

June 2010

Non - Residential Refurbishment

5.3.4 Internal lining walls



energy saving



warmth



quietness



fire protection



sustainability

Non-residential Refurbishment

Internal Lining Walls Contents

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Internal lining walls

Solution optimiser and pathfinder

Internal linings

Construction compatibility with Part L2B

Elemental U-value requirement

Knauf Insulation solution

Insulated dry lining**

Product*: Polyfoam Linerboard
Description: XPS insulated plasterboard fixed directly to masonry

Page No: 614

II01



Independent lining**

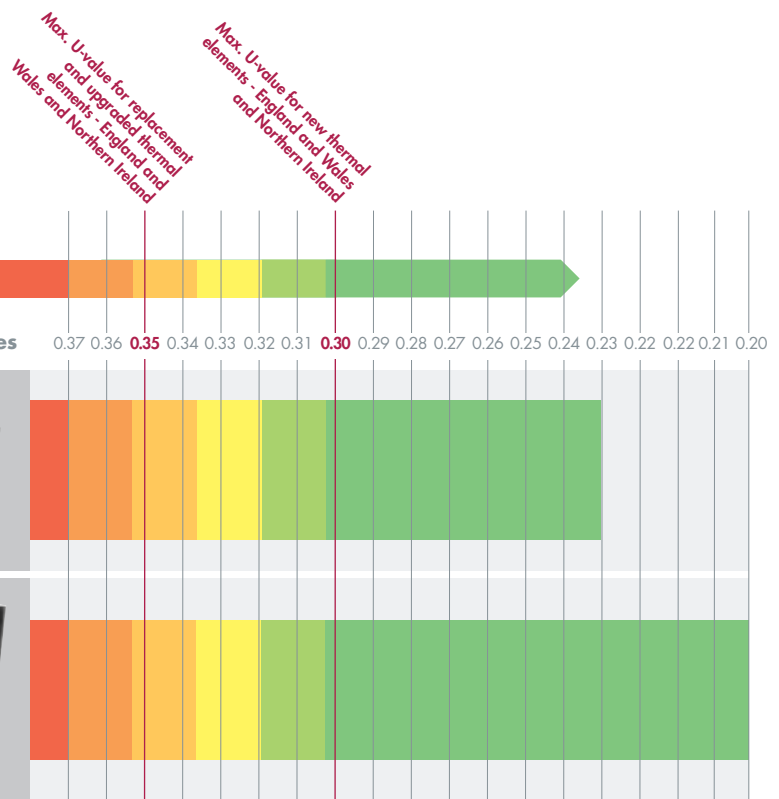
Product*: Earthwool DriTherm Cavity Slab and Earthwool Flexible Slab
Description: Independent metal frame with glasswool insulation between the frame and wall, rock mineral wool insulation between the studs

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II02



U-values



Knauf Insulation offers a range of products for the thermal upgrade of existing masonry walls by the addition of an internal lining. It is unlikely that walls for new extensions will be designed to require thermal internal lining and the insulation can be placed more sensibly in the cavity.

However, in many cases, this is the only way to upgrade existing solid walled buildings, especially if they are in an architecturally sensitive area and external insulation would be inappropriate.

Key

U-values achievable by constructions within this document.

*Recommended Knauf Insulation product(s). Other products may be applicable.

Find online. Visit www.knaufinsulation.co.uk and key in construction code to find the most up to date information on your chosen solution.

** Masonry is assumed to be dense, medium or lightweight aggregate block and download CAD

Introduction

Internal insulation has long been a favourite method for improving the thermal performance of existing solid walls.

Using plasterboard laminated to a thermal insulation board is a straightforward way of upgrading the thermal insulation of walls.

Thermal plasterboard laminate products are widely available and fixing of the system is straightforward and well understood.

However, for many constructions laminated plasterboard solutions can struggle to achieve the increased thermal insulation standards required for refurbishment work necessitating the adoption of independent lining systems created from metal or timber frames.

This section includes independent lining systems that achieve lower U-values than a standard laminated plasterboard.

Avoiding thermal bridging

When a wall is insulated internally, there are unavoidable thermal bridges at the junctions with internal partitions, separating walls and floors.

At window and door openings, the insulation should always be returned into the reveal and the soffit, otherwise there is a high risk of condensation occurring on the uninsulated reveals.

Where an independent steel framework is used as the lining, there should always be a continuous layer of insulation on one side of the steel frame to avoid severe thermal bridging through the steel members.

Avoiding air infiltration

Air infiltration behind an insulated lining, and through gaps and cracks in the wall behind, can significantly reduce the thermal performance of the wall.

The design should incorporate an air barrier to reduce air leakage. This can be:

- A parging coat on the inside of the external wall
- Continuous ribbons of adhesive behind a rigid insulation backed plasterboard along the top and bottom of the wall, at internal and external corners and around all openings and service penetrations.
- A layer of plasterboard sealed at all junctions, with a flexible sealant used at the floor junction and around openings and service penetrations.
- A separate vapour control layer

Avoiding condensation in the construction

In order to minimise the risk of condensation forming on the cold internal surface of the external wall, it is essential to have a vapour control layer on the warm side of the insulation.

In addition, the following detailing points will help to limit the amount of warm room air getting behind the insulation:

- Seal the joints at the junctions between the dry lining and surrounding walls and floors
- Keep the number of service penetrations to a minimum
- Seal around penetrations, such as waste pipes, with an expanding foam

Dampness in existing walls

Dry lining should not be used to isolate a dampness problem. Any dampness in an existing wall should be cured before internal insulation is installed. Existing solid walls may be temporarily suffering from damp following treatment for rising damp or after curing rain penetration problems or rectifying leaking gutters or downpipes.

Polyfoam extruded polystyrene has a high moisture resistance and its thermal performance is unaffected by moisture, making it an ideal insulant for use on solid walls which may not be completely dry.

Where doubts remain about the resistance of the wall to rain penetration, despite repointing or rendering, use an insulated independent lining. The independent lining should be at least 25mm clear of the existing masonry and the resulting cavity should be ventilated to the outside at high and low level. Particular care is needed to seal the insulated lining at the perimeter, at all service penetrations and around openings.

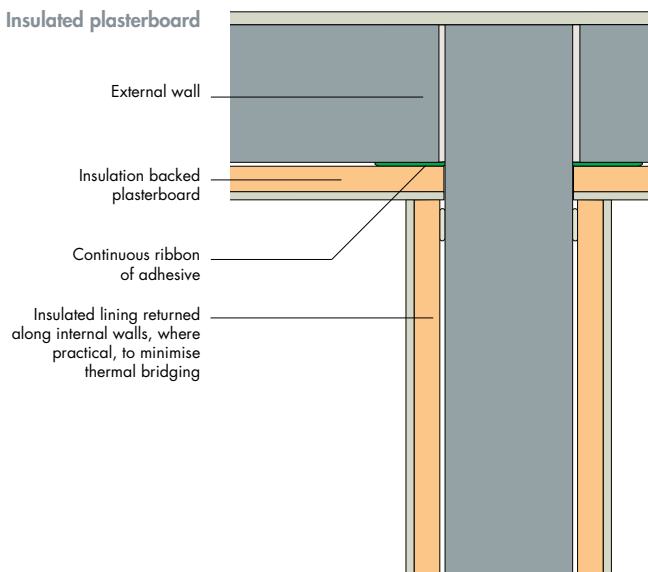


design detail finder

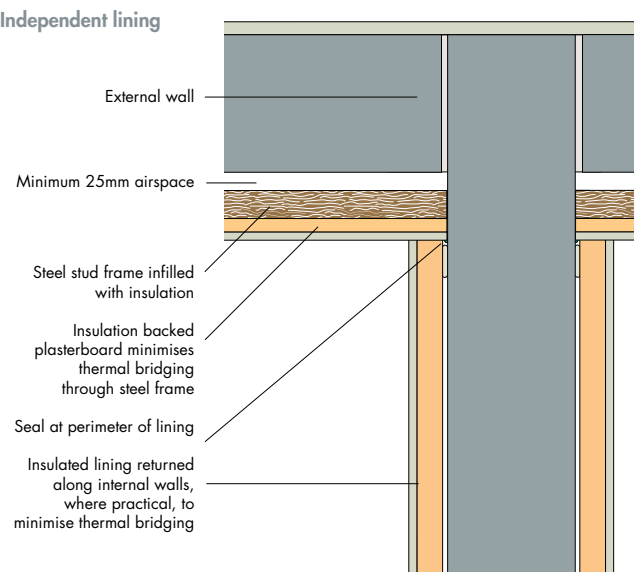
Knauf Insulation solutions for these types of construction can be found on pages 614-617

Alternative insulated dry linings

Insulated plasterboard



Independent lining



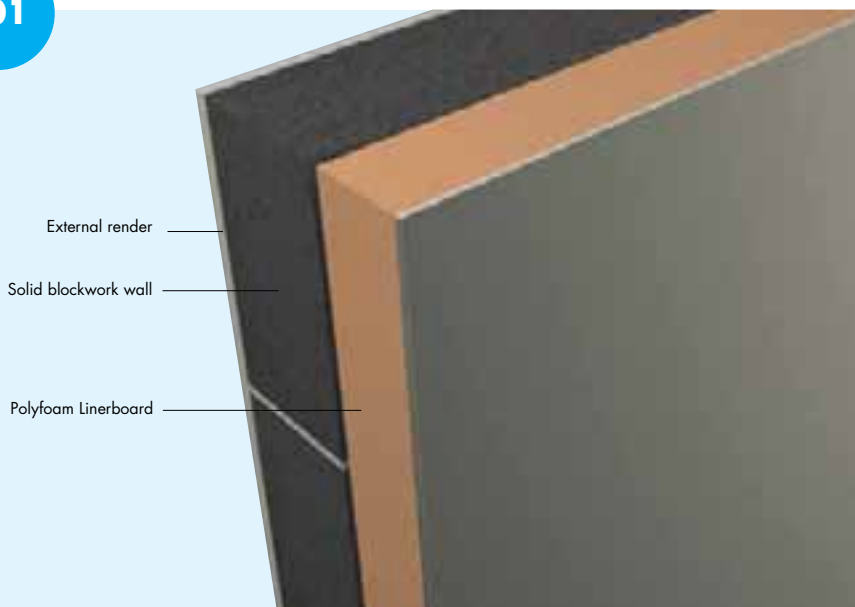
Internal linings

Insulated dry lining

I101

Advantages

- ✓ Robust nature of Polyfoam in Linerboard supports plasterboard, improving its impact resistance
- ✓ Moisture resistance of Polyfoam provides excellent solution for upgrading existing walls
- ✓ Fixed with combination of plasterboard adhesive and mechanical fasteners



Products

Polyfoam Linerboard is a laminate of Polyfoam, 100% ozone friendly, extruded polystyrene, rigid board insulation and 9.5mm tapered edge plasterboard.

Typical construction

New or existing masonry solid walls, lined internally with Polyfoam Linerboard.

Polyfoam Linerboards can be fixed with adhesive, plaster adhesive dabs or mechanically fixed. Where dabs or adhesive are used, secondary mechanical fixings are needed to secure the plasterboard in case of fire.

Installation

Before fitting the dry lining, the ceiling lining should be in place. The surface to be lined should be clean and dry with any wallpaper or loose plaster removed. If heavy fixtures, such as wash basins, are to be fixed to the wall, timber battens should be provided to accept the fixings.

Holes for services should be cut before fixing the board. To accommodate services or obstructions on the wall, cut away the insulation to the depth of the obstruction. Boards can be either cut or sawn. When cutting the boards, use a sharp knife to cut through the insulation and score the plasterboard. The score is then snapped open to give a clean edge.

Adhesive fixing Polyfoam Linerboard can be fixed directly with plaster or cement based adhesives.

The adhesive is applied in vertical bands at the board edge and down the centre of the board. Continuous bands of adhesive should also be applied around openings, service penetrations and at the junctions with ceilings and floors.

There should also be a continuous ribbon of plaster adhesive around the perimeter of each wall area. These measures are taken to minimise air infiltration

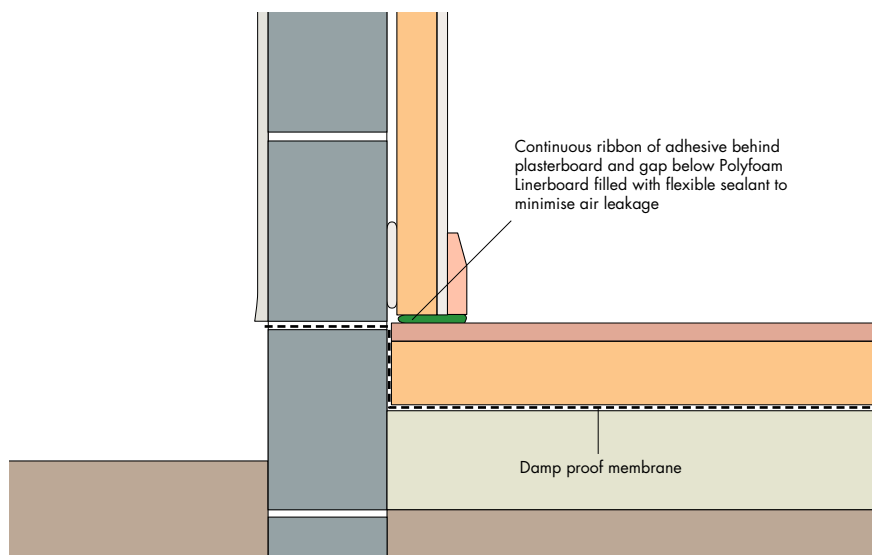
Offer the board to the wall and adjust with a foot lifter as necessary. Insert packing strips at the base. Tap the board to align with pre-determined guidelines and adjacent boards.

A neat and closed joint should be achieved at the wall/ceiling junction. Fill any gap at the base with proprietary bonding compound or sealant.

When fixing Polyfoam Linerboard with adhesive, secondary mechanical fixings are required. Two fixings are recommended at the top of each board, 25mm in from the edge. The fixings should penetrate at least 35mm into a solid background.

All PVC insulated electrical cables should be run in trunking or conduit behind the dry lining to avoid direct contact with the insulation.

Typical junction with ground floor



Typical specification

Polyfoam Linerboard of insulation thicknessmm with integral 9.5mm plasterboard to be fixed directly to the external walls by adhesive*/plaster adhesive dabs*/mechanical fixing* using the method and materials recommended in Knauf Insulation literature.

(*Delete as appropriate)

When the adhesive has set, secure with two (manufacturer/reference) mechanical fixings along the top edge of each board (for adhesive/dabs).



Alternatively, refer to NBS clause: K10/185

Performance

Thermal performance

The insulation element of Polyfoam Linerboard has a thermal conductivity of 0.030 W/mK and the plasterboard has a thermal conductivity of 0.19 W/mK.

Table 60 gives U-values for typical constructions.

Fire performance

Polyfoam Linerboard has an integral 9.5mm plasterboard which offers excellent fire performance. Polyfoam insulation contains a flame retardant to inhibit localised ignition.

When installed on adhesive dabs, the secondary fixings at the top of each board will ensure the integrity of the application during evacuation in case of fire.

Compression resistance

The rigidity of the Polyfoam board behind the plasterboard will offer an excellent support to the finished internal lining and assist in the resistance of impact damage, helping to prolong its service life.

Moisture resistance

Walls should be sound and weatherproof before applying a thermal plasterboard laminate.

When lining internal walls in refurbishment projects, the existing wall is often in a state of disrepair, which can lead to dampness in the wall.

The Polyfoam insulation backing to the plasterboard is highly resistant to moisture absorption and can offer the best peace of mind solution for an application where any potential moisture ingress is a concern. If in any doubt about adhesive, use mechanical fixings.

Table 60: Typical U-values for dry lined solid masonry walls

Insulation thickness (mm)	U-values (W/m ² K) for 215mm solid masonry wall of:					
	Dense block (λ=1.13)	Medium block (λ=0.51)	Lightweight aggregate (λ=0.34)	Standard aircrete (λ=0.16)	Lightweight aircrete (λ=0.11)	Brick (λ=0.77)
45.5/9.5	0.48	0.44	0.41	0.33	0.29	0.46
36/9.5	0.57	0.51	0.46	0.37	0.32	0.54
30.5/9.5	0.63	0.56	0.51	0.40	0.34	0.60

Note: The U-values have been calculated to BS EN ISO 6946: 1997 and BR 443 and assume a 19mm sand cement render external finish. For project specific calculations contact our Technical Advisory Centre on 01744 766666.

Internal linings

Independent lining

I102

Advantages

Twin layer Earthwool DriTherm Cavity Slab 37 and Earthwool Flexible Slab

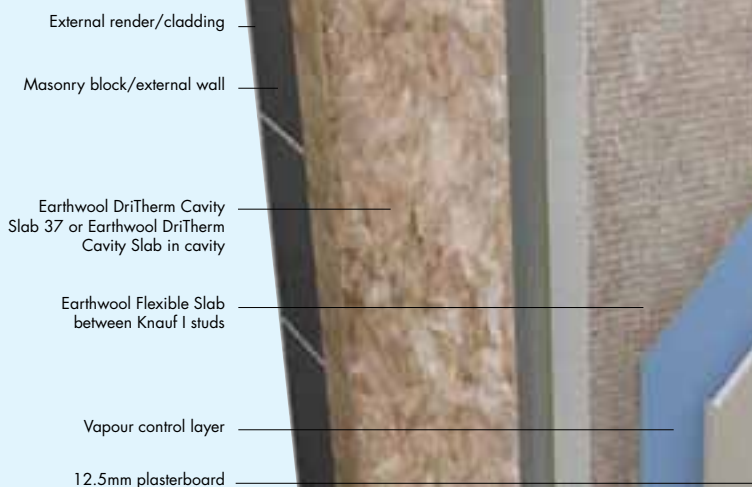
- ✓ Will not allow damp penetration
- ✓ Non combustible insulation product
- ✓ Keeps frame warm
- ✓ Narrow system width

Twin layer Earthwool Flexible Slab/ Polyfoam Linerboard

- ✓ Linerboard prevents cold bridging
- ✓ Robust nature of Polyfoam in Linerboard supports plasterboard, improving its impact resistance

Timber studs with Earthwool Flexible Slab

- ✓ Insulation friction fits between studs
- ✓ Single layer insulation



Products

Earthwool DriTherm Cavity Slab 37 is a semi-rigid slab of glass mineral wool with a water-repellent additive. Its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP*.

Earthwool DriTherm Cavity Slab is a water-repellent rock mineral wool slab. Its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP*.

Earthwool Flexible Slab is a multi-purpose flexible, friction-fit, rock mineral wool slab. Its manufacture has a very low impact on the environment and is classified as Zero ODP and Zero GWP*.

Polyfoam Linerboard is a laminate of Polyfoam, 100% ozone friendly, extruded polystyrene, rigid board insulation and 9.5mm tapered edge plasterboard.

* Ecohomes and Code for Sustainable Homes classification

Typical construction

Masonry solid wall, with an independent internal lining, which can be:

- Knauf I studs, with twin layer insulation (as shown)
- Knauf I studs, infilled with Earthwool Flexible Slab and lined with Polyfoam Linerboard to reduce thermal bridging
- Timber studs infilled with Earthwool Flexible Slab

An independent lining is ideal for existing solid walls that are out of true or new build solid masonry walls where a high level of thermal performance is required.

Knauf I studs are available 50, 60, 70, 92 and 146mm deep.

Installation

Twin layer Earthwool DriTherm Cavity Slab 37 or Earthwool DriTherm Cavity Slab

Construct the Knauf I stud independent lining 50mm from the internal face of the external wall. Space the studs at 600mm centres. Insert 50mm thick Earthwool DriTherm Cavity Slab 37 or Earthwool DriTherm Cavity Slab horizontally, in broken bond into the cavity between the steel frame and the external wall. Insert a layer of Earthwool Flexible Slab between the I studs of

the metal frame.

Fix a vapour control layer to the studs before screwing 12.5mm plasterboard to the metal frame and finish using standard drylining techniques.

Where there is a need to install services in the outer wall, select a 70, or 92mm deep I stud and place 50mm thick Earthwool Flexible Slab to the back of the frame to provide a service void.

Twin layer Earthwool Flexible Slab/Polyfoam Linerboard

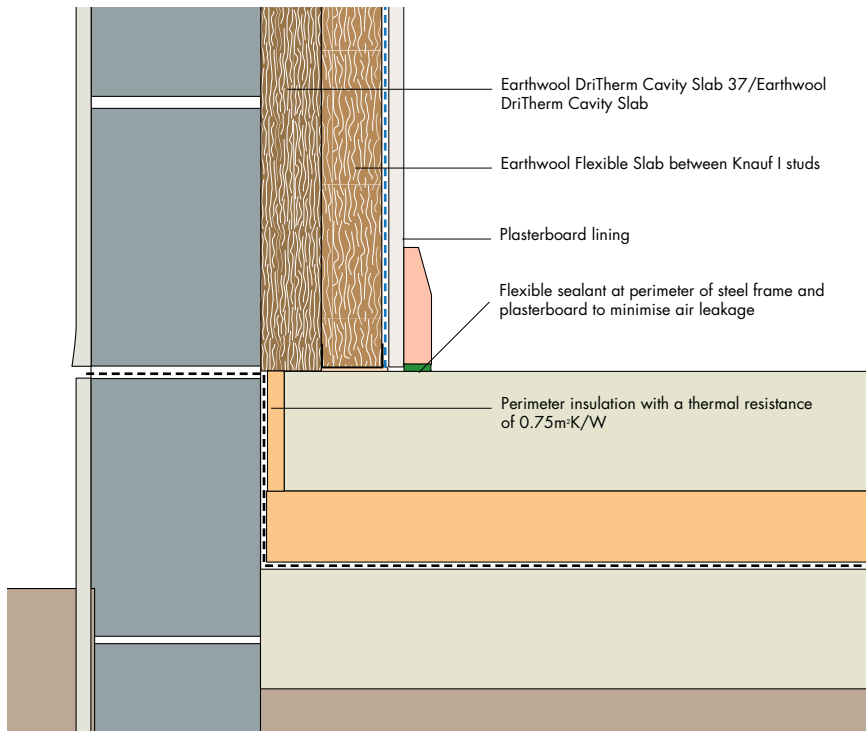
Construct the Knauf I stud independent lining at least 25mm from the internal face of the external wall. Space the studs at 600mm centres, insert Earthwool Flexible Slab between the studs. Screw fix Polyfoam Linerboard to the steel frame at maximum 150mm centres at least 12mm in from the board edge.

Timber stud with Earthwool Flexible Slab:

Construct a timber stud frame at least 25mm from the internal face of the external wall, with studs at 600mm centres. Insert Earthwool Flexible Slab between the timber studs.

Fix a vapour control layer to the studs before fixing 12.5mm plasterboard in place and finish using standard drylining techniques.

Typical junction with ground floor



Typical specification

Construct a timber*/steel* stud framework mm away from the internal face of the blockwork.

- a) Infill the gap between the steel frame and the block wall with Earthwool DriTherm Cavity Slab 37*/Earthwool* DriTherm Cavity Slabmm thick, laid in broken bond. Earthwool Flexible Slabmm thick to be friction fitted between the steel studs.
- b) The independent lining to be insulated with Earthwool Flexible Slabmm thick. Insulation to be friction fitted between the studs. The wall panel to be lined internally with Polyfoam Linerboard of insulation thicknessmm with integral 9.5mm plasterboard screwed to the steel studs at 150mm centres.
- c) The independent lining to be insulated with Earthwool Flexible Slabmm thick. Insulation to be cut as necessary and friction fitted between the timber studs.



Alternatively, refer to BS clause: K10/145 or K10/155

Performance

Thermal performance

50mm Earthwool DriTherm Cavity Slab has a thermal conductivity of 0.035 W/mK.

65mm and 75mm Earthwool DriTherm Cavity Slab have a thermal conductivity of 0.037 W/mK.

Earthwool DriTherm Cavity Slab has a thermal conductivity of 0.037 W/mK.

Earthwool Flexible Slab has a thermal conductivity of 0.035 or 0.037 W/mK.

The insulation element of Polyfoam Linerboard has a thermal conductivity of 0.030 W/mK and the plasterboard has a thermal conductivity of 0.19 W/mK.

Table 61 gives U-values for typical independent lining systems.

Fire performance

Earthwool DriTherm Cavity Slab 37, Earthwool DriTherm Cavity Slab and Earthwool Flexible Slab are classified as Euroclass A1 to BS EN ISO 13501-1.

Polyfoam Linerboard consists of a 9.5mm plasterboard which offers excellent fire performance as a facing material and Polyfoam insulation which contains a flame retardant to inhibit localised ignition.

Table 61: Typical U-values for solid masonry walls with independent lining

Insulation thickness (mm)	U-values [W/m²K] for 215mm solid masonry wall of:					
	Dense block (λ=1.13)	Medium block (λ=0.51)	Lightweight aggregate (λ=0.34)	Standard aircrete (λ=0.16)	Lightweight aircrete (λ=0.11)	Brick (λ=0.77)
Earthwool DriTherm Cavity Slab and Earthwool Flexible Slab (behind and between steel studs)						
70+50	0.32	0.30	0.28	0.24	0.22	0.31
Earthwool Flexible Slab between steel studs and Polyfoam Linerboard (between and lining steel studs)						
70+45.5/9.5	0.31	0.29	0.27	0.23	0.21	0.30
70+36/9.5	0.35	0.32	0.30	0.26	0.23	0.34
70+30.5/9.5	0.38	0.35	0.33	0.27	0.25	0.36
Earthwool Flexible Slab between 38mm wide timber studs (9% bridging)						
140	0.26	0.24	0.23	0.20	0.19	0.25
100	0.37	0.33	0.32	0.27	0.24	0.36

Note: The U-values have been calculated to BS EN ISO 6946: 1997 and BR 443 and BRE Digest 465 (where appropriate) and assume a 19mm sand cement render external finish. Steel studs assumed to have 50mm wide flanges. All studs at 600mm centres. For project specific calculations contact our Technical Advisory Centre on 01744 766666.

KNAUFINSULATION

it's time to save energy



Knauf Insulation Ltd
PO Box 10
Stafford Road
St Helens
Merseyside
WA10 3NS
UK

Tel: 01744 766 600

Fax: 01744 766 750

www.knaufinsulation.co.uk

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Knauf Insulation Ltd
PO Box 10
Stafford Road
St Helens
Merseyside
WA10 3NS

Customer Service (Sales)
Tel: 0844 800 0135
Fax: 01744 612007
Email: sales@knaufinsulation.com
www.knaufinsulation.co.uk

Technical Advisory Centre
Tel: 01744 766 666
Fax: 01744 766 667
Email: tech@knaufinsulation.com

Literature
Tel: 08700 668 660
Fax: 0870 400 5797
Email: info@knaufinsulation.com