EPS Briefing

For Architects, Architectural Technicians, Building and Construction Specifiers

ECONOMY PERFORMANCE SUSTAINABILITY

SPECIFIER BRIEFING

EPS has for decades been the architect's number one choice for economy, performance and sustainability in a wide range of applications. It is the leading 21st century solution for many construction and civil engineering tasks including:

- **Roof, floor and wall insulation**
- **Sub-structures and void-fill blocks for civil engineering**
- **Foundation systems**
- **Clay Heave protection**
- **Bridge, rail and road widening schemes**
- **Underground heating system support**
- **Interior and exterior decorative mouldings**

About this Specifier Guide

We have designed this guide for ease of use in the busy specifier's office. It is available in electronic (PDF) and printed versions. You can download copies from **www.epsconstructiongroup.com**

There are four tabulated sections covering:

- **Why specify EPS?** - Attributes and applications
- **What is EPS made of?** - Production and composition
- **How does EPS perform?** - Standards and performance
- **What are EPS sustainability credentials?**

ATTRIBUTES

Why specify EPS?

Its attributes and applications

Why specify EPS?

EPS may mean Expanded Polystyrene but it also stands for the three things which are crucial to modern construction - Economy, Performance and Sustainability.

Only EPS offers a unique combination of attributes and advantages which has led to it being the leading choice for decades for architects and construction specifiers.

Applications

EPS is ideally suited for the following applications:

- **Roof, floor and wall insulation**
- **Sub-structures and void-fill blocks for civil engineering**
- **Foundation systems**
- **Clay Heave protection**
- **Bridge, rail and road widening schemes**
- **Underground heating system support**
- **Interior and exterior decorative mouldings**

Why specify EPS?

Lightweight

EPS offers an exceptionally lightweight solution to so many applications in construction. This is not surprising when you consider that, as a result of advanced manufacturing technologies, EPS is effectively 98% air captured within a 2% cellular matrix.

The advantages in on-site handling and transportation bring significant economic benefits whilst considerably reducing health and safety risks associated with the lifting of heavier materials. It is therefore an excellent substitute for infill materials and ballast where it also brings load and fill times down in time-critical build projects.

High Strength and Structural Stability

In spite of its light weight, the unique matrix structure of EPS brings the benefits of exceptional compressive strength and block-rigidity. This means it is ideal for use in many construction and civil engineering applications, particularly as a structural base infill, for example in road, railway and bridge infrastructures. Strength tests performed on EPS which was first placed in the ground almost 30 years ago show that it is just as strong today – the tested strength routinely exceeding the original

Why specify EPS?

minimum design strength of 100kPa. EPS bridge foundations, which have been subject to many years of sustained loading, show 'creep' deformation of less that 1.3% - only half as much as had been theoretically predicted. Most importantly, EPS stability does not deteriorate with age.

Economy

EPS is a well-established material for the construction industry and offers a proven and economic solution which helps specifiers maintain build costs and insulation budgets. Far from incurring a cost premium, the new-build cost of insulating a building with EPS, rather than polyurethane, polyisocyanurate or mineral wool, is typically 20% less. Floor construction with EPS requires only one waterproof membrane to be installed, not the two needed for mineral wool or PU foam – saving on both material and labour. And for a given insulation performance, EPS itself costs less than these competing materials.

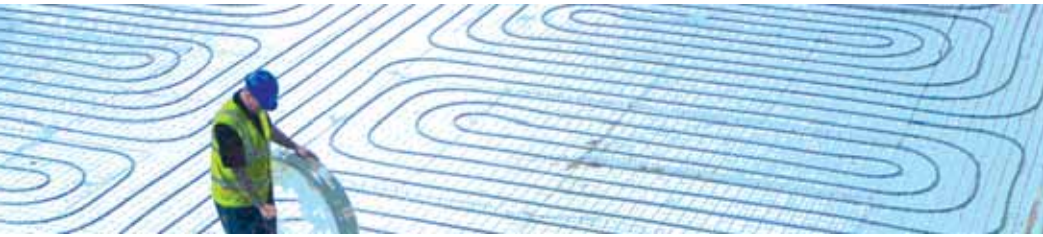
Insulation

In the construction sector, EPS has a long established reputation for its exceptionally high insulation qualities. Its BRE 'A-plus' rating means it is the perfect choice for use in under-floor,

Why specify EPS?

between-floor, walling and roofing applications where it is able to give a constant insulation value across the full service life of the building.

Thermal conductivity testing of EPS to DIN 52612, under the auspices of the Forschungsinstitut für Wärmeschutz in Munich, confirmed that its insulation efficiency at 0.0345W/mK was well within the originally specified standard requirement of 0.04W/mK. For those seeking higher performance material for the Code For Sustainable Homes (CSH),



low lambda material is available – which is typically grey in colour. The thickness of high-performance, low lambda EPS can be as little as 70mm, making possible a total floor thickness of 135mm.

Why specify EPS?

Design Versatility

Ease of cutting or moulding allows the factory production or on-site preparation of complex shapes to match the most demanding architectural and design requirements – usually without the need for specialist cutting tools or skills. This means the breathing masks, goggles and protective gloves needed for working with mineral wool and other materials are not required with EPS.

Accredited Performance

EPS has a long and proven track record and has been tested to some of the world's most demanding performance standards. EPS has BBA Approval, BRE Certification and many wider industry accreditations. Its light weight, high compressive and impact strength, insulation, safety and eco-credentials combine to make it the preferred option for so many architectural and construction applications.

Resistance to Water Ingress

After almost 30 years in the ground, samples of EPS retrieved from locations as little as 200mm above the groundwater level all have less than 1% water content by volume,

Why specify EPS?

whilst blocks which are periodically entirely submerged show less than 4% water content – performance notably superior to other foamed plastic materials.

Safety in installation and use

EPS is non-toxic, chemically inert, non-irritant and rot-proof. Fungi and bacteria cannot grow on EPS and it is insoluble and non-hygroscopic.

EPS is also rodent-proof and offers no nutrient attraction to vermin. Nor is it affected by water, thus ensuring that moisture contact will not lead to deterioration of the product or its performance. In fact, the reinstatement of flood-damaged buildings is a much quicker, more practical and less costly procedure if building structures feature non-water-absorbing insulation material – waterlogged open-cell foams and mineral fibres are very vulnerable to flood damage, are very hard to dry out and may never recover their insulation performance. Cement, lime, gypsum, anhydrite and mortar modified by plastics dispersions have no effect on EPS, so it can confidently be used in conjunction with all conventional types of mortar, plaster and concrete encountered in building construction. All of this makes it entirely safe in use across all of its construction applications including subterranean and marine environments.

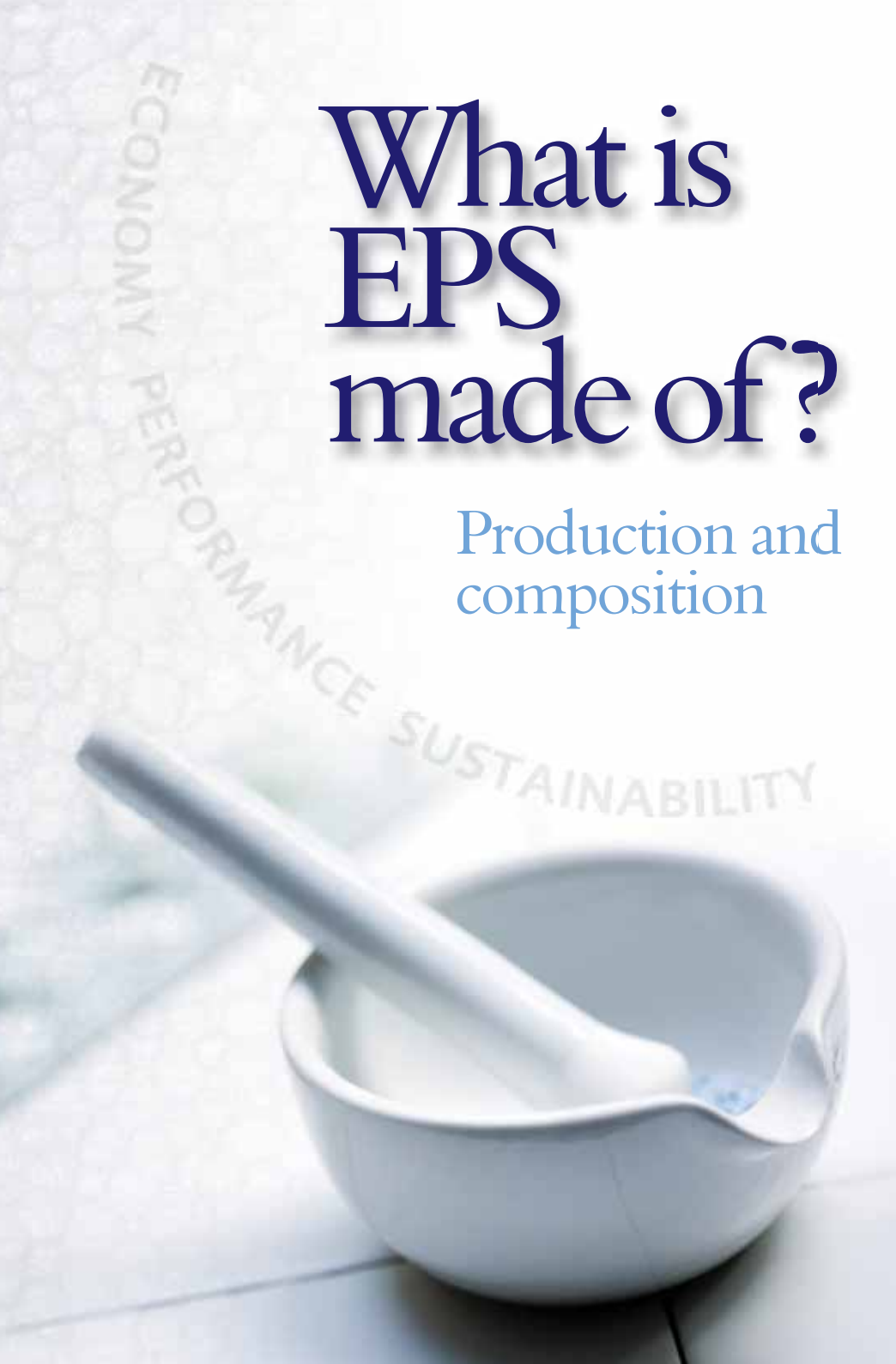
Why specify EPS?

Sustainability Credentials

At every stage of its life cycle, from production to recovery or recycling, EPS offers exceptional eco-credentials and is therefore ideally suited to the new generation of eco-friendly building projects. All manufacturing processes comply with current environmental regulation. EPS uses no greenhouse gas producing materials. It is chemically and environmentally non-aggressive and it can be – and is – easily recycled into long-life products through an expanding nationwide network of collection points.

What is EPS made of?

Production and composition

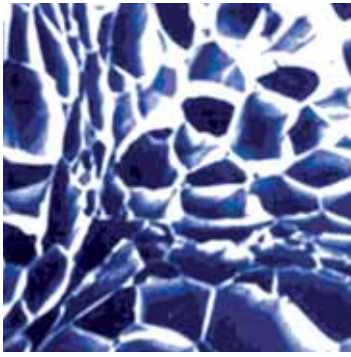


What is EPS made of?

What goes into EPS?

Put simply, EPS is 98% air and 2% plastic. It uses, as its base material, styrene monomer. The monomer is a by-product of petroleum and naphtha produced during oil refining which provides a ready and continuous source. Styrene also occurs naturally in many foods such as strawberries, coffee beans, beer and wine.

Polystyrene is produced when the styrene monomer is polymerised into long chains. A gas called pentane is used as a non-CFC expansion agent to blow polystyrene into its final lightweight, expanded cellular form. During the production process, the pentane is quickly broken down into carbon dioxide and water. Pentane has low volatility. For example, it is found in the digestive systems of animals and created when vegetable matter decomposes in a process called anaerobic composting.



On the basis of current EU testing and classification regimes, styrene monomer is non-toxic in all normal usage and is not classified in terms of carcinogenicity or mutagenicity. Pentane has no potential to harm the ozone layer unlike CFCs or HCFCs.

What is EPS made of?

What processes are used?

EPS has been made for more than half a century and EPS manufacturers comply with all current regulatory and legislative requirements. The processes include a combination of heat and pressure utilising clean technologies and minimising energy inputs and water usage through closed loop energy recycling. For all of these reasons, EPS manufacture is a highly efficient process.

No solid waste is created and process waste and off-cuts are reintroduced to the production batch immediately. Atmospheric and land/water emissions are strictly controlled, resulting in minimal localised impacts.

Where is EPS made?

Due to the light weight of EPS and its relatively high volume, the EPS industry has grown to be located close to its home markets. This means that, in the UK, a number of strategic production sites enable the construction sector to have a constant, close supply of EPS to meet their continuous demands.

What is EPS made of?

This also means that architects and construction specifiers selecting EPS building solutions can be reassured that all EPS is supplied to exacting standards from a trusted supplier. The back cover of this specifier booklet gives the names of the UK's leading suppliers to the construction industry, all of whom are BBA approved and are members of the British Plastics Federation. These companies can also be counted upon to provide expert support and advice to their architectural and construction customers.

What impacts does the industry have?

Particularly when used as building insulation, EPS will save far greater impacts than it can ever generate. This means that whatever resources go into the manufacture and supply of EPS, its exceptional performance will guarantee a far greater payback in resource reduction (such as heat saving) when installed in a building. In simple terms, EPS gives maximum return for minimal resource.

How does EPS perform?

Standards and performance criteria

ECONOMY PERFORMANCE SUSTAINABILITY

PERFORMANCE

How does EPS perform?

In Manufacture

Architects and specifiers can be assured that BPF members who manufacture EPS comply rigorously with UK and EU legislative and regulatory requirements. These can be embodied in the following main principles which apply to every aspect of production:

- **Health and Safety at work**
- **The transportation and storage of raw materials**
- **Pollution and emission controls**
- **The reduction and recycling of waste**
- **The proper maintenance, repair and protection of machinery**
- **The adoption of safe working practices supported by the provision of protective workwear**
- **Training and skills support for employees**
- **Continuous product development and performance enhancement**

Members of the UK British Plastics Federation EPS Group comply with the international ISO 9001 Quality Standard and adhere to relevant environmental regulations.

All EPS is manufactured to EN13163.

UK BPF EPS members are accredited to carry out SAP calculations.

How does EPS perform?

In Use

	Standard (white)				Low lambda (grey)
Material	EPS70	EPS100	EPS150	EPS200	EPS70
Compressive stress at 10% deformation (kPa)	70	100	150	200	70
Thermal conductivity (W/mK)	0.038	0.036	0.035	0.034	0.030
Board size (mm)	2400 x 1200				
Board thickness (mm)	25, 30, 35, 40, 50, 60, 70, 75, 80, 100+				

EPS has been established in use for more than 50 years and has carried **BBA Approval** for construction applications since 1976.

EPS has a **BRE A-plus** rating making it one of the 'elite' groups of construction materials with the lowest environmental impacts.

EPS is the closest of any modern building material to fulfilling the 60yr life set as a performance target by the **UK Building Regulations.**

EPS boasts **ECO points** projected over a 60yr life of only 0.043. This acts as a clear assurance to specifiers of the eco-credentials of EPS and its significant benefits when it comes to environmental impact assessment.

How does EPS perform?

EPS enables full compliance with **Building Regulations Part L1 and L2 and "Section 6" in Scotland.**

EPS is **non-hygroscopic, non-irritant and rot-proof.** It does not deteriorate over time and requires no special storage conditions.

EPS provides a **constant insulation value** across the full life of a building – offering thermal conductivity for grey EPS as low as 0.03 W/mK and 0.038 W/mK for white.

EPS is dimensionally stable to within 0.2% at 23^{0}C and 50% RH, when tested in accordance with BS EN 1603:1997. Where there is no mechanical load, EPS can be exposed to temperatures of up to 90^{0}C.

Hot bitumen is a particularly suitable adhesive for roofing and cold store applications – the very short term exposure to temperatures of over 100^{0}C has practically no effect.

There are no lower temperature limits for EPS unless structural circumstances indicate that a volume change would be critical.

Unlike fibrous materials, EPS will not settle over time.

EPS manufactured by BPF members carries the **CE mark.**

How does EPS perform?

EPS is widely used throughout the construction industry in a **flame-retardant** grade where its trusted performance has been established over decades in use. EPS should be specified for installation in a protected/enclosed environment such as under concrete screed, behind plasterboard, in building cavities and underground.

EPS is combustible, but the flame-spread with flame-retardant EPS is markedly reduced and generally meets the requirements of Class E when tested and classified in accordance with BS EN ISO 13501-1:2002 – EPS will extinguish on removal of the igniting flame.

The fire behaviour of naked EPS insulation material is not relevant. The material is generally covered by other material which determines the fire behaviour. The insulation material is only affected by fire after the covering material fails and by this time the building or the compartment cannot be saved from total loss.

EPS is well proven in decades of use in civil engineering applications where it has been **subjected to millions of loading cycles,** for example, in road and railway structures.

How does EPS perform?

EPS has long been regarded as a **high-performance, value-for-money** material. The established, well-invested and highly efficient manufacturing processes help manufacturers to maintain competitive pricing policies when compared with other, less effective and higher installed-cost alternatives. Together with its outstanding environmental attributes, this makes EPS the best choice for sustainable building projects.

What are the EPS sustainability credentials?

Environmental Impacts and Sustainability Issues

SUSTAINABILITY

What are the EPS sustainability credentails?

Production Impacts

BPF EPS manufacturers use advanced 'clean technologies' and operate to strict environmental management procedures.

EPS is 98% air. It uses **no CFCs or HCFCs** in manufacture and all emissions are controlled strictly within environmental regulatory frameworks which apply in the UK and EU.

EPS brings considerable energy and resource-saving benefits. Using **less than 0.1% of global oil as a feed-stock,** it can save up to 200 times its own resource in thermal energy saving.

All energy, heat and water in-puts at manufacture are strictly monitored and maximum use is made of re-use and **recycling on a closed loop basis** wherever possible.

EPS manufacturing units **do not produce residual solid waste** from the production process.

All process waste, off-cuts etc, is **recycled into the production process.**

What are the EPS sustainability credentails?

The inherent light weight of EPS makes it the lightest of all construction materials in common use - thus helping **minimise environmental impacts and costs** associated with the movement of heavier materials.

ECO points for EPS projected over a 60-year life amount to only 0.043. This indicator is based on accepted robust assessment procedures covering production, transportation and disposal and is a clear measure of the minimal environmental impacts of EPS in construction.

Eco-balances and life-cycle analyses demonstrate that EPS has exceptional merits as a construction material. For example, it has a **Zero Ozone Depletion Potential and a low Global Warming Potential.**

Environmental Advantages in Use

EPS for commercial construction applications gets the highest possible A-Plus summary rating in the BRE Global Green Guide to Specification **(www.thegreenguide.org.uk).**

What are the EPS sustainability credentails?

This makes EPS one of the special group of construction materials which have the least possible environmental impacts. In fact, In addition to the A–Plus summary rating, EPS (rated on element no. 815320022) gains 'A' ratings across the majority of the critical environmental performance matrices including:

Water Extraction	**A+**
Mineral Resource Depletion	**A+**
Stratospheric Ozone Depletion	**A+**
Human Toxicity	**A+**
Ecotoxicity	**A+**
Nuclear Waste	**A+**
Waste Disposal	**A+**
Fossil Fuel depletion	**A**
Eutrophication	**A+**
Acidification	**A**

EPS has outstanding thermal insulation qualities which make it a first choice material for many construction applications. **EPS reduces CO_2 emissions by up to 50%** - making sure it more than offsets its small carbon footprint - giving maximum return for minimal resource.

Heating and cooling of buildings accounts for around half of Europe's total energy consumption. By acting as a highly efficient thermal insulator, EPS can also make a

What are the EPS sustainability credentails?

significant contribution to reducing fossil fuel for these purposes. In turn, this **helps reduce SO_2 and SO_3 emissions** – a major cause of acid rain.

EPS has extremely low moisture absorption and will never rot. Together with its outstanding ageing performance and chemical resistance, it offers **exceptional durability** which, in turn, overcomes the need for replacement which would mean resource wastage.

Post-Use Environmental Credentials

EPS is **recyclable** at many stages of its life cycle. During production, all manufacturing waste can be fully reprocessed by milling or granulating into pellets and adding to the production mix without any detriment to the quality of the finished EPS product.

The integrity and performance of EPS can be expected to last at least the full lifetime of the building in which it is used. At the end of its useful life, however, the fact that EPS **does not degrade or deteriorate** throughout its life means that it is ideal for recovery and recycling.

What are the EPS sustainability credentails?

By definition, the amount of construction - based EPS found in the domestic waste stream is very small indeed and, in fact, even when we take into account the widespread use of EPS in packaging, it has been calculated that **EPS accounts for only 0.1% of Municipal Solid Waste (MSW).**

The UK Government is now moving rapidly towards making greater use of clean-burn incineration of waste into energy and hot water for district heating. The number of UK facilities for energy recovery from waste is expected to triple by 2020. As part of the waste mix, plastics (including EPS) play a crucial role in helping achieve the temperatures required for optimum clean-burn efficiency. In the event, therefore, that EPS does not find its way into the recycling stream, its **calorific value** - can easily be recovered to benefit homes, offices and factories.

Whilst landfill is a last resort, at the end of the preferred waste management hierarchy, users and specifiers of EPS should be reassured that, even when confined to landfill, EPS remains inert and will not decompose to generate greenhouse gases or degenerate to pollute the air, water or ecosystems. It has **zero Ozone Depletion Potential (ODP) and a low Global Warming Potential (GWP).**

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