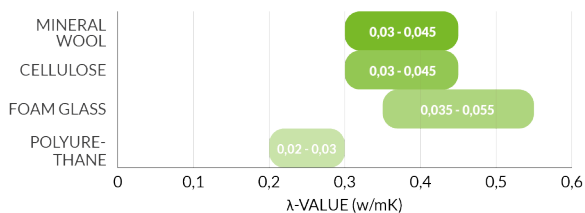


Note:

- *Keep materials dry and clean*
 - The heat insulation capacity of all materials will decrease if exposed to water
 - Dirty materials increase the risk of mould, even more so if the materials are wet
- *Insulate sufficiently, don't leave gaps*
 - Areas with no or insufficient insulation will give thermal bridges and significantly increase the energy emissions
 - Difficult areas may be filled using loose fill insulation
- *Control the fibre direction*
 - Some materials are dependent on its fibre direction to decrease the heat conductivity
- *Prevent air leakages*
 - Stationary air makes for great

Insulation capacity of conventional materials (λ -value)



About DREEAM

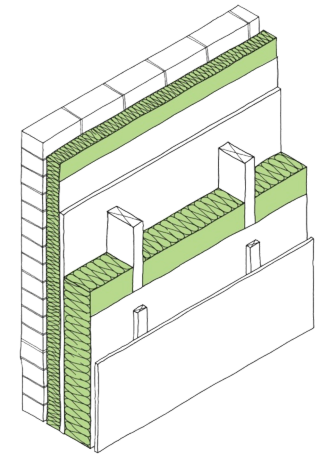
DREEAM (Demonstration of an integrated Renovation approach for Energy Efficiency At the Multi building scale) aims to show that renovating at a larger scale opens the opportunity for better integration of renewable energy and is generally more cost-effective. The project demonstrates a multi-building and single owner renovation approach that can achieve a 75% reduction of total energy demand.

The DREEAM approach is implemented on pilot sites in the UK, Germany and Italy. These demonstration sites are to validate the DREEAM method in different climate, cultural and institutional configurations.



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HEAT INSULATION



Why do we need insulation?

A well-insulated building is a basic condition for efficient regulation of the climate inside. A good insulation stabilizes the inside temperature all year round as it protects the cold during the winter and excess heat in the summer.

Insulation will also improve building standards by e.g.

- decrease of energy emissions
- decrease of the energy needs of the building
- decrease the risk of mould
- increasing fire safety

Insulation capacity (λ , W/mK)

Heat is transferred by radiation, conduction and convection. All materials have their characteristics in heat transfer and insulation capacity, measured in terms of λ (λ). A low λ value implies that the material transfers little energy, hence has a high insulation capability.

Mineral wool

There are two different types of mineral wool; rock and glass wool. They differ in the base material used in the production. Both types of mineral wool are not very flammable and easier to compress compared to e.g. cellular plastic.

If mineral wool is placed incorrectly, not parallel to each other and perpendicular to the direction of heat emissions that is, the insulation capacity is reduced by up to 10 %.

Area of application: walls, roofs, the framing of joists and installations.

Cellulose

As cellulose absorbs moisture from its surroundings it can absorb moisture in the construction and decrease the risk of mould and improve fire safety. This feature also makes it important to be observant of dry surroundings.

The cellulose is usually soft and frequently caves in after a while. This makes it common practice to fill in gaps and package the insulation using foam.

Area of application: walls, roofs and the framing of joists above ground.

Foam glass

Foam glass is a non-organic material produced by expanding glass. It is heat resistant, non-sensitive to moist and is easy to process.

The foam glass boards are easy to cut and install but need to be handled carefully as they are sensitive and can't handle too many bumps.

Area of application: walls, roofs and foundation. Works good as part of the construction.

Polyurethane

The polyurethane is available both as boards and foam. The foam is expansive and is a good filling material.

Polyurethane foam is produced from two components that are mixed together at the nozzle during application. The two components are sensitive to UV-light and should thereby not be stored in direct sunlight. They need to be mixed correctly and precision is needed when applied due to the expansion.

Area of application: used as boards in sandwich elements and in panels, and as foam in the building's construction (walls, roof and ground).

Enhanced foam insulation TRL 7*

Enhanced foam insulation is a graphite enhanced *polystyrene foam* for insulation boards with hydrophobic properties. It can be used in various remodelling applications-

The material works in the very same way as traditional insulation, with one primary difference - the high-purity graphite particles gives the insulation a reflective property. This increases the energy efficiency of the material, and enhanced foam insulation has 20 % better performance than expanded polystyrene and low thermal conductivity.

Bio-based insulation TRL 5

Bio-based insulation is a *phenolic foam* derived from biomass lignocelluloses from common low-cost bio-based waste products with low acidity.

Bio-based insulation has improved mechanical characteristics through micro reinforcement and offers high insulation and compressive strength that is 20 % better than that of polyurethane. It is an environmentally friendly alternative that can replace conventional materials in many cases without any loss in thermal performance.

*TRL = Technology Readiness Level, a scale from 1-9 to assess the maturity level of a technology. 1 is the lowest and 9 is the highest.