PIR vs EPS vs XPS vs Phenolic Insulation

Choosing the right rigid insulation board is not just about grabbing the cheapest sheet and hoping for the best. Different insulation types are built for different jobs, and the right choice usually comes down to balancing thermal performance, thickness, moisture exposure, loadings, installation practicalities and budget. In plain English: some boards are slim and high-performing, some are tougher in wet conditions, and some win because they are simply cheaper and easier on the wallet.

What the products are generally used for?

PIR is one of the most common rigid insulation types used in UK construction. It is regularly used in floors, walls and roofs, especially where you want good thermal performance without building up too much thickness. Products such as Celotex GA4000 are marketed for floor, wall and roof applications, and are widely used in both new build and refurbishment work.

EPS is widely used in floors, walls and some general insulation applications where cost matters and extreme thermal performance is not the top priority. It is especially common in floor builds and other areas where a thicker build-up can be accommodated. EPS boards such as Jabfloor and similar products are sold for floor and wall insulation and are commonly chosen as a cost-effective solution.

XPS is typically used where the insulation may be exposed to moisture, higher compressive loads, or tougher site conditions. It is regularly used in floors, basements, inverted roofs and specialist applications where strength and moisture resistance matter more than headline lambda values. Kingspan GreenGuard and similar XPS products are positioned for heavier-duty and damp-prone applications.

Phenolic insulation is generally used where the target is maximum thermal performance with minimum thickness. It is common in premium wall, floor and roof applications, including cavity walls, framing systems and pitched roof build-ups, where shaving down thickness can make the whole detail work. Kingspan Kooltherm products are marketed as some of the most thermally efficient commonly available rigid boards in this category.

Why each one is used?

PIR is popular because it gives strong all-round performance and is widely available. For many domestic and light commercial jobs, it lands in the sweet spot between thermal efficiency, price and ease of sourcing. It is often the “default” rigid board because it performs well enough for a huge range of standard floor, wall and roof details.

EPS is used because it is usually the budget-friendly option. If you have enough depth available and you are not chasing the slimmest possible build-up, EPS can make a lot of sense. It is lightweight, simple to cut and can be a very practical choice where cost control is front and centre.

XPS is used because it is tougher. It has a closed-cell structure, very good moisture resistance and higher compressive strengths than many standard rigid insulation products. That makes it attractive in heavier-duty floor applications and situations where water exposure is a real design issue rather than just a theoretical one.

Phenolic is used because it gives the best thermal performance for the thickness in many standard comparisons. Where every millimetre counts, phenolic is often the board that rescues the detail. The catch, of course, is that better performance usually comes with a higher price tag. Physics is rude like that.

Ease of use

PIR is generally easy to handle, transport and cut on site. Manufacturers position it as light and rigid, which is one reason it is so common across everyday projects. For installers, it is familiar territory.

EPS is also easy to handle because it is lightweight and simple to cut, although it can be a bit messier on site and is more prone to damage than tougher boards if it is knocked about. Still, from a labour point of view, it is generally straightforward.

XPS is still easy enough to work with, but it is really valued for being more robust during handling and installation. If the site is a bit rough-and-ready, XPS usually takes that abuse better than softer or lower-density options.

Phenolic is usually manageable to install, but the real selling point is not that it is easier than the others. It is that you may need less thickness to hit the same target. In tight details, that can make the whole installation easier overall because you are not fighting thresholds, rafters, cavity widths or room size losses.

Technical characteristics that matter

The headline technical figure most people focus on is **thermal conductivity**, often shown as lambda value in W/mK. Lower is better.

Phenolic typically leads the pack, with Kingspan Kooltherm products commonly quoted around **0.019 to 0.022 W/mK** depending on product type.

PIR typically sits around **0.021 to 0.022 W/mK** for mainstream products such as Celotex GA4000 and similar ranges

XPS is commonly around **0.030 – 0.034 W/mK** in the examples reviewed here, although its strength and moisture resistance are often the reason it gets specified rather than chasing the lowest possible lambda.

EPS in the examples reviewed here is commonly around **0.034 – 0.038 W/mK** for standard grades such as EPS70, with stronger grades like EPS100 or EPS150 used when higher loading is needed.

On **compressive strength**, the gap can be significant. Celotex GA4000 PIR is listed at **140 kPa** compressive strength at 10% deformation. Standard EPS70 is commonly around **70 kPa**, while XPS products such as Kingspan GreenGuard are declared at **300 kPa**, **500 kPa** and **700 kPa** depending on grade. Kingspan Kooltherm K103 phenolic floorboard is listed at **120 kPa**. So if loadings are a major concern, the answer is not automatically "best lambda wins".

On **moisture resistance**, XPS is the standout. Its closed-cell structure and low water absorption are a major reason it is chosen for basements, inverted roofs and demanding floor applications. PIR has decent moisture performance in many standard uses, but XPS is usually the stronger pick where damp exposure is a major design factor.

Approximate costs

Please note: Prices were correct at time of review (April 2026). Oil and raw materials are fluctuation significantly use to the middle east conflict - please check with multiple suppliers to check for availability and current prices.

These prices move around by brand, thickness, merchant and volume, so treat them as a practical guide rather than gospel.

At **100mm thickness**, mainstream **EPS70** can be around **£19.28 ex VAT per 2400 x 1200 board**, while **EPS100** is around **£24.20 ex VAT** per board from one UK retailer. That is roughly the low-cost end of the rigid board market.

A mainstream **100mm PIR** board such as Celotex GA4000 is listed at around **£50.60 ex VAT per 2400 x 1200 board** from Travis Perkins. That places PIR well above EPS on initial material cost, but with much better thermal performance per millimetre.

A **100mm XPS** product such as Kingspan GreenGuard 300 kPa is listed around **£56 to £57 per 3m² pack** on Materials Market, which puts it broadly in premium territory compared with standard EPS and not far off some PIR price points depending on grade and pack format.

A **100mm phenolic** board such as Kingspan Kooltherm K103 or K107 is listed around **£312 to £316 per 8.64m² pack**, which works out at roughly **£36 per m²** before VAT depending on the exact product and merchant. In simple terms: phenolic usually sits at the expensive end, but it earns its keep where thickness is tight and performance matters.

How they tend to be sold and availability

PIR is widely available through major builders' merchants, insulation specialists and online distributors. It is one of the easiest rigid insulation types to source in the UK, and it comes in a broad range of board sizes and thicknesses.
EPS is also widely available and often sold either by individual sheet or by pack, depending on the supplier. It tends to be easy to source, especially in standard floor grades such as EPS70 and EPS100.

XPS is available through specialist insulation retailers and selected merchants, but the range is often more application-led and grade-specific. In other words, it is available, but not always as universally stocked as standard PIR.
Phenolic is readily available in the UK, particularly through insulation specialists, but it is more commonly bought for performance-led applications rather than casual value shopping. It is usually sold in packs and across product-specific ranges for floors, roofs, walls and cavity details.

Other points a customer should know before choosing

If your project has **tight thresholds, shallow rafters, narrow cavities or limited floor build-up**, you will usually end up looking hardest at **phenolic first, then PIR**. They give more thermal performance for the thickness.
If your project is **budget-led** and you have room for extra thickness, **EPS** becomes much more attractive. It is rarely the glamorous option, but it can be the sensible commercial option.
If the area is **damp, heavily loaded, or likely to face a tougher service life**, **XPS** deserves serious consideration. It is not usually chosen because it is cheapest or because it has the best lambda. It is chosen because it is tougher and more moisture-resistant.
Also worth noting: not all grades within each family are equal. EPS70, EPS100 and EPS150 are different products for different loadings. The same applies across PIR, XPS and phenolic ranges. So the right question is not just “which material is best?” but “which product grade is right for this exact build-up?”

Conclusion

If you want the simple version: **EPS** is usually the cheapest, **PIR** is the common all-rounder, **XPS** is the tough moisture-resistant specialist, and **phenolic** is the premium option when you need the best thermal performance for the least thickness. There is no universal winner. The best product is the one that fits the detail, the budget and the expected service conditions without creating headaches elsewhere in the build. On plenty of projects, PIR wins because it is balanced. On tight details, phenolic often wins. On wet or high-load areas, XPS comes into its own. And on cost-sensitive builds with enough depth, EPS is still very much in the game.

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