Internal Wall and Floor Insulation with Marmox Multiboard

Housing

Marmox Multiboard is strong, waterproof and lightweight insulation board that can be used on floors, walls and ceilings. It is CE Marked as an insulation material and is a listed Energy Saving Trust product which guarantees the board's suitability as an energy saving product.

Meeting Building Regulations

As of the 6th April 2014 planning applications in England now need to comply with the Part L:2013. In Scotland, similar changes to Section 6: 2115 came into force in October 2015. In Wales, Part L: 2013 has been effective from July 2014 and in Northern Ireland Regulations F1 and F2 became effective from the 25th February 2014.

These latest regulations are a stepping stone to the now stalled Zero Carbon regulations and represent a reduction in England's Target Emission Rate of 6% for housing and an average 9% for commercial buildings. In Wales, the reduction will be 8% for housing with a 20% target for commercial buildings. The 2015 Scottish revision an even more ambitious goal of reducing this by 21% over 2010 regulations.

In England only there is a new standard. In addition to meeting the new Target Emission Rates, buildings now need to meet **Target Fabric Energy Efficiencies**. Whether a design meets the required TER and TFEE are determined by a SAP assessment but as a guide, target U values for each of the building elements are still presented.

This leaflet describes how the Marmox Multiboards are used in each application and the thicknesses required to provide the necessary U Values to achieve compliance.

Non-Domestic Properties

In accordance with the EU's Energy Performance of Buildings Directive (2010) the demand on the fabric of insulation of commercial buildings has increased. Building Regulations show area weighted U-values as maximum values but meeting these alone are no longer likely to be enough to comply with the overall CO_2 emissions requirements.

In Wales, there is a 20% aggregate improvement over 2010 levels. Northern Ireland's Part F2: 2012 is 25% better and England's Part L2 represents a 9% improvement. Scottish non-domestic regulations have always been tighter than in the rest of the UK so the 2015 improvement which averages about 12% still keeps Scotland's buildings the best insulated version although if 'zero carbon' ever does happen, there is an expected 43% improvement planned before 2019.

Building Regulations

One aspect of building regulations are to improve the thermal efficiency of buildings. They must be met when applied to any project above a certain size. In England and Wales this requirement is in **Approved Document L1, or ADL1** (*for domestic buildings*) and **ADL2** (*for non-domestic buildings*). In Scotland this in **Section 6** and in Northern Ireland it is within **Sections F1** (*domestic*) **and F2** (*non-domestic*). The final thermal efficiency is expressed in terms of an emission rate which is calculated usually by building control but the building regulations give guidance on: -

1. Constructing extensions, where minimum U-Values as set out in need to be met
2. Material Change of Use (*for example turning a garage into a habitable room*)
3. Renovations and replacements of existing insulation elements.

U Values

A U-Value or 'Coefficient of Thermal Transmittance' is the rate of heat loss through a particular building element. It is measured in Watts per square metre and is multiplied by the difference in temperature of the inside of the room with the temperature on the other side of the wall or floor.

The U value (heat loss) of an un-insulated solid wall is typically about 2.1Watts per square metre per degree difference in temperature. That means that for every degree colder the outside temperature is compared with the temperature in the house, 2.1 Watts of heat are lost through every square metre of the wall.

A 12.5mm Marmox Multiboard would reduce this heat loss to about 1.2W and a 20mm board would reduce this by over 50% to 0.9 Watts.

Before an insulation product is used as part of a wall or floor etc. it does not have a U Value; the U Value measures the rate of heat loss from one side of part of the building to the outside.

Achieving U Values are NOT what determines whether a building meets the regulations.

Meeting U value targets will probably lead to meeting the building regulations but simply meeting the U value is not what equates to compliance. Since 2010, to comply with all UK Building Regulations the CO_2 emissions associated with heating the building (*the Dwelling Emission Rate or DER*) must be less than the Target Emission Rate or the TER.

As from 2014 to be compliant ***in England only***, the calculated Dwelling Fabric Efficiency Rate (**DFEE**) must also be calculated. This must not be greater than the Target Fabric Energy Efficiency Rate as published in the building regulations. Meeting this different standard is also achieved by meeting the target U values but this standard unlike the DER only measures the quality and performance of the insulation – it stops the practice of people compensating for having one poorly insulated wall if the wall opposite it was super insulted.

This FEE standard, or rather a modified version is present in Wales but only for non-domestic buildings, in Wales it is called Target Primary Energy Consumption, **TPEC**; this is a "fabric first" approach which concentrates on insulation not just CO_2 emissions.

All UK Building Regulations provide various target U Values calculated so that generally they will provide a building with the necessary insulation characteristics but different types of properties and different types of element even within the same property can have different **weighted average U values** which need to me met.

U Value Targets in the UK

SCOTLAND: Section 6

The 2015 Scottish Building Standards are most efficient in the UK which means that the U Value targets are more difficult to achieve and more insulation is needed.

- **New Builds**

	New Build Domestic	*New Build Non-Domestic*
Element	Area weighted average U-value	*Area weighted average U-value*
Wall	**0.17 W/m^2 K**	*0.23 W/m^2 K*
Floor	**0.15 W/m^2 K**	*0.22 W/m^2 K*
Roof	**0.11 W/m^2 K**	*0.18 W/m^2 K*

- **Renovating Existing Buildings**

Element	**Housing: refurb - extension**	Non-Housing: refurb - extension
Wall	**0.22 – 0.17 W/m^2 K**	0.30 - 0.25 W/m^2 K
Floor	**0.18 – 0.15 W/m^2 K**	0.25 - 0.20 W/m^2 K
Roof	**0.18 - 0.11 W/m^2 K**	0.25 - 0.15 W/m^2 K

England: Part L

English Building Regulations for housing have the extra standard, Target Fabric Energy Efficiency Targets to ensure sufficient insulation is used on all parts of the building envelope.

- **New Build Domestic**

	New Build Domestic	*New Build Non-Domestic*
Element	Area weighted average U-value	*Area weighted average U-value*
Wall	**0.28 W/m^2 K**	0.35 W/m^2 K
Floor	**0.22 W/m^2 K**	0.25 W/m^2 K
Roof	**0.16 W/m^2 K**	0.25 W/m^2 K

- **Renovating Existing Buildings**

Element	**Housing: refurb - extension**	Non-Housing: refurb - extension
Wall	**0.30 - 0.28 W/m^2 K**	0.30 - 0.28 W/m^2 K
Floor	**0.25 – 0.22 W/m^2 K**	0.25 - 0.22 W/m^2 K
Roof	**0.18 - 0.16 W/m^2 K**	0.18 - 0.16 W/m^2 K

Wales: Part L

Welsh Building Regulations for non-housing have the extra standard, Target Primary Energy Consumption to ensure sufficient insulation is used on all parts of the building envelope.

- **New Build Domestic**

	New Build Domestic	*New Build Non-Domestic*
Element	Area weighted average U-value	*Area weighted average U-value*
Wall	**0.21 W/m^2 K**	0.26 W/m^2 K
Floor	**0.18 W/m^2 K**	0.22 W/m^2 K
Roof	**0.15 W/m^2 K**	0.18 W/m^2 K

- **Renovating Existing Buildings**

Element	**Housing: refurb - extension**	*Non-Housing: refurb - extension*
Wall	0.30 - 0.21 W/m^2 K	0.30 – 0.26 W/m^2 K
Floor	0.25 - 0.18 W/m^2 K	0.25 – 0.22 W/m^2 K
Roof	0.18 - 0.15 W/m^2 K	0.18 – 0.15 W/m^2 K

NORTHERN IRELAND: Part F

- **New Build Domestic**

	New Build Domestic	*New Build Non-Domestic*
Element	Area weighted average U-value	*Area weighted average U-value*
Wall	**0.30 W/m^2 K**	0.35 W/m^2 K
Floor	**0.25 W/m^2 K**	0.25 W/m^2 K
Roof	**0.25 W/m^2 K**	0.25 W/m^2 K

- **Renovating Existing Buildings**

Element	**Housing: refurb - extension**	*Non-Housing: refurb - extension*
Wall	0.35 - 0.30 W/m^2 K	0.35 - 0.35 W/m^2 K
Floor	0.25 - 0.22 W/m^2 K	0.25 - 0.25 W/m^2 K
Roof	0.35 - 0.22 W/m^2 K	0.35 - 0.25 W/m^2 K

Isle of Man
Jersey
Guernsey

Being outside of the EU, The Isle of Man Government is responsible for publishing and enforcing the Manx Building regulations. The insulation aspects of Part L: 2014 (*L1 for dwellings, L2 for buildings other than dwellings*) are based on the 2010 English Building regulations but does not incorporate Fabric Energy Efficiencies and is not determined by SAP.

Both Jersey's Technical Guidance Part 11: 2011 and Guernsey's Technical Standard Part L1 and L2 are also based on England's 2010 Part L.

Element	Area weighted average U Value	Maximum U Value
Wall	0.30 W/m^2 K	0.70 W/m^2 K
Floor	0.25 W/m^2 K	0.70 W/m^2 K
roof	0.25 W/m^2 K	0.35 W/m^2 K

Extensions

Element	Standard U-Value
Walls	0.28W/m^{2}K
Ceiling	0.16 W/m^{2}K
Flat Roof	0.18 W/m^{2}K
Floor	0.22 W/m^{2}K

To achieve compliance an insulated cavity wall, significant under-floor and ceiling insulation will be required.

Because Marmox Multiboards are not manufactured in thicknesses greater than 60mm, alone they are unable to provide these levels of insulation but can be used in conjunction with other materials to contribute to the overall U-Values.

Material Change of Use

The conversion of a garage, or part of a garage, into habitable space will normally require approval under the Building Regulations.

When converting say a garage to a habitable room, any thermal elements (*walls, floors and ceilings*) must becoming part of the dwelling it should be examined and upgraded.

If the wall, floor or ceiling currently performs worse than the values described as "threshold U Values" (for example a wall having a U Value greater than 0.70Watts/m^2.K) then it should - *if technically, functionally and economically viable* – be upgraded to the "Improved U Vales" that are used for renovations. For walls this is 0.30Watts/m^2.K.

If a reason can be shown why this is impractical such as it will not be physically possible to fit or the payback is estimated to be more than 15 years then the U value should be improved to at least the "threshold value" (*which for walls and floors is 0.70Watts/m^2.K*)

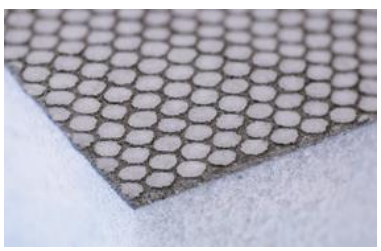
Renovations

Only if at least 50% of a walls and floors and ceilings combined are being renovated the elements should be upgraded to achieve the U Values known as "Renovation Levels" set out in Building Regulations. If just a small proportion of a property is being renovated then there is no requirement to adhere to Part L, F or 6.

The current "Improved U Values" for walls is a slightly lesser requirement than is needed for new build. The regulations also say that these values are target values to be adhered to only if technically, functionally and economically viable.

If the target U value for any one element cannot be achieved then improving the thermal insulation of other elements should be considered.

Marmox Multiboard – THE Insulation Board



Marmox Multiboard has a core of XPS, an insulation material with a declared thermal conductivity (*EN13164*) of 0.034Watts/m.K. It is a CE Marked insulation product and recommended by the Energy Saving Trust.

The big difference between Marmox Multiboard to thermal laminates / plasterboards is that Multiboard is just a reinforced sheet of robust insulation material whereas thermal plasterboards consist of the insulation layer attached to a sheet of plasterboard.

Marmox Multiboard has SIX significant advantages over insulated plasterboards: -

Advantage 1 - Thinner

Marmox Multiboard can be produced as thin as 4mm however a 4mm Marmox board provides hardly any thermal insulation. 10mm thick Marmox will provide noticeable insulation but clearly this will not be as effective as a 60mm Marmox board.

Although some top grade thermal laminates/thermal plasterboards comprise either PIR or phenolic foam which gives better insulation than XPS, those types of boards must also consist of a sheet of plasterboard that is effectively 10mm or 12mm of non-insulating material that has to be there to hold the insulation in place. With Marmox boards, there is no 12mm of plasterboard, just insulation.

It is also important to note that just because Marmox boards are available in thin boards, they are not equivalent to other insulation boards which are thicker. A 10mm thickness of Marmox has equivalent insulating power to 7mm of PIR or Phenolic foam – *but those of course cannot be made in those thicknesses.*

Advantage 2 - Simpler to Fit

Marmox Multiboard is designed to be fitted flush against the wall. Many Thermal laminates/thermal plasterboards need to be placed on battens which again increases the encroachment into the room space.

This simple installation method also means that they can be fitted by virtually anyone with very basic DIY skills.

Not being on battens also eliminates the void between the board and the wall which is a prime location for potentially damaging interstitial condensation to occur.

Advantage 3 - Waterproof

The cementitious skin of the Marmox boards is moisture absorbent in order for it to be able to bind to adhesives, mortars, plaster etc. however the core is completely impermeable to water which is why Marmox Multiboard can be used as a moisture barrier.

PIR and Phenolic insulation have more effective thermal conductivities than XPS in dry conditions but the significant advantage our Marmox Multiboard has over PIR and Phenolic boards is evident if there is any dampness in the walls or floor. The effect on the thermal conductivity of Marmox Multiboard if it gets wet is negligible whereas if PIR or phenolic foam becomes wet its insulating power falls dramatically. If phenolic foam becomes saturated it can actually become a thermal conductor having the completely opposite effect of an insulator.

When using Marmox Multiboard it can always be guaranteed that the thermal insulation of an element insulated with Marmox will not deteriorate if the wall or floor becomes damp.

Advantage 4 - Lightweight

Plasterboard is large and heavy and fitting it either on walls or on ceilings creates a massive strain on the fixings holding the board in place. A sheet of Marmox Multiboard typically weights no more than two or three kilograms so can be fixed with less fixings and confidence that it is not going to fall down.

The ease of fitting a lightweight board must not be overlooked not just in terms of health and safety but in the numbers of people and equipment needed. Installing plasterboard to a ceiling would either take a couple of people and possibly the use of ceiling supports to hold it in place. Marmox Multiboard can be fitted easily by just one person, a screwdriver, screws and some washers.

Advantage 5 - Strong

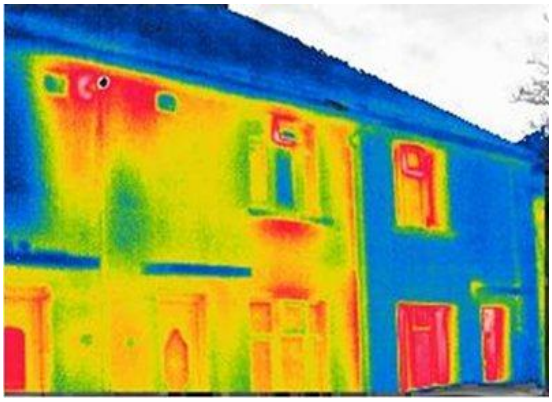
Marmox Multiboard has a compressive strength (*to EN826*) of 450KPa which approximates to being able to withstand a load of 40 tonnes evenly distributed over a square metre.

Advantage 6 – No need to prime

Marmox Multiboard was originally developed as a tile backer board and so with its cement-based skin has always been able to accept a tile adhesive. The unique surface of the Marmox Multiboard has both a patented keying pattern designed to give optimum grip and admixtures in the concrete layer itself to provide a much stronger surface than other foam cored tile backer boards.

The concrete skin also includes an additive which reduces the permeability of the surface and effectively pre-primes the surface for plastering. Further additives protect against Etteringite formation which can happen when gypsum plasters are used on cementitious surfaces.

Internal Wall Insulation



Thermal Image showing heat loss through walls

The U value depends on what the wall is made of and its thickness.

Marmox Multiboard is the ideal internal wall insulation for all walls and especially solid walls. It has a proven track record in reducing heat loss and reducing fuel bills.

It is however difficult to attain the same levels of insulation that one would find in a newly build house because modern construction incorporates cavities than can be insulated. For example, to meet current insulation levels over 120mm of insulation would be needed. In the cavity this is fine and unseen, but it is usually too thick to have as an internal wall lining

Improving the Insulation of Timber Framed Walls

Typically, a timber frame wall would comprise a 140mm layer of insulation between the studs. Building Regulations require smaller U-Values therefore demanding better levels of insulation. The following table shows how that in addition to insulating between the studwork, Marmox Multiboard used in place of plasterboard will reduce the heat loss.

	Plasterboard	12.5mm Multiboard	20mm Multiboard	40mm Multiboard
Timber Stud with 140mm mineral wool	0.30W/m^{2}K	0.28W/m^{2}K	0.26W/m^{2}K	0.21W/m^{2}K
Metal frame with 140mm mineral wool	0.35W/m^{2}K	0.32W/m^{2}K	0.28W/m^{2}K	0.24W/m^{2}K

The target in England is 0.28, in Wales 0.21, in Scotland 0.17. In Scotland, insulation thicker than 60mm would be required to reach current targets.

Insulating Solid Walls (home improvement)

More than a third of all the heat loss in an un-insulated home is lost through the walls.

Modern houses are usually built with cavity walls that can be insulated however most pre-war homes and high rise flats were built with solid walls which let the heat flood out. In fact, twice as much heat is lost through a solid wall than through an un-insulated cavity wall.

What Thickness of Marmox Board is Required?

The thicker the board, the better the thermal insulation will be however in most situations our 60mm thick board would be impractical because that would take up too much space and block your windows! The most popular are thicknesses for I.W.I. are 30mm, 20mm and 12.5mm.

Advice from the Energy Saving Trust

Insulating your solid walls with Marmox Multiboard is a simple and effective way to stop wasting energy and money at home. Insulating your walls will help to heat your home more efficiently, reduce surface condensation and mould growth and of course using less energy reduces carbon dioxide emissions.

What could you save?

Marmox Multiboard is an ENERGY SAVING TRUST RECOMMENDED PRODUCT and the E.S.T has estimated that insulating all the external solid walls of a house could save approximately 1.8 tonnes of CO_2 per year.

This equates to an annual reduction in heating bills of approximately £365…… *That's a pound a day!*

How to identify whether you have solid walls?

Solid walls are mainly made of brick or stone and are found in most houses built before 1940. The easiest way to tell is from the pattern of the bricks on the outside of your house. If your home has solid walls, the bricks will tend to be placed head-on and lengthways in an alternating pattern like this.

With the majority of solid walled properties, Marmox Multiboard will significantly reduce heat loss but not provide similar insulation to meet the current EU target values for new homes.

With an assumed temperature difference of 10^{O}C from the inside to the outside of the house, this table shows the approximate U values achieved using various thicknesses of Marmox Multiboard on a solid brick wall 220mm thick and on an unfilled cavity wall – brick leaf and a concrete block leaf.

Thickness of Multiboard	Solid brick wall		Unfilled cavity wall	
	No insulation	With Marmox	No insulation	With Marmox
10mm	2.1Watts	1.3Watts	1.6Watts	1.1Watts
20mm		0.9Watts		0.8Watts
40mm		0.6Watts		0.5Watts
60mm		0.4Watts		0.4Watts

Our technical department will be happy to calculate U-values for any specific requirements you have.

Improving U values of floors

The U value depends on various things including: *1) what the floor is made of, 2) whether it is suspended or on the ground, 3) the thickness of the perimeter walls, 4) what lies beneath*

The main factor is the ratio between the area and the "exposed perimeter" – which is the perimeter length of outside walls only.

The other thing that needs taking into account is the temperature difference between the outside and inside the house.

Typically, for comparison purposes, a difference of 10^{O}C is used and the desired U value for a floor in a new build is 0.25Watts per square metre per temperature difference between the outside and the inside. In a refurbishment, the maximum recommended value is 0.35W/m^{2}k.

This table shows the thickness of Marmox Multiboard necessary to achieve these specific U values if the floor is a concrete slab on the ground. The P:A ratio is the main factor so although the values change for different floor types, they will be reasonably similar to these figures.

P:A Ratio	*U-value of existing floor without insulation* (W/m^2 K)	Thickness of Marmox Multiboard (mm) needed to achieve these U-values				
		0.40	0.35	0.30	0.25	0.20
1:6	*0.31*	*unnecessary*	4mm	4mm	20mm	50mm
1:5	*0.36*	*unnecessary*	6mm	10mm	30mm	60mm
1:3	*0.51*	20mm	30mm	30mm	60mm	N/A
1:2	*0.67*	30mm	40mm	50mm	N/A	N/A
1:1.5	*0.82*	40mm	50mm	60mm	N/A	N/A
1:1	*1.00*	40mm	60mm	N/A	N/A	N/A
1: ½	*1.35*	50mm	60mm	N/A	N/A	N/A