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CPD Article

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Thermal Flooring: Making it work for you

Efficiency in housebuilding is more prevalent today than ever before. As we strive to live more efficiently, we must seek new ways of saving money, reducing carbon emissions and harnessing effective methods to power our homes.

Thermal flooring helps by reducing heat loss in the property and achieving u-values that have been specified. This article looks at why thermal flooring is important and how it works. It also examines exactly how the required u-values can be achieved and how this helps housebuilders when it comes to complying with building regulations such as Part L and SAP ratings. It also showcases five live examples of thermal flooring systems used in modern housebuilding across the UK and discusses alternatives to the popular methods of thermal flooring.

Thermal flooring is a growing area of construction and with legislation following our desire to improve efficiency; it is a crucial system for modern, efficient and robust housebuilding.

Key Learning outcomes

- What thermal flooring is and why it is used
- Understanding u-values in flooring
- How we achieve the specified u-value
- In-situ examples of thermal flooring
- What else is available in the market

1.0 The obvious and not so obvious reasons for thermal flooring

The main reason for thermal flooring is to assist in improving the thermal efficiency of the dwelling in question. Thermal flooring does this by increasing the insulation within the floor and therefore reducing the u-value. The u-value is the amount of heat that passes through the structure component, so the lower the u-value, the less heat is escaping and the more efficient the room or building.

Since 1995, a Standard Assessment Procedure (SAP) rating is required under part L of the building regulations. SAP is an official government approved system used for calculating the energy performance of a dwelling, and it relates to the running cost of a property.

Part L of the building regulations looks at ‘conservation of fuel and power.’ The associated Approved Document (L1A for new dwellings) outlines a method of calculating this through emissions. Companies must be mindful of Dwelling Emission Rates (DER) and Target Emission Rates (TER) which are set using baseline figures of a similar property. Different properties lose heat through different parts of the dwelling. When significant energy losses occur through doors, windows and walls’, being able to reduce the heat loss through the floor is very advantageous to architects and housebuilders alike.

It is estimated that in an uninsulated house between 10% and 15% of heat loss is through the floor. As the need for efficiency and reducing the impact on the planet continues to gain traction thermal efficiency has become more prominent and important in housebuilding. Planners and councils increasingly use DER and TER u-value figures when looking at sustainability.

A supplementary benefit to thermal flooring reducing heat loss in a dwelling is helping the house owner reduce their energy bills. Thermal flooring can also improve living standards and impact positively on health and well-being by cutting down on the build-up of damp and mold, that can naturally occur within a dwelling.

A less well known reason for thermal flooring is the ease of handling and installation. Because most thermal flooring uses EPS panels, they are incredibly lightweight when compared to traditional beam and block systems. Whilst the concrete beams and structural topping remain high mass, the EPS panels are easier than concrete blocks to transport around the building site and put in place.

An additional benefit of this is the reduction of impact on the environment through transportation of EPS panels on road networks.

Thermal flooring systems help efficiency by increasing insulation and reducing u-values.

2.0 Types of thermal flooring

There are currently three basic types of thermal flooring available on the market.

Beam and Block

Traditional beam and block incorporates sheet insulation of varying thickness to achieve the required u-value over the beam and block structure that is specified to meet the required u-value.

Above the insulation the installer would lay 75mm of screed topping and some edging insulation strip to ensure there is no cold-bridging.

The main advantage of this system is the installer will have a working platform immediately after laying down the blocks. Applying the insulation and screed over the beam and block surface is then often carried out at a later stage in the dwelling construction.

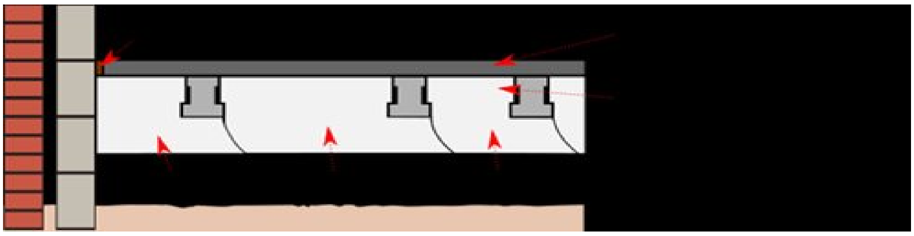
Top Sheet

The second option is similar to the beam and block except that instead of concrete blocks, an infill EPS panel is used. A top sheet insulation of varying thickness to achieve the required u-value remains over the beam structure
A structural topping and edging insulation strip completes the flooring. An advantage to this is that it is popular amongst groundworkers and installers, mainly because of the ease of use. In addition, the EPS panels used are standard sizes and therefore wastage is reduced.

Under-Beam

The third option is what is called an 'under-beam' solution. Here the EPS panels are designed and shaped to fit in-between and under the beams providing insulation underneath the flooring structure rather than above. A structural concrete topping of 75mm is then applied over the structure with the edging insulation strip around the perimeter.

The advantage to this system is that it only requires one panel in between the beams instead of the infill panels and a top sheet. With the EPS panels covering the under-side of the beams, it prevents cold, damp air creating a cold element within the structure. The structural topping goes straight onto the structural beams element.



The Under-Beam thermal flooring option is designed to cover the underside of the beams, preventing cold, damp air from entering the structure.

3.0 Achieving your desired u-value

To achieve the correct u-value as determined by the specifier, a number of things need to be considered. A mixture of EPS panel depth and grade can ensure that you reach the correct u-value but p/a (perimeter to area) ratio, beam thickness and depth, and beam centres will also have to be applied.

U-values or thermal transmittance is measured by the heat in watts per square metre Kelvin or W/m^{2}K. For most ground floors the u-value can be measured using ISO 13370.

Different types of EPS panels

The EPS panels are differentiated by their grade and depth. Different manufacturers will produce different EPS panels.

Following is an example table of thermal flooring, and the combinations used to achieve certain u-values. This table is indicative, and the values should not be taken into any live project scenario.

The following table below that is a typical example of EPS panels available on the market.

Example u-values (W.m-2.K-1) - Single beams at full centres								
		EPS panel thickness (other depths available)						
		T Beam (White)			T Beam Plus (grey)			
Beam depth	p/a ratio	290	350	450	260	290	350	420
150	0.4	0.14	0.11		0.14	0.12	0.1	
	0.6	0.15	0.12		0.15	0.13	0.1	
	0.7	0.15	0.12		0.15	0.13	0.1	
	0.9	0.15	0.12		0.15	0.13	0.1	
225	0.4		0.14	0.1		0.17	0.12	0.09
	0.6		0.15	0.1		0.18	0.13	0.1
	0.7		0.15	0.1		0.19	0.13	0.1

Panel Grade	Thermal Conductivity	Compressive Strength	Bending Strength
EPS 70	0.038 λ90	70 kPa	115 kPa
EPS 100	0.036 λ90	100 kPa	150 kPa
EPS 150	0.034 λ90	150 kPa	200 kPa
PlusTherm	0.030 λ90	115 kPa	70-100 kPa

An example table of thermal flooring, and an example table of EPS panels available on the market.

4.0 Live examples of thermal flooring

The Zu – Nuneaton, Warwickshire

Over 2200m^2 of thermal flooring was used on 38 properties for the Cartwight Homes development. 350mm deep EPS infill panels at grade 70 were used to ensure the u-value was met.

Persimmon – Long Marston, Warwickshire

The manufacturer worked with the ground worker Ashlane Construction. They provided thermal flooring for 150 houses on an old MOD site. The thermal flooring included 150mm beams with EPS 100 insulation panels at 220 mm thick which achieved the required u-value of 0.22.

Bastian – Emerson Valley and Olney, Buckinghamshire

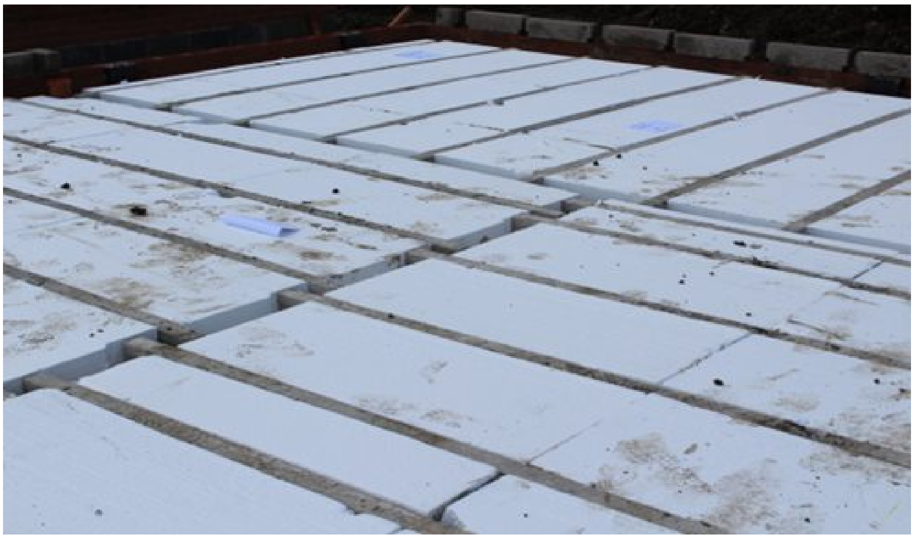
The requirements for Bastion resulted in the specification of a 115 kPa 350 mm thermal flooring product which achieved a u-value of 0.1. The flooring consisted of various beam depths and widths.

LMH – Kettering, Northamptonshire

This supply and fix job required 115 kPa 290 mm EPS panels for 34 plots. The thermal insulation resulted in achieving a u-value of 0.13.

FG Whitley – Buckley and Mold, Flintshire

These sites were again supply and fix projects. Both sites requiring EPS 70 350 mm panels to achieve a U-value of 0.12. The beams consisted of 105,125 and 165 beams, and the plots included the garages with standard beam and block flooring.



Thermal flooring Cartwright homes

5.0 Other considerations and alternatives

A disadvantage to using thermal flooring is that because the EPS panels are lightweight they are generally not suitable for a working platform. The floor laying team would have to lay the concrete topping in order to begin work above the structure. The EPS panels can also be blown around site in strong winds if they are not securely stored.

'Universal' Panels

The universal system is a thermal flooring solution where the shape of the EPS panels means it can be used with virtually any manufacturer's beams. The universal system panels are pre-cut to be placed between and over the concrete beams. A structural topping is then placed over the floor.

Precast Insulated Units

Top surface finished, 1200mm wide precast concrete panels with varying depth insulation bonded to the underside. These units require accurate bearing structure and structural lifting equipment to move and place onto foundation walls.

Insitu groundfloor slab

This system is the old established method of construction. It does not use beams; instead a layer of hardcore is topped with sand blinding, then concrete, insulation and finally a screed to form an insulated structural surface. It is a solid method, but not as quick or efficient as the EPS panel methods.

Raft system

The raft system is used where there are poor ground bearing conditions, like the fens in Cambridgeshire for example. This system utilises a reinforced concrete raft in one piece. The insulation and screed are then applied on top.

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