Comparing Insulation Choices for Floors, Walls and Ceilings/Roofs
PIR vs EPS vs XPS vs Phenolic vs Mineral Wool

Insulation is one of those categories where people often ask, “Which one is best?” when the real question is, “Best for what part of the building?” The right answer for a floor is not always the right answer for a cavity wall, and the right answer for a loft is not always the right answer for a flat roof. Once you bring in thickness limits, moisture exposure, compressive strength, fire performance, acoustic performance and budget, the field changes quickly. Approved Document L remains the core energy-efficiency guidance in England, and a new 2026 edition has been published with later implementation dates, so specification needs to stay tied to current project requirements rather than old rule-of-thumb thicknesses.

For most UK residential projects, the common comparison usually comes down to **PIR**, **EPS**, **XPS**, **phenolic**, and **mineral wool**. Not every one of these is equally suitable everywhere. Some are strong in floors, some are strong in walls, some are excellent in roofs, and some win because they bring extra benefits such as fire resistance or acoustic performance rather than just a lower lambda value.

What the products are generally used for?

PIR is one of the most common rigid insulation choices across **floors, walls and roofs**. Celotex GA4000 is explicitly marketed as suitable for wall, floor and roof applications, which is a big reason PIR is often treated as the market’s go-to all-round rigid board.

EPS is used heavily in **floors**, and in some wall and specialist insulated build-up systems where thickness is less critical and cost matters. Jablite’s Jabfloor range is positioned for all floor constructions, including domestic and commercial applications, and comes in different compressive grades depending on loading.

XPS is generally used where insulation may face **higher compressive loads or more moisture exposure**, such as **floors, basements, inverted roofs and specialist heavy-duty applications**. Kingspan GreenGuard is marketed for inverted roofs, basements, car park decks and heavy-duty floor uses, which tells you exactly where it earns its keep.

Phenolic insulation is generally used in **walls, floors and roofs** where the target is the best thermal performance for the least thickness. Kingspan’s Kooltherm range is positioned as premium-performance insulation and is widely used where tight build-ups matter.

Mineral wool is used across **walls, lofts, ceilings, roofs and internal partitions**, especially where **fire performance, acoustic performance and breathability** matter alongside thermal performance. ROCKWOOL cavity products are marketed for masonry cavity walls, while loft and roof rolls are sold for roof and loft spaces. Knauf also positions glass mineral wool products strongly in cavity, loft and partition applications.

Why each one is used

PIR is used because it delivers strong thermal performance without demanding excessive thickness. Celotex states a lambda of **0.022 W/mK** for GA4000, and its roof insulation guidance says Celotex PIR boards can offer values as low as **0.021 W/mK**, which is why PIR is often the practical middle ground between cost and performance.

EPS is used because it is usually one of the most cost-effective insulation options, especially in floors where extra thickness can often be accommodated more easily than in walls or roofs. It is rarely the glamorous choice, but it is regularly the commercially sensible one. Jablite's technical literature also shows it is available in multiple compressive-strength grades, which helps tailor it to the job.

XPS is used because it is tougher and more moisture resistant than many other common insulation types. Kingspan markets GreenGuard XPS for basements, inverted roofs and heavy-duty applications, and the product literature highlights low water absorption and good compressive strength. That makes it much more of a specialist performer than a generic everywhere board.

Phenolic is used because it gives excellent thermal performance in thinner build-ups. Kingspan's insulation guidance describes Kooltherm as a lower-lambda option, and its broader materials guide says phenolic insulation can achieve **0.019 W/mK**. That makes it particularly useful in tight cavities, constrained roof build-ups and premium specifications.

Mineral wool is used because it does more than just insulate. ROCKWOOL and Knauf both position mineral wool products around acoustic performance, fire performance and thermal performance. In short, it is often chosen when the detail needs a broader set of benefits than just "hit the U-value in the thinnest possible board."

Ease of use

PIR is generally easy to cut, transport and fit. Celotex specifically promotes its boards as light and rigid, which is one reason PIR remains popular with installers across floors, walls and roofs.

EPS is also lightweight and fairly easy to handle, but it is more vulnerable to site damage and can feel less robust than denser rigid board products. It is straightforward, but not exactly elegant. Still, where the job is floor insulation and budget matters, it is often a very practical choice.

XPS is easy enough to handle as a rigid board, but its real installation advantage is durability in demanding conditions rather than pure convenience. If the area is damp, heavily loaded or exposed to tougher service conditions, XPS generally holds up well.

Phenolic is usually installed in much the same general way as other rigid boards, but its value is not that it is easier to fit. Its value is that you often need less of it to hit the same target. Where thickness is tight, that can make the whole build-up more workable.

Mineral wool is often very easy to friction-fit in studs, rafters and loft spaces, especially slab and roll products. ROCKWOOL Flexi and Rollbatt are both positioned around that kind of application, and Knauf's product family does much the same. It is usually forgiving to install, though it often needs more thickness than PIR or phenolic to achieve the same thermal result.

Technical characteristics that matter

The headline thermal figure most people look at is **lambda value**, where lower is better. In the product information reviewed here, **phenolic** leads at around **0.019 W/mK**; **PIR** typically sits around **0.021 to 0.022 W/mK**; **XPS** is commonly around **0.033 to 0.034 W/mK**; **EPS** is commonly around **0.038 W/mK** for standard floor grades; and mineral wool products commonly span roughly **0.032 to 0.040 W/mK** depending on type and application.

For **compressive strength**, the differences matter most in floors. Celotex GA4000 PIR is declared at **140 kPa** compressive strength at 10% deformation, standard Jabfloor EPS grades range broadly from **70 kPa upward**, and Kingspan GreenGuard GG300 XPS is marketed at around **300 kPa**. That is why not every board belongs under every floor.

For **fire and acoustic performance**, mineral wool often stands out. ROCKWOOL Flexi and Acoustic Roll-type products are marketed as **non-combustible** or best-classified for reaction to fire in their respective categories, and ROCKWOOL repeatedly positions stone wool as an acoustic performer in walls, floors and roofs. That does not automatically make mineral wool the best thermal product in every build-up, but it absolutely makes it a stronger all-round performer in many wall and roof details.

For **moisture exposure**, XPS is the standout. Kingspan GreenGuard is explicitly positioned for inverted roofs and basements, and retailer technical summaries highlight low water absorption. EPS can also cope in many floor applications, but if the detail is genuinely moisture-challenging, XPS is usually the more specialist fit.

Approximate costs of the product

At a broad UK planning level, **EPS** is usually the budget leader, **PIR** sits in the middle, **XPS** tends to be premium in specialist applications, **phenolic** usually sits at the top end for standard rigid insulation, and **mineral wool** varies depending on whether you are buying straightforward loft roll or higher-spec slab products. That is broadly how the market behaves, even though specific prices swing with brand, thickness and merchant.

In practical terms, **EPS** is usually the cheapest route where thickness is available, especially in floors. **PIR** generally costs more but buys you reduced thickness. **Phenolic** costs more again but can rescue tight details. **XPS** often looks expensive if you judge it only by thermal performance, but that misses the point because it is usually bought for strength and moisture resistance. **Mineral wool** can range from very cost-effective in loft roll form to more premium in specialist façade and cavity products.

How they tend to be sold and availability

PIR is extremely widely available in the UK through builders' merchants, insulation specialists and online distributors. Celotex boards are sold in multi-application ranges, which is one reason PIR is often the easy answer when supply-chain simplicity matters.

EPS is commonly sold by grade and thickness, especially in floor applications. Jabfloor is sold in a range of grades such as 70, 100, 150 and above, which ties directly to loading requirements.

XPS is less of a generic "use anywhere" board and more commonly sold into specialist applications like basements, inverted roofs and heavy-duty floors. It is available, but usually a little more application-led than standard PIR.

Phenolic is widely available through insulation specialists and premium specification routes, especially where walls and roofs are being designed around thinner high-performance solutions. It is usually sold as part of a performance-led specification rather than a bargain hunt.

Mineral wool is sold in a huge range of slabs, batts and rolls for specific uses such as lofts, cavity walls, internal partitions, rainscreen systems and timber-frame walls. Availability is generally excellent, but the product family is broad enough that you need to make sure you are buying the right mineral wool product for the actual application rather than just grabbing "some wool."

Other points a customer should know before choosing

For **floors**, rigid boards usually dominate. **EPS** is strong on value, **PIR** is strong on thickness reduction, and **XPS** is strong where the detail is tougher or wetter. If you are dealing with domestic slabs and normal loading, EPS or PIR often lead the conversation. If you are dealing with basements, inverted build-ups or heavier-duty conditions, XPS becomes much more relevant.

For **walls**, the choice depends heavily on the wall type. In masonry cavity walls, **mineral wool cavity batts** and **high-performance rigid boards** both have a place. Mineral wool is attractive where fire and acoustic performance matter, while PIR and phenolic are attractive where cavity width is tight and thermal performance per millimetre matters more.

For **ceilings and roofs**, the right answer depends on whether the insulation is going in a **loft**, **between rafters**, **over rafters**, or in a **flat roof**. Mineral wool rolls remain a very common loft solution, while PIR and phenolic boards are frequently used where roof depth is constrained or warm-roof detailing is required. Celotex's roof guidance and Knauf/ROCKWOOL loft products reflect that split very clearly.

If the project also needs strong **acoustic** or **fire** performance, mineral wool often moves up the shortlist quickly. If the job is mainly about hitting a thermal target in the thinnest possible space, **phenolic** and **PIR** usually push forward. If the job is mainly about **low-cost floor insulation**, **EPS** remains a serious contender. And if the job is **wet, heavy-duty or below ground**, **XPS** starts making much more sense.

Conclusion

If you want the blunt version: **PIR** is the all-round rigid board that fits a lot of floor, wall and roof jobs; **EPS** is the value player, especially in floors; **XPS** is the specialist choice for wetter and harder-working applications; **phenolic** is the premium option where thickness is tight and thermal performance matters most; and **mineral wool** is the versatile wall-and-roof performer that brings fire and acoustic benefits as well as thermal insulation.

There is no universal winner because the “best” insulation changes depending on where it is going. Floors often favour EPS, PIR or XPS depending on budget and loading. Walls often become a choice between rigid performance boards and mineral wool depending on cavity width, fire strategy and acoustic goals. Roofs and ceilings often split between mineral wool in lofts and rigid boards in tighter or more demanding roof details. The smart move is not buying the board with the prettiest brochure. It is choosing the insulation that actually suits the build-up, the site conditions and the performance target.