

# GREENSTEP

ALTERNATIVE MATERIALS FOR BUILDING & INTERIORS

INSULATION

SUSTAINABILITY GUIDE





## Why Specify Wood Fibre or Cork Insulation instead of PIR?

Specifying wood fibre or cork insulation instead of PIR (polyisocyanurate) insulation is often about prioritising whole-building performance rather than achieving the lowest U-value with the thinnest insulation build-up.

Both wood fibre and cork are increasingly specified within sustainable, low-energy, breathable and retrofit construction projects where moisture management, occupant comfort, acoustic performance and embodied carbon are considered alongside thermal efficiency.

### Moisture Management & Breathability

One of the strongest reasons for specifying wood fibre or cork is their ability to support breathable construction. Both materials are vapour-open and hygroscopic, meaning they can absorb and release moisture without trapping it within the building fabric.

This helps reduce the risk of:

- Interstitial condensation
- Timber rot
- Mould growth
- Freeze-thaw damage
- Long-term deterioration of masonry or timber structures

The materials are particularly beneficial in:

- Solid wall retrofit projects
- Heritage and listed buildings
- Timber frame structures
- Lime-render systems
- Breathable wall build-ups

PIR is highly vapour resistant and can create moisture traps if the detailing or vapour control strategy is imperfect.

### Summer Comfort & Overheating Resistance

Wood fibre and cork provide significantly greater thermal mass and decrement delay compared with PIR. This means they slow the movement of heat through the building fabric more effectively, helping maintain comfortable internal temperatures during hot weather.

This is particularly important in:

- Roof and loft conversions
- South-facing façades
- Passivhaus projects
- Highly insulated modern buildings

PIR performs very well in winter heat retention but contributes less towards reducing summertime overheating due to a relatively low density and thermal mass.

### Lower Embodied Carbon & Sustainability

Natural insulation materials are increasingly specified within low-carbon construction strategies.

Wood fibre insulation is commonly manufactured from forestry by-products and stores biogenic carbon throughout its service life.

Cork insulation is harvested from cork oak bark without cutting down the tree, allowing the bark to regenerate naturally. Expanded cork boards can even approach carbon-negative performance depending on manufacturing methods and transport distances.

PIR insulation is petrochemical-based and generally has a substantially higher embodied carbon footprint.

These sustainability considerations are increasingly relevant for:

- Net Zero projects
- LETI targets
- BREEAM assessments
- Passivhaus certification
- Local planning sustainability requirements

### Acoustic Performance

Wood fibre and cork offer excellent acoustic absorption properties due to their dense fibrous and cellular structures. They are highly effective at reducing airborne sound transmission and improving acoustic comfort.

This makes them useful in:

- Timber frame construction
- Urban housing projects
- Party wall systems
- Roof and floor insulation

PIR insulation is comparatively poor acoustically, because rigid foam boards transmit sound more readily.

### Fire Behaviour & Smoke Toxicity

Wood fibre and cork generally char predictably when exposed to fire and tend to produce very low levels of toxic smoke compared with petrochemical foam insulation products.

PIR insulation can melt, shrink, and emit toxic smoke gases during combustion.

While PIR systems can achieve compliant fire ratings when correctly detailed, some designers and specifiers prefer the fire behaviour characteristics of natural insulation materials.

### Internal Comfort & Indoor Air Quality

Buildings insulated with natural materials are often perceived as feeling more thermally stable and less artificially sealed.

Wood fibre insulation in particular can help regulate humidity fluctuations internally, improving comfort and reducing surface condensation risk. This moisture-buffering behaviour can contribute positively towards internal air quality and occupant wellbeing.

### Compatibility with Natural Finishes

Wood fibre and cork insulation systems integrate particularly well with breathable and natural construction materials, including:

- Lime plaster
- Clay plaster
- Cork render
- Timber cladding
- Breathable membranes

Expanded cork insulation is also naturally water resistant, rot resistant, and dimensionally stable, making it highly suitable for external façade systems.

### Thermal Performance Comparison

MATERIAL	TYPICAL LAMBDA VALUE (W/mK)	KEY CHARACTERISTICS
PIR	~0.022	Excellent thermal performance (per mm)
Cork	~0.038 – 0.040	Breathable, durable and acoustic
Wood Fibre	~0.038 – 0.045	Thermal mass and moisture buffering

### Typical Specification Logic

Specify wood fibre when: breathable construction, timber frame, acoustic performance, overheating resistance, and retrofit durability are key priorities.

Specify cork when: a durable natural external insulation material is required with strong moisture resilience and acoustic performance.

Specify PIR when: achieving the lowest U-value within the thinnest possible build-up and lowest upfront cost are the primary project drivers.

### Hybrid System Approaches

Many contemporary high-performance buildings now combine PIR with wood fibre or cork insulation systems to balance:

- Thermal efficiency
- Moisture safety
- Embodied carbon reduction
- Occupant comfort
- Buildability and construction depth

Common examples include:

- PIR between rafters with external wood fibre sarking
- Cork external wall insulation systems
- Breathable façade systems combining cork render with wood fibre boards