

Manufactured chemical-based materials

Polyurethane foam and other isocyanurate foams

Installers may well be at risk from volatile compounds. And the question must arise as to the vulnerability of occupants in this respect. During a fire the material will give off hydrogen cyanide gas.

Rock wool, slag wool, and glass wool

These can cause extreme irritation to the skin, the eyes, and the respiratory passages. Sustained exposure can lead to bronchial problems. The production produces large amounts of waste, and involves the addition of phenol-formaldehyde resin, silanes, and siloxanes.

Polystyrene foam

During a fire it gives off both carbon monoxide and carbon dioxide, as well as smoke.

Phenolic foam

Phenols are known carcinogenic aromatic organic compounds.

Urea-formaldehyde foam

Even small doses of formaldehyde can irritate eyes and mucous membranes. It is also registered as carcinogenic and can cause allergies.

Natural alternatives

Hemp batts

Hemp is the acclaimed insulating material of the 21st form, which has been held back by an unjustified connotation with its sister drug-related form. Hemp is very fast growing, maturing to a height of 4m (13ft) in around 100 days. This means that weeds have no chance to grow, so no herbicides or pesticides need be used. Admittedly the hemp batts are bound with a thermoplastic binder (polyolefin fibres) and treated with ammonium phosphate salts to provide fire and pest resistance, but despite this they have to be a better ecological option than a totally polymer based product. More pertinently they have none of the irritant factors associated with handling mineral fibres, and are hygroscopic providing a capability for buffering moisture. Hemp is also available on a roll. Hemp batts

can be used for lofts, floors (though not ground floors) walls and ceilings, but not anywhere that is subject to prolonged exposure to water.

Wool

Probably the most healthy and renewable option on the face of the planet, the universal use of wool is hindered by its production and transport costs. It has a unique ability to absorb and release moisture, and is thus the most efficacious component of a breathing wall.

Even its ignition is not a problem as it is mineral treated against fire, and tends to melt as it moves away from the ignition sources and then self-extinguishes.

Sheep's wool batts

'Thermafleece' is the most widely known of this product, which largely consists of wool but contains polyester reinforcement to create the batts. They are further treated against pests, fungus, and fire, this being essential as wool will degrade if subjected to saturation for a long period of time. The key feature with the wool batts is that they can absorb and release moisture without loss of thermal resistivity, and are less problematic with regard to interstitial condensation. They are also effective in reducing transmission of airborne sound.

Cellulose

Known by its trade name Warmcell 100, the cellulose fibre is derived from waste newspapers and treated with fire retardant and biocides. It is blown into lofts and floor voids.

Corkboard

Another naturally grown material, corkboard is produced from the bark of the evergreen oak, *Quercus suber*. It has to be imported from Portugal, Spain and North Africa, so there is a sea-miles component to the equation. Although its production requires energy for the boiling of the material to encourage the granules to bond themselves together with their own resins, it is a renewable source provided the trees are well managed in the 10-12 years they take to grow their bark. Cork board can be used for flat roofs, in batt form, or as a loose fill material. Very popular in the 1970s as a decorative wall material, corkboard needs to enjoy a rebirth as a wall and floor insulation. It is naturally resistance to fungus and water penetration.

Foamed glass

If made from scratch, using limestone and sand, foamed glass is very energy intensive. It is suitable for those existing traditional buildings where the floor needs to breathe, by virtue of using a crushed glass product in the sub-base of a Limecrete floor to resist rising damp.

Softboard

Ideally it should be made from waste from other wood processes.

Woodwool

The most popular wood wool is Heraklith, made from wood shavings bonded not with cement but with magnesite. The wood shavings are waste, but the composite board is not capable of being recycled once it falls out of use.

Compressed strawboard/flaxboard

The material has huge potential as an insulator and can cope with vapour permeability (ideal for lining of breathing walls) and as thermal insulation for flat roofs, but not with any excessive moisture. In this respect it is very similar to wood fibre in that it is a cellulose product.

Wood fibreboards

Known by the trade name of Pavatex. Used as external wall insulation they give all the benefits of an external render in creating thermal mass, and because they store heat, condensation is avoided. Their best quality is that they allow moisture to pass from inside rooms to the outside, thus avoiding all the problems associated with vapour barriers. In addition, this same thermal mass provides for cooling in summer by delaying the peak of external daytime surface temperature permeating to the inside. A reduction of internal temperature of around 4C is possible, compared to structures with insulation to the same u-value, but with other forms of manufactured insulation.

A system for roofing provides water resistant interlocking wood fibre boards (called Isolair sarking board) over the rafters without thermal bridges, and without the necessity for external membranes or internal vapour barriers. The whole purpose wood fibre boards is to provide an excellent system of vapour buffering, and thus a breathing roof, whilst utilising up to 95% wood waste, and when the material is no longer required it can be composted or recycled.

Calsitherm climate board

Calsitherm climate board is an alternative for internal insulation and can be applied directly to an internal plaster without the need for studs. It is made from calcium silicate and is microporous, with a high capillary action to enable it to buffer the moisture content of a room. It is mould resistant because of the nature of the material.

Reed boards/mats

NOTE: Care must be taken when introducing any cellulose based product into a building which has had an outbreak of dry rot. The fungus feeds on the cellulose molecule and will romp away, causing total devastation.

Clay board

Clayboard manufactured using clay, reed and hessian is reputed to have outstanding thermal and vapour diffusion properties, thus making it the ideal material for buffering moisture in bathrooms, for example.