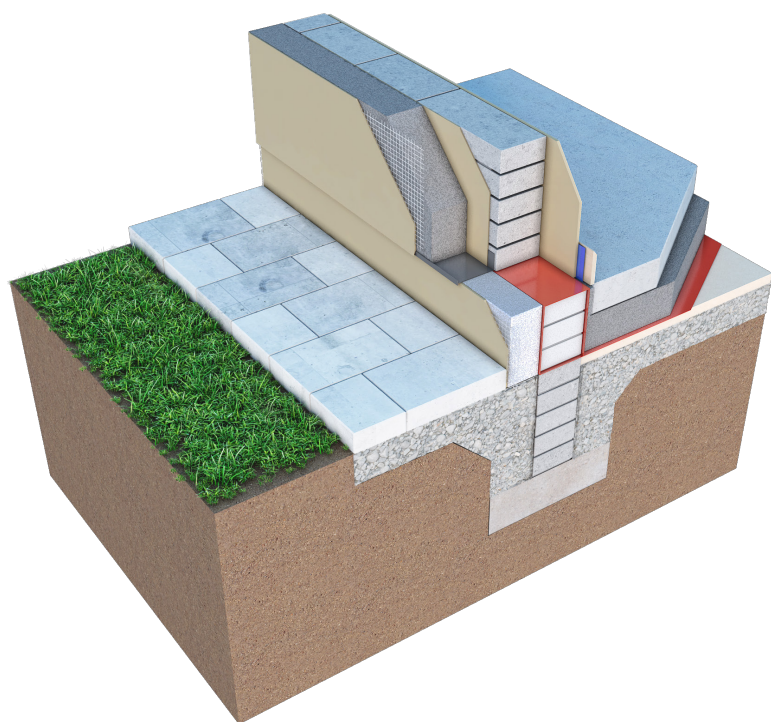


KORE

KORE External

Retrofit External Insulation Design Guide

KORE External Insulation System



Key Features

- Meets and exceeds buildings regulations
- Suitable for passive house construction
- Installed by insulation experts
- Suitable for use with composite external insulation systems
- Thermal mass benefits from concrete construction

KOREEXTERNAL

Application & Description

Application

KORE External Insulation, together with a composite system, is fixed to the external face of external wall constructions. The product is designed for application on cavity walls, solid walls, hollow block walls, and timber frame walls. The product is suitable for use on existing buildings.

Product Name Guide

Product Name	Application	Retrofitting
KORE External EPS 70 Silver	External Wall	Yes
KORE External EPS 70 White	External Wall	Yes
KORE External EPS 200 White	Plinth & Reveals	Yes

Description

KORE External is a high performance expanded polystyrene (EPS) insulation board that is used in conjunction with a composite external thermal insulation system. The product consists of rigid boards cut from moulded blocks of EPS. The blocks are aged for four to six weeks to ensure the product is delivered to site to the exacting tolerances required for external insulation products. KORE External products are available in two grades of material, silver and white, and a range of thicknesses. Our KORE External Plinth board is manufactured to a very high density, EPS200, specifically to insulate the plinth below the damp proof course. EPS200 has very low water absorption properties making it an ideal solution at plinth level.

Typical Construction & U-Value Calculations

Calculation Assumptions

All U-value calculations are in accordance with BS EN ISO 6946:2007. Unless stated otherwise inner blocks have a thermal conductivity of 1.13W/mK. Internal finishes unless otherwise stated taken as 12.5mm standard plasterboard with 3mm plaster skim on dabs. Conventional surface resistance; direction of heat flow taken as horizontal. Where applicable air layer is taken as unventilated. Unventilated air layer emissivity surfaces were given due consideration. Corrections for air layers and mechanical fasteners penetrating the insulation layer were considered. A correction factor was applied to calculations for existing buildings. These calculations should act as a guide only. Please contact our technical team for a detailed U-value calculation and condensation risk analysis.

Definitions

fRSI-Value Definition

The fRSI-value is a ratio of the difference in internal temperature and minimum surface temperature to the difference in internal and external temperatures. Internal and external temperatures are applied to the relevant surfaces of the model, and the software calculates the heat flow through the materials and bridging elements, to determine the heat energy loss from inside to outside, and the surface temperatures on the inner surfaces of the building. It is then determined if the fRSI-value is above or below the limits set out in IP 106 and Technical Guidance Document Part L 2019. fRSI-value must be above 0.75 at the coldest point (must be above 15 degrees Celsius) on any internal face of the junction modelled for residential areas.

Psi Value Definition

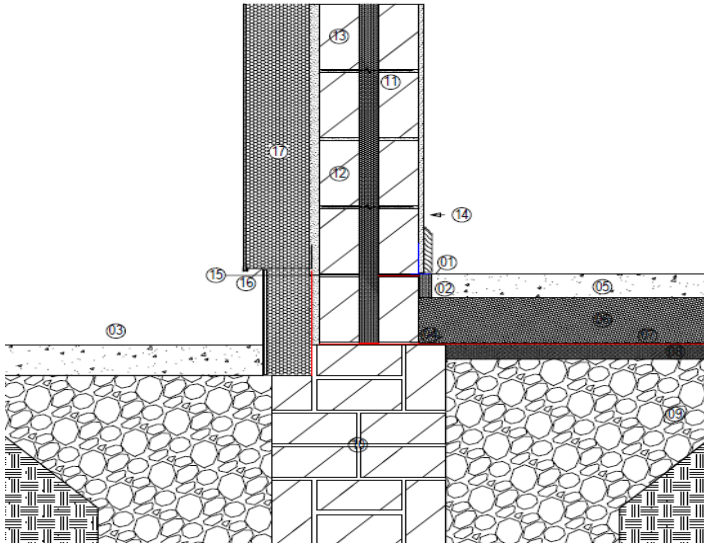
The Psi-value represents the extra heat flow through the linear thermal bridge over and above that through the adjoining plane elements. If a Psi-value does not meet the default value outlined in TGDG tables it is still possible to calculate a Thermal Bridging Factor (y value) that is better than default, by means of manual (y value) calculation. The Thermal Bridging Factor (y value) is a parameter that is inputted in the BER calculation and takes into account the Psi-values of all heat loss junctions, the lengths over which the Psi-values apply and the total thermal envelope area of the building.

Thermal Modelling

All thermal modelling has been carried out by Evolusion Innovation on behalf of KORE Insulation. Evolusion Innovation are NSAI certified to thermally model junction details and calculate their linear thermal transmittance. Evolusion's thermal modellers are also included on the NSAI registrar of approved thermal modellers. All modelling is carried out in accordance with EN ISO 6946 as well as EN ISO 10211-1 and BR 497.

Typical Construction & U-Value Calculations

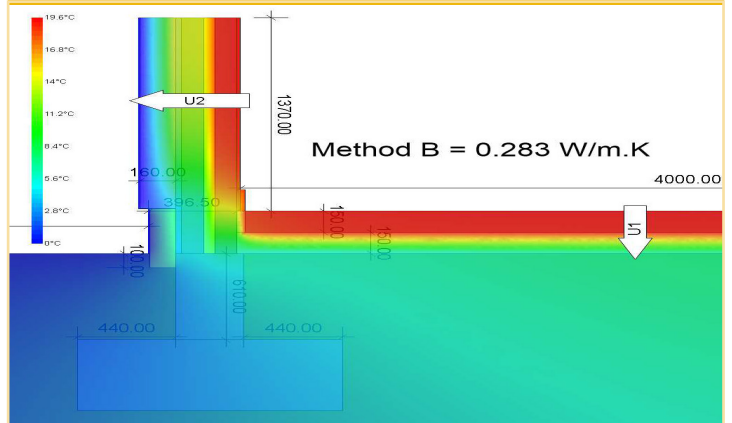
EWI_87: Cavity Wall Construction - Block Inner and Outer Leaf, Dense Plaster Internal Finish, Cavity Pumped KORE Fill Diamond Bonded Bead, External Insulation Application



1. Junctions to be taped with airtightness tape to ensure air tightness levels are achieved.
2. 35mm KORE EPS70 Silver Floor perimeter insulation with min R-Value of 1.1 m²k/w.
3. Footpath
4. Radon membrane to be lapped over block and sealed to radon barrier below with radon resisting sealing tape to avoid rising moisture.
5. Concrete floor to engineers' specifications and details.
6. 150mm KORE Floor Insulation.
7. Radon barrier on 50mm sand blinding and installed to TGD-C.
8. 50mm sand blinding.
9. Compacted hardcore.
10. Foundations and rising walls to structural engineers' specifications and details.
11. Wall ties to manufacturers specifications and details.
12. 50mm KORE Fill bonded bead insulation to be installed 225mm minimum below top of floor level.
13. 250mm Cavity Wall - 100mm block, 50mm KORE Fill Diamond bonded beads, Block
14. 15mm internal sand cement render (internal includes airtight parge coat)
15. DPC level minimum of 150mm from ground level.
16. Galvanised steel base rail with expansion fixings.
17. KORE External insulation adhered to wall with adhesive mortar, and external rendering system consisting of a high polymer base coat, reinforcing mesh, silicone primer and silicone render.

Plasterboard, Block, Cavity, Block, Insulation, Render		
Insulation	KORE External EPS70 White	KORE External EPS70 Silver
	U-Value W/m ² K	
100mm	0.22	0.20
120mm	0.20	0.17
130mm	0.19	0.16
150mm	0.17	0.15
180mm	0.15	0.13
190mm	0.14	0.13
200mm	0.14	0.12
210mm	0.13	0.12
220mm	0.13	0.11
230mm	0.12	0.11
240mm	0.12	0.10
250mm	0.12	0.10
300mm	0.10	0.09

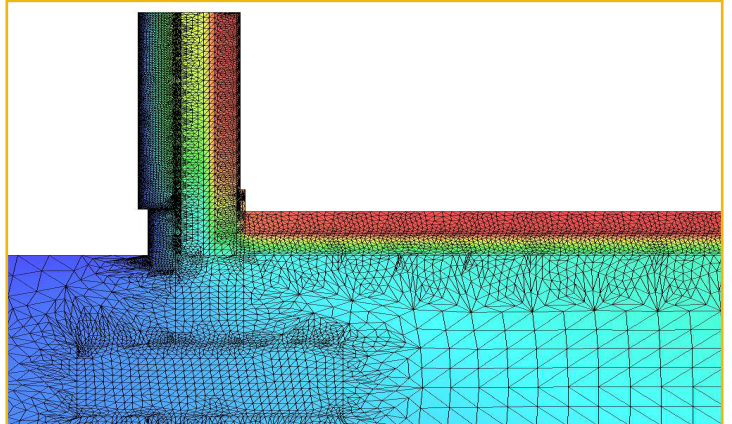
EWI_87: Psi Calculation



Thermal bridges calculation

$$\Psi = +0.283 \text{ W/(mK)}$$

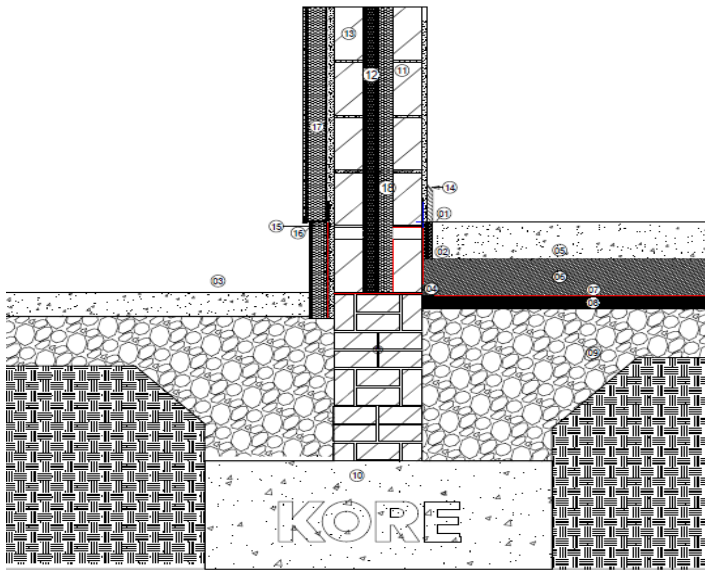
EWI_87: fRsi Calculation



$$f_{Rsi} = 0.83 > 0.75$$

Typical Construction & U-Value Calculations

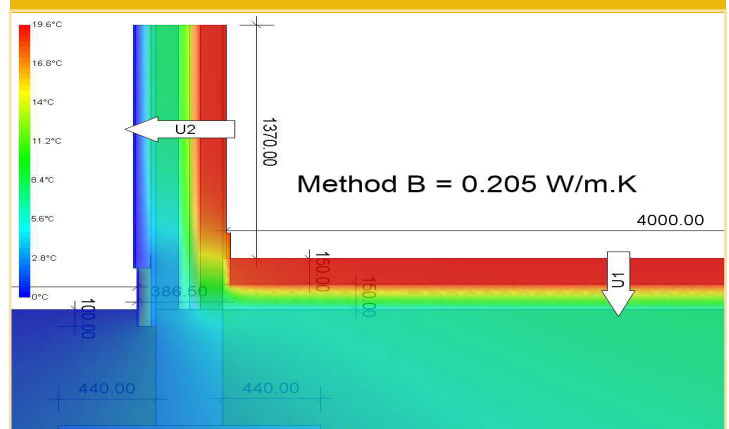
EWI_90: Cavity Wall Construction - Block Inner and Outer Leaf, Dense Plaster Internal Finish, Cavity Pumped KORE Fill Diamond Bonded Bead with 50mm EPS70 White Board, External Insulation Application



1. Junctions to be taped with airtightness tape to ensure airtightness levels are achieved.
2. 35mm KORE EPS70 Silver Floor perimeter insulation with min R-Value of 1.1 m²k/w.
3. Footpath
4. Radon membrane to be lapped over block and sealed to radon barrier below with radon resisting sealing tape to avoid rising moisture.
5. Concrete floor to engineers' specifications and details.
6. 150mm KORE Floor Insulation.
7. Radon barrier on 50mm sand blinding and installed to TGD-C.
8. 50mm sand blinding.
9. Compacted hardcore.
10. Foundations and rising walls to structural engineers' specifications and details.
11. Wall ties to manufacturers specifications and details.
12. 50mm KORE Fill bonded bead insulation to be installed 225mm minimum below top of floor level.
13. 300mm Cavity Wall - 100mm block, 50mm KORE Fill & 50mm EPS Board, Block
14. 15mm internal sand cement render (internal includes airtight pargé coat)
15. DPC level minimum of 150mm from ground level.
16. Galvanised steel base rail with expansion fixings.
17. KORE External insulation adhered to wall with adhesive mortar, and external rendering system consisting of a high polymer base coat, reinforcing mesh, silicone primer and silicone render.
18. 50mm EPS70 White board.

Plasterboard, Block, Cavity, Block, Insulation, Render		
Insulation	KORE External EPS70 White	KORE External EPS70 Silver
U-Value W/m²K		
100mm	0.17	0.16
120mm	0.15	0.14
130mm	0.15	0.13
150mm	0.14	0.12
180mm	0.12	0.11
190mm	0.12	0.11
200mm	0.12	0.10
210mm	0.11	0.10
220mm	0.11	0.10
230mm	0.11	0.09
240mm	0.10	0.09
250mm	0.10	0.09
300mm	0.09	0.08

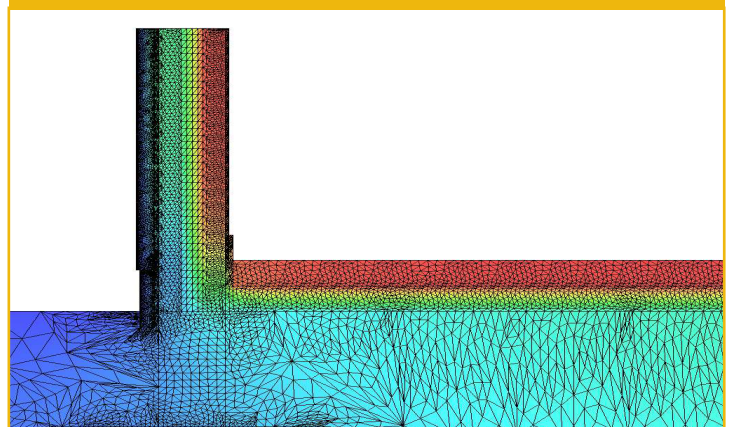
EWI_90: Psi Calculation



Thermal bridges calculation

$$\psi = +0.205 \text{ W/(mK)}$$

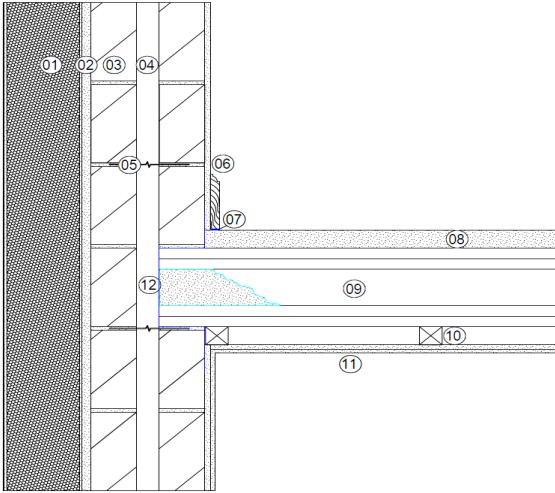
EWI_90: fRsi Calculation



$$f_{Rsi} = 0.84 > 0.75$$

Typical Construction & U-Value Calculations

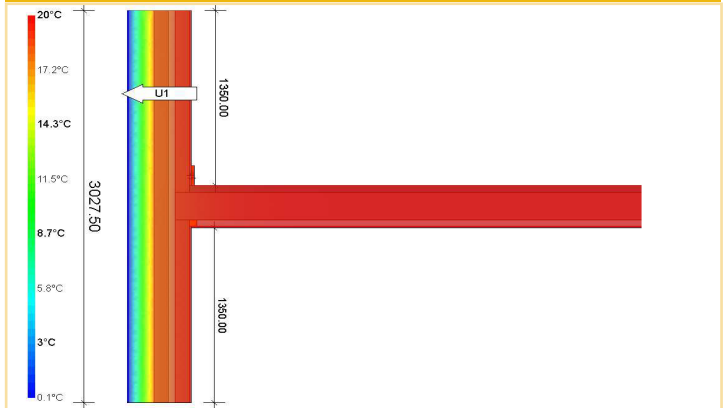
EWI_23: Cavity Wall Construction - Retrofit Block Inner and Outer Leaf, Plasterboard and Skim Internal Finish, Cavity Empty Unventilated, External Insulation Application



1. KORE External Insulation adhered to wall with adhesive mortar, and external rendering system consisting of a high polymer base coat, reinforcing mesh, silicone primer and silicone render
2. Existing 20mm external render
3. 250mm cavity wall - 100mm concrete block outer leaf, 50mm cavity, and 100mm concrete block inner leaf
4. 50mm unventilated cavity
5. Wall ties to manufacturers specifications and details
6. Existing 13mm internal render
7. Skirting-seal gap between skirting board and the floor using a flexible sealant
8. Screed to concrete flooring manufacturers specifications and details
9. Hollowcore slab to concrete flooring manufacturers specifications and details
10. 50mm x 50mm timber battens fixed to underside of slab
11. 12.5mm plasterboard fixed to battens below hollowcore slab with 12.5mm gypsum render over
12. Airtight membrane draped around end of hollowcore slab during installation and sealed on inside

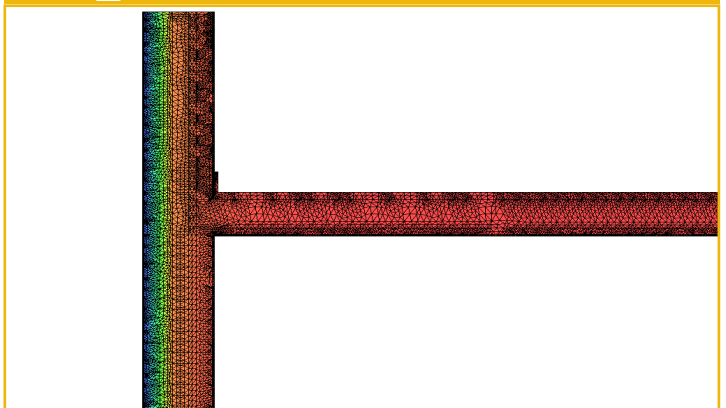
Plasterboard, Block, Cavity, Block, Insulation, Render		
Insulation	KORE External EPS70 White	KORE External EPS 70 Silver
	U-Value W/m ² K	
100mm	0.30	0.26
120mm	0.26	0.22
130mm	0.24	0.21
150mm	0.22	0.18
180mm	0.18	0.16
190mm	0.17	0.15
200mm	0.17	0.14
210mm	0.16	0.14
220mm	0.15	0.13
230mm	0.15	0.12
240mm	0.14	0.12
250mm	0.14	0.12
300mm	0.12	0.10

EWI_23: Psi Calculation



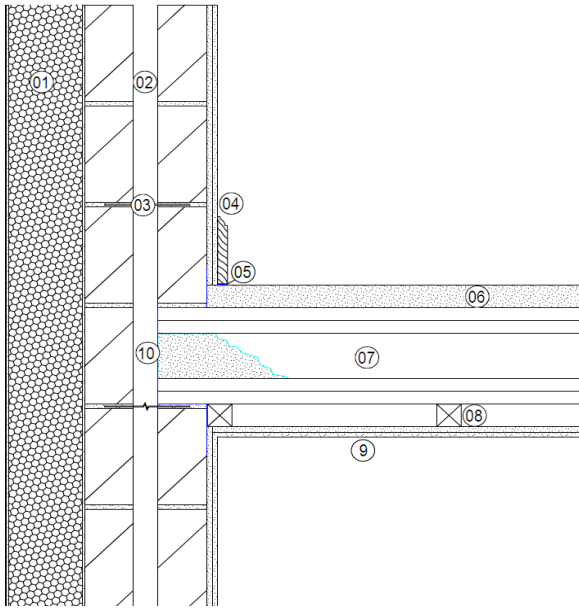
Thermal bridges calculation
 $\psi = +0.000 \text{ W/(mK)}$

EWI_23: fRsi Calculation



Typical Construction & U-Value Calculations

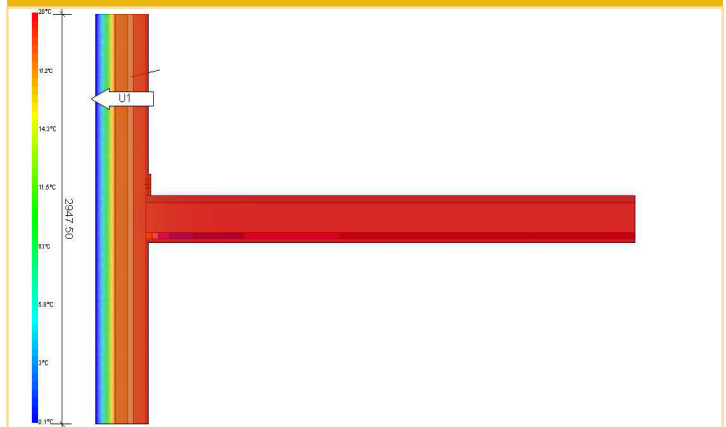
EWI_20: Cavity Wall Construction - Block Inner Leaf, Block Outer leaf, Dense Plasterboard Internal Finish, Cavity Empty Unventilated, External Insulation Application



1. KORE External insulation adhered to wall with adhesive mortar and external rendering system consisting of a high polymer base coat, reinforcing mesh, silicone primer and silicone render
2. 250mm cavity wall - 100mm concrete block outer leaf, 50mm cavity and 100mm concrete block inner leaf
3. Wall ties to manufacturers specifications and details
4. 12.5mm plasterboard fixed on internal face of wall with 12.5mm gypsum render over
5. Skirting-seal gap between skirting board and the floor using a flexible sealant
6. Screed to concrete flooring manufacturers specifications and details
7. Hollowcore slab to concrete flooring manufacturers specifications and details
8. 50mm x 50mm timber battens fixed to underside of slab
9. 12.5mm plasterboard fixed to battens below hollowcore slab with 12.5mm gypsum render over
10. Airtight membrane draped around end of hollowcore slab during installation and sealed on inside

Plasterboard, Block, Cavity, Block, Insulation, Render		
Insulation	KORE External EPS70 White	KORE External EPS70 Silver
U-Value W/m²K		
100mm	0.30	0.26
120mm	0.26	0.22
130mm	0.24	0.21
150mm	0.22	0.18
180mm	0.18	0.16
190mm	0.17	0.15
200mm	0.17	0.14
210mm	0.16	0.14
220mm	0.15	0.13
230mm	0.15	0.12
240mm	0.14	0.12
250mm	0.14	0.12
300mm	0.12	0.10

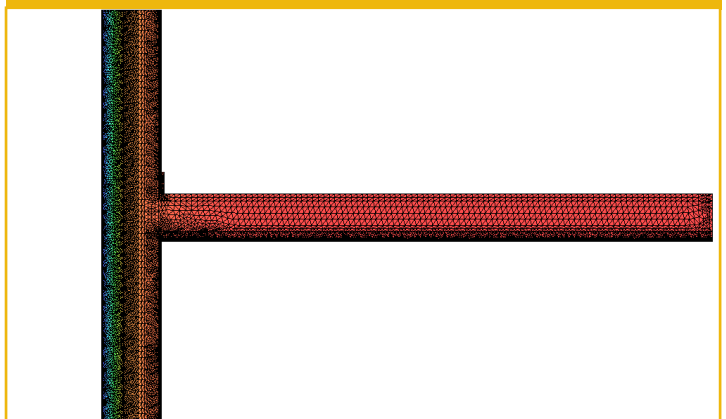
EWI_20: Psi Calculation



Thermal bridges calculation

$$\psi = +0.000 \text{ W/(mK)}$$

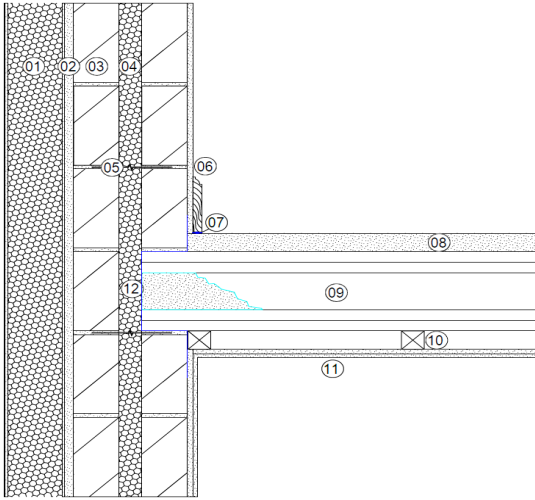
EWI_20: fRsi Calculation



$$f_{Rsi} = 0.96 > 0.75$$

Typical Construction & U-Value Calculations

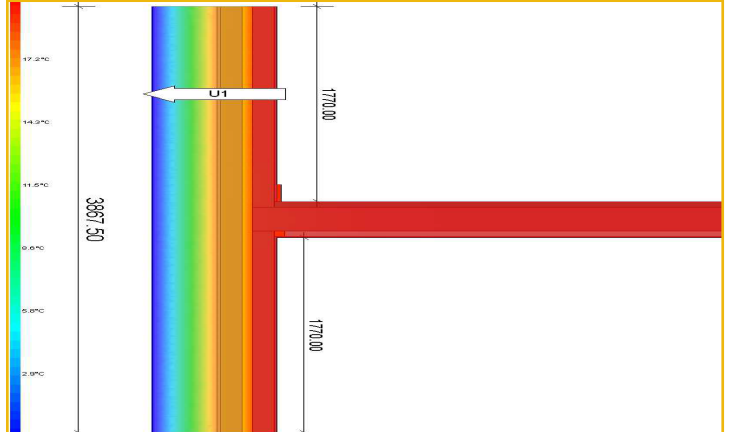
EWI_21: Cavity Wall Construction - Block Inner and Outer Leaf, Dense Plaster Internal Finish, Cavity Pumped KORE Fill Bonded Bead, External Insulation Application



1. KORE External Insulation adhered to wall with adhesive mortar and external rendering system consisting of a high polymer base coat, reinforcing mesh, silicone primer and silicone render
2. Existing 20mm external render
3. 250mm cavity wall - 100mm concrete block outer leaf, 50mm cavity and 100mm concrete block inner leaf
4. 50mm KORE Fill Bonded Bead insulation
5. Wall ties to manufacturers specifications and details
6. Existing 13mm internal render
7. Skirting seal-gap between skirting board and the floor using a flexible sealant
8. Screed to concrete flooring manufacturers specifications and details
9. Hollowcore slab to concrete flooring manufacturers specifications and details
10. 50mm x 50mm timber battens fixed to underside of slab
11. 12.5mm plasterboard fixed to battens below hollowcore slab with 12.5mm gypsum render over
12. Airtight membrane draped around end of hollowcore slab during installation and sealed on inside

Plasterboard, Block, Insulation, Block, Insulation, Render		
Insulation	KORE External EPS70 White	KORE External EPS70 Silver
	U-Value W/m ² K	
100mm	0.24	0.20
120mm	0.22	0.17
130mm	0.21	0.17
140mm	0.18	0.16
150mm	0.19	0.15
180mm	0.17	0.13
190mm	0.16	0.13
200mm	0.16	0.12
210mm	0.15	0.12
220mm	0.14	0.11
230mm	0.14	0.11
240mm	0.14	0.10
250mm	0.13	0.10
300mm	0.12	0.09

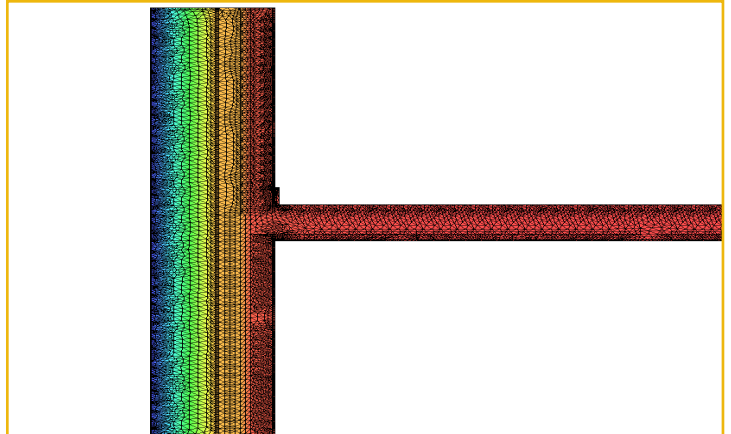
EWI_21: Psi Calculation



Thermal bridges calculation

$$\psi = +0.000 \text{ W/(mK)}$$

EWI_21: fRsi Calculation



$$f_{Rsi} = 0.98 > 0.75$$

Specification Guidelines

Building Standards

KORE External Insulation can satisfy the requirements of the Irish Building Regulations as outlined in:

- Part L - Conservation of Fuel and Energy - Dwellings (2019)
- Part L - Conservation of Fuel and Energy - Buildings other than Dwellings (2019)

Environmental

Expanded Polystyrene is BRE Green Guide A+ Rated. KORE Insulation has acquired an Environmental Product Declaration (EPD) for their Expanded Polystyrene range.

Water Vapour Control/Condensation

Consideration must be given to the risk of condensation when designing thermal elements. In accordance with BS 2550:2002 Code of Practice for the control of condensation in buildings, a condensation risk analysis should be carried

out. Contact the KORE technical department for further details.

Fire Stops

Current building regulations and standards should be considered in full when detailing fire stops for the building.

Detailed Specification Guide

Full specification guide is available on www.kore-system.com

Thermal Bridging

TGD Part L of the Irish Building Regulations states that care must be taken to ensure the continuity of insulation and to limit local thermal bridging and that any thermal bridge should not pose a risk of surface or interstitial condensation.

KORE have undertaken a complete thermal bridging analysis of KORE External Insulation at all typical junctions. Please contact our team today to request a copy of these results.

On Site

Installation Guidelines: Insulated Rendering Systems

It is recommended that the installation guidance from the render system manufacturer be consulted before installing products on site. Specific render systems require specific installation approaches that need due consideration. The guidance outlined below can be used in conjunction with the render system information.

- The surface of the wall to which KORE External insulation is to be mechanically fixed must be free of water repellents, dust, dirt, efflorescence and other harmful contaminant or materials that may interfere with the adhesive bond. Projecting mortar or concrete parts must be removed. A bedding compound can be used to even the surface of the wall before fixing the insulation.
- Mechanically fixed insulation boards should be fixed with a minimum of 5 fixings per board or 7 per m/sq. It is recommended that the most thermally advanced fixings should be used to fix the insulation board while not compromising on the required pull out strength.
- KORE External insulation boards must be butted tightly together.
- At openings and external corners insulation board edges should be mechanically fixed at a minimum of 300mm centres.
- To minimise the effects of cold bridging, KORE External Plinth Insulation should be installed below the DPC level and where practicable, extend below ground level.
- The insulation thickness and detailing at floor level/below DPC to be in accordance with requirements contained in the appropriate Technical Guidance Document as per relevant Building Regulations.
- Window and door reveals must be insulated to minimise the effects of cold bridging in accordance with the recommendations of the Acceptable Construction Details Document published by DoEHLG, to achieve an R-value of 0.6m²K/W.
- For retrofitting applications care must be taken to reduce thermal bridging at window cill details, the KORE EPS Cill significantly reduces the thermal bridging factor. Contact our team for further details.

Installation Guidelines: Insulated Cladding Systems

It is important to note that the method of installation of KORE External Insulation will depend on the facing or cladding system used on the building. It is recommended that the installation guidance from the cladding system manufacturer be consulted before installing products on site.

- In typical applications the wall is battened either horizontally or vertically, using treated timber.
- The timber is fixed at appropriate centres to provide the necessary support for the cladding or tile battens.
- KORE External insulation is cut to fit tightly between the battens and should be wedged into position. Where an air gap is required between the insulation and the cladding, the insulation board must be pinned in place using corrosion free fixings.
- Next a breathable sarking felt is placed over the insulation. The edges and joints are sealed.
- To satisfy building regulations a second layer of KORE External insulation is fixed over the battens. Where this is the case it is essential to ensure that the cladding system is efficiently fixed back to the main wall to prevent downward drag of cladding. A double counter batten system should be considered. In this case the battens on the main wall must be in the same orientation as the cladding battens.
- The specified cladding system is installed as per the manufacturer's recommendations and guidelines.

Cutting

On-site trimming of boards where necessary to maintain continuity of insulation is easily executed using a fine tooth saw or builder's knife. Care must be taken to maintain the thickness, flatness and squareness of the board to achieve close butting of joints and continuity of insulation

Packaging and Storage

KORE External insulation boards must be protected from prolonged exposure to sunlight and should be stored under cover in their original wrapping, not in contact with ground moisture and raised above ground level. Care must be taken to avoid contact with solvents and with materials containing volatile organic components such as tar and newly treated timber.

Product and Technical Details

Properties

Type

KORE External insulation is supplied as EPS70 and EPS200 as defined in IS EN 13163:2012. Reaction to Fire Class E, containing a flame retardant additive. KORE External insulation is aged material.

Density

KORE External EPS70 Silver: 15kg/m³

KORE External EPS70 White: 15kg/m³

KORE External EPS200 White: 30kg/m³

Thermal Conductivity

The thermal conductivity of KORE External insulation products are in accordance with IS EN 13163:2012 and EN 12667 Thermal Performance of building materials and products - determination of thermal resistance by means of guarded hot plate and heat flow meter method.

KORE External EPS70 White: 0.037 W/mK

KORE External EPS70 Silver: 0.031 W/mK

KORE External EPS200 White: 0.033 W/mK

Thermal Resistance

Thermal resistance, known as the R-value, varies with the thickness of the insulation. To calculate the thermal resistance (m².K/W) divide the thickness of the insulation by its thermal conductivity and round down the result to the nearest 0.05.

	KORE External EPS 70 White	KORE External EPS70 Silver	KORE External Plinth EPS200 White
Thickness Insulation (mm)	Thermal Resistance (m ² .K/W)		
50mm	1.351	1.613	1.515
60mm	1.622	1.935	1.818
70mm	1.892	2.258	2.121
80mm	2.162	2.581	2.424
90mm	2.432	2.903	2.727
100mm	2.703	3.226	3.030
120mm	3.243	3.871	3.636
150mm	4.054	4.839	4.545
175mm	4.730	5.645	5.303
200mm	5.405	6.452	6.061
250mm	6.757	8.065	7.576
300mm	8.108	9.677	9.091

Product and Technical Details

Durability

The KORE External insulation and KORE External Plinth insulation is rot-proof, water repellent and durable.

Behaviour in Fire

When properly installed, the insulation is protected by the cladding or other facing material and will have no adverse effect on either the surface spread of flame or the fire resistance of the wall. Any necessary fire performance is provided by the facing material.

Dimensions

Standard Size: 1200mm x 600mm

Standard Thickness:

EPS70 White and Silver - 100mm, 120mm, 150mm, 175mm, 200mm, 250mm, 300mm

EPS200 White - 10mm, 20mm, 30mm, 40mm, 50mm, 60mm, 70mm, 80mm, 90mm, 100mm

Tolerances

In accordance with IS EN 13163:2012 and BS EN 13499:2003 the following tolerance apply to KORE External EPS70 Silver, KORE External EPS70 White and KORE External EPS200 White

Characteristic	Level/Class/Limit Value	Value (mm)	Standard
Thickness	T1	±1mm	EN823
Length	L2	±2mm	EN822
Width	W2	±2mm	EN822
Squareness	S2	±2mm	EN824
Flatness	P5	±5mm	EN825

Dimensional Stability

KORE External EPS70: In accordance with IS EN 13163:2012 and EN 1603, dimensional stability, DS(N)2.

KORE External EPS70: In accordance with IS EN 13163:2012 and EN 1603, dimensional stability under constant laboratory conditions, DS(70,-)1, Declared Value 1%.

KORE External EPS70: In accordance with IS EN 13163:2012

and EN 1603, dimensional stability under constant laboratory conditions, DS(N)2.

KORE External EPS200: In accordance with IS EN 13163:2012 and EN 1603, dimensional stability under constant laboratory conditions, (DS200,-)1, Declared Value 1%.

Compressive Strength

KORE External EPS70: In accordance with IS EN 13163:2012 and EN 826, compressive strength at 10% deformation, CS(10)70.

KORE External EPS200: In accordance with IS EN 13163:2012 and EN 826, compressive strength at 10% deformation, CS(10)200.

Bending Strength

KORE External EPS70: In accordance with IS EN 13163:2012 and EN 12089, bending strength.

KORE External EPS200: In accordance with IS EN 13163:2012 and EN 12089, bending strength, BS250.

Tensile Strength

KORE External EPS70: In accordance with IS EN 13163:2012 and EN 1607, tensile strength perpendicular to the surface, TR120.

KORE External EPS200: In accordance with IS EN 13163:2012 and EN 1607, tensile strength perpendicular to the surface, TR220.

Certification

KORE External Insulation should be used in conjunction with an approved NSAI Render System.

Standards

KORE Fill Bonded Bead is manufactured to:

- 1) ISO 14001:2015 - Environmental Management systems
- 2) ISO 9001:2015 - Quality Management Systems
- 3) ISO 45001:2018 – Occupational Health & Safety Management System

Technical Services

Contact our team today for:

- U-value calculations
- Condensation risk analysis
- Determination of exposure zone
- Accredited drawings and details
- Thermal bridging analysis results
- Temperature factor analysis
- Any other project specific requirements
- BIM Files

Other Products to Consider

KORE External Insulation can be installed with a wide range of other KORE products, whether new build or retrofitting existing buildings. KORE's products are suitable for Passive House builds.

- KORE's Insulated Foundation System
- KORE's Floor Insulation System
- KORE Lock for Cold and Warm Pitched Roofs
- KORE Loft Insulated Attic Flooring System
- KORE's Range of Draught Proofing Products
- KORE's Wall and Roof Ventilation Products
- KORE's Hot and Cold Water Lagging Jackets
- KORE's Pipe Insulation

Contact Details

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Disclaimer

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KOREEXTERNAL



A Product of **AIRPACKS**

The Green, Kilnaleck, Co. Cavan, Ireland/Eircode - A82T291