.23	0.22	0.20	0.21	0.20	0.18	0.20	0.19	0.18
120	0.24	0.23	0.21	0.22	0.21	0.20	0.21	0.21	0.19
110	0.26	0.25	0.23	0.23	0.23	0.21	0.23	0.22	0.20
100	0.28	0.27	0.24	0.25	0.24	0.22	0.24	0.23	0.22
90	0.30	0.29	0.26	0.27	0.26	0.24	0.26	0.25	0.23
80	0.33	0.31	0.29	0.29	0.28	0.26	0.28	0.27	0.25



*Other thicknesses are available

Compression resistance

ThermoShell Rock has very high compressive and impact strength providing additional protection when additional resistance to impact damage is required.

ThermoShell EPS has high compressive strength and provides a durable system suitable for use in all areas where high impact strength is not an overriding consideration.

Fire performance

ThermoShell Rock/Rock Plus are non-combustible and classified as Euroclass A1 to BS EN ISO 13501-1.

ThermoShell EPS is class E Reaction to Fire in accordance with BS EN 13501-1 and contains a flame retardant additive.

Cavity barriers are not required when installing the ThermoShell Rock system, but should be installed in accordance with Building Regulation requirements when installing the ThermoShell EPS system.

External Wall Insulation

Render on insulation

Rocksilk EWI Slabs and Rocksilk Lamella Slab



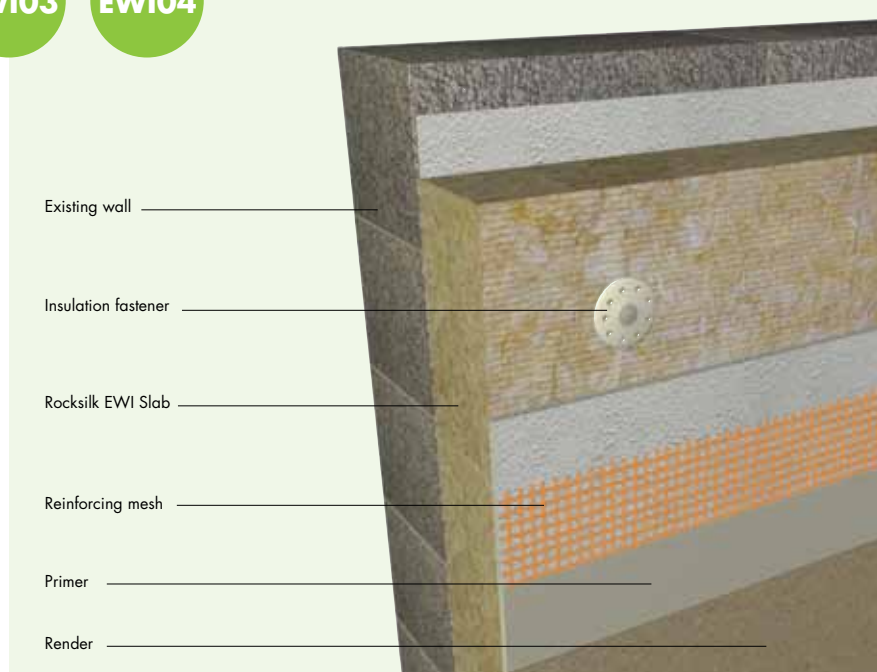
EWI03

EWI04

- Breathable system allows moisture vapour to pass through the construction removing the risk of condensation forming
- Can improve the appearance of an existing building whilst providing upgraded thermal performance
- Can accommodate wall imperfections to provide a high quality finish
- Installed externally with minimal disruption to occupants of existing buildings

Rocksilk EWI Slabs

- Non-combustible with a Euroclass A1 reaction to fire rating
- Zero Ozone Depletion Potential (ODP)
- Zero Global Warming Potential (GWP)



Product

Rocksilk EWI Slabs are a high impact strength rock mineral wool slabs with a water repellent additive specially developed for external wall insulation systems. Their manufacture has a very low impact on the environment.

Typical construction

Existing or new solid masonry wall insulated with Rocksilk EWI Slabs and a render finish.

Note: Rocksilk EWI Slabs are used as the mineral wool solution in many proprietary external wall insulation systems available on the market.

Installation

Mechanical fix: Rocksilk EWI Slabs are easy to cut with a knife or saw to fit around openings. Remove all loose and flaking materials from the wall, making good all hollow areas to give a smooth, stable substrate.

Temporarily fix Rocksilk EWI Slab using simple friction fit mechanical fixings. These are sufficient as temporary fixings but must not be relied upon as the final structural fixing. Use one or two fixings per slab.

Secure expanded metal lath using specialist fixings such as EJOT TID and DH, which extend through the insulation into the masonry wall. Normally nine fixings per square metre are required, but this largely depends on the pullout force achieved by the particular fixing being used and the nature of the substrate. Please refer to fixing manufacturer for further information.

Provide beads around openings, at corners and at the perimeter of the insulated area, at structural joints and to form expansion joints. Where damp proof courses (dpc's) occur, they should be extended through the insulation and render. Apply render in two coats. Proprietary renders should be applied in accordance with manufacturer's instructions.

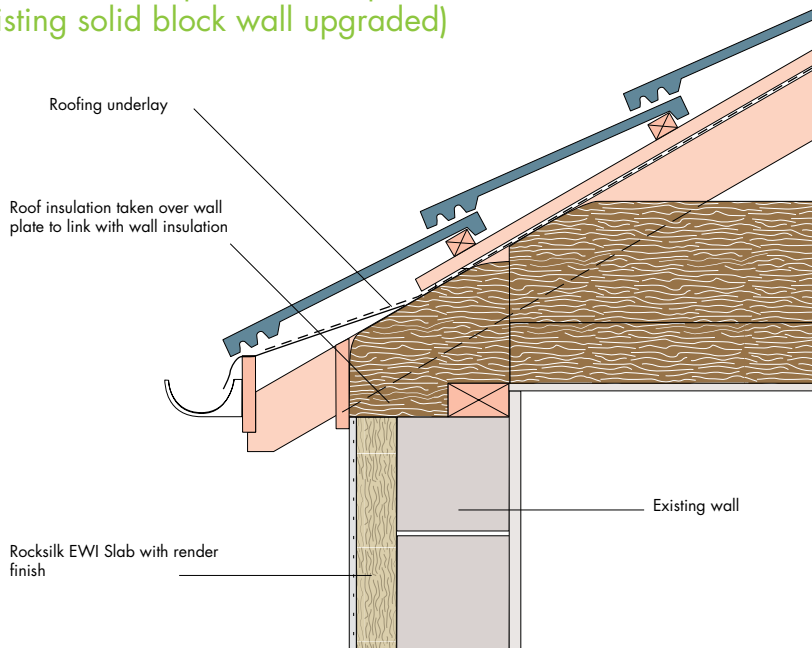
EWI04

Rocksilk Lamella Slab is available for use in adhesively fixed external wall installation systems. Details of proprietary EWI system manufacturers can be obtained by contacting our Technical Advice and Support Centre team on 01744 766666.



Installed by approved installers.
For details visit ThermoShell.co.uk

Typical detail at junction with pitched roof (existing solid block wall upgraded)



Typical specification

Fix Rocksilk EWI Slab*/EWI Slab Plus* mm thick to the substrate with temporary fixings/adhesive.

Expanded metal lath (material/reference) to be fixed through the insulation into the wall using fixings. Provide stop and drip beads around openings, at corners, at base of insulation and at dpc level. Form expansion joints using beads at minimumm horizontal andm vertical centres. Horizontal joints to align with (e.g. window heads).

Apply two coat render as specification clause.....

(*Delete as necessary).

National Building Specifications (NBS) based on standard version J42, contain a set of proprietary clauses which are edited version written by Knauf Insulation.



Alternatively, consult the National Building Specifications, Standard version clause/clauses... M21/210.....

Knauf Insulation specification clauses can be downloaded from knaufinsulation.co.uk/nbs

Performance

Compression resistance

The rigidity of Rocksilk EWI Slabs makes them easy to handle and less prone to site damage than less robust options. The compression resistance of the Rocksilk EWI Slabs provide excellent support to the lath and render systems improving its resistance to impact damage, and thereby helping to prolong its service life.

Thermal performance

Rocksilk EWI Slab Plus has a thermal conductivity of 0.038W/mK.

Rocksilk EWI Slab has a thermal conductivity of 0.036W/mK.

Fire performance

Rocksilk EWI Slabs are non-combustible and classified as Euroclass A1 to BS EN ISO 13501-1.

Rocksilk EWI Slabs are non-combustible, fire barriers are not required.

For information on EJOT fixings, telephone 01977 687040

EW103

Table 17 - Typical U-values of external walls with external wall insulation

Thickness* (mm)	U-values (W/m²K) for 215mm solid masonry wall of:							
	Medium block (λ = 0.51)		Lightweight aggregate (λ = 0.34)		Standard aircrete (λ = 0.16)		Lightweight aircrete (λ = 0.11)	
	0.038	0.036	0.038	0.036	0.038	0.036	0.038	0.036
200	0.17	0.16	0.16	0.15	0.15	0.14	0.14	0.13
190	0.17	0.16	0.17	0.16	0.15	0.15	0.14	0.14
180	0.18	0.17	0.18	0.17	0.16	0.15	0.15	0.14
170	0.19	0.18	0.18	0.18	0.17	0.16	0.16	0.15
160	0.20	0.19	0.19	0.18	0.17	0.17	0.16	0.16
150	0.21	0.20	0.20	0.19	0.18	0.18	0.17	0.16
140	0.22	0.21	0.21	0.21	0.19	0.18	0.18	0.17
130	0.24	0.23	0.23	0.22	0.20	0.19	0.19	0.18
120	0.25	0.24	0.24	0.23	0.21	0.21	0.20	0.19
110	0.27	0.26	0.26	0.25	0.23	0.22	0.21	0.20
100	0.29	0.28	0.28	0.27	0.24	0.23	0.22	0.21
90	0.32	0.30	0.30	0.29	0.26	0.25	0.23	0.23
80	0.35	0.33	0.33	0.31	0.28	0.27	0.25	0.24



Note: Fixings assumed to be plastic insulation holders with 5mm dia. steel expansion pin.

For project specific calculations contact our Technical Advice and Support Centre on 01744 766666.

*Other thicknesses are available

KNAUFINSULATION

it's time to save energy

Disclaimer

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Wherever possible, products are manufactured to the appropriate British Standard (BS), or harmonised European Standards, (BS EN) and are supplied subject to our Terms and Conditions of Sale, a copy of which is available on request.

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