



Dow Building Solutions

Introducing STYROFOAM™ Solutions for flooring and cellars: performance, product overview and references



Introduction

In the demanding conditions of today's building and engineering projects STYROFOAM™ blue extruded foamed polystyrene boards can deliver the thermal performance and strength you require - for the lifetime of the structure.

As a world-class producer of thermal insulation products, Dow Building Solutions can provide help, advice and information in order to help you achieve the solutions you're looking for.

STYROFOAM™ Solutions are available in a number of different grades which are designed to meet the performance requirements of specific applications.

For construction applications they are marketed under the brands FLOORMATE™ (for flooring), ROOFMATE™ (for roofing) and PERIMATE™ (for below ground and basement applications).

About STYROFOAM

STYROFOAM™ has been manufactured by Dow since the 1940s. The process of extruding foamed polystyrene results in a material with uniformly small, closed cells, a smooth 'skin' and an unrivalled set of properties which make it the choice of specifiers in a wide range of demanding insulation applications:

- **low thermal conductivity** - minimising the board thickness needed to achieve a specific U-value, thus allowing the designer greater flexibility
- **high compressive strength** - in load-bearing applications, the closed cell structure gives the foam great rigidity and makes it highly resistant to compression
- **low water absorption** - STYROFOAM™ has natural resistance to rain, snow, frost and water vapour which makes it an exceptionally stable material, which retains its initial insulation performance and physical integrity in exposed conditions over the very long term.
- **user-friendliness** - STYROFOAM™ is easily worked with normal hand tools
- **hygiene** - STYROFOAM™ boards have low susceptibility to rot, meaning mould or fungal growth is minimised. They are clean, odourless and free from irritating dust.

It was this unusual property that made the inverted warm flat roof concept possible, an idea pioneered by Dow

Developing your STYROFOAM Solution

Each construction project has its own unique combination of insulation requirements, and developing an insulation project specification can be a time consuming process. However, the designer now has available a range of options in the form of STYROFOAM™ Solutions, as well guidance for using STYROFOAM™ to maximum effect in a wide selection of typical application areas.

You will find each STYROFOAM™ Solution detailed in a series of guides available from Dow Building Solutions. These can be found on our website at www.styrofoam.co.uk, by calling 020 3139 4190 or by emailing dbsuk@dow.com.

Authority

STYROFOAM™ is manufactured under the BS EN ISO 9001: 2008 Quality Management System (BSI certificate Q05968). Dow also operates an Environmental Management System which has accomplished ISO 14001:2004 (BSI Certificate EMS 547690).

STYROFOAM™ products comply with BS EN 13164: 2012 Thermal insulation products for buildings - factory made products of extruded polystyrene (XPS) - specification.

Meeting environmental standards

Concern about ozone depletion in the stratosphere has led to international agreements to phase out the use of ozone depleting chemicals. All STYROFOAM™ products are hydrochlorofluorocarbon (HCFC) free and comply with the requirements of EC Regulation No 2037/2000 (1 October 2000) on substances which deplete the ozone layer.

STYROFOAM™-A products use carbon dioxide as the main blowing agent - the Ozone Depletion Potential (ODP) is zero and the Global Warming Potential (GWP) is less than five.

Characteristics and performance

Surface characteristics

Dow STYROFOAM™ boards are blue. All boards have a smooth homogeneous skin on both sides with the exception of XENERGY™ LG and PERIMATE™ DI-A.

Structural

STYROFOAM™ boards are available in a range of compressive strengths to suit different load bearing requirements.

Fire

Information on aspects of fire performance of extruded polystyrene in building applications is given in BS 6203: 2003, 'Guide to fire characteristics and fire performance of expanded polystyrene materials (EPS and XPS) used in building applications'.

STYROFOAM™ products contain a flame retardant additive to inhibit accidental ignition from a small fire source.

STYROFOAM™ is, however, combustible and if exposed to an intensive fire may burn rapidly. During shipment, storage, installation and use STYROFOAM™ products should not be exposed to flames or other ignition sources.

Fire classification is based on small scale tests, which may not reflect the reaction of the product in its end use state under actual fire conditions.

STYROFOAM™ products should, when installed, be adequately protected from direct exposure to fire.

STYROFOAM™ products achieve Euroclass E (reaction to fire).

Temperature

Polystyrene products will melt when brought into direct contact with high temperature heat sources: for STYROFOAM™ boards the recommended maximum continuous working temperature is 75°C.

Water/moisture

STYROFOAM™ is:

- highly resistant to water absorption
- very resistant to the passage of water vapour
- highly resistant to repeated freeze/thaw cycles.

Biological

STYROFOAM™ has a low susceptibility to rot, and mould or fungal growth is therefore minimised.

Chemical

STYROFOAM™ boards are compatible with most commonly occurring construction materials such as lime, cement, plaster, anhydrous gypsum, solvent-free bituminous compounds, water-based wood preservatives, as well as alcohols, acids and alkalis.

Certain organic materials such as solvent-based wood preservatives, coal tar and derivatives (creosote), paint thinners and common solvents (e.g. acetone, ethyl acetate, petrol, toluene and white spirit) will attack STYROFOAM™, resulting in softening, shrinkage and possible dissolution, with a consequent loss of performance.

The use of solvent-free adhesives is advised.

Compatibility with STYROFOAM™ should be checked with the adhesive suppliers.

Sunlight

Protect STYROFOAM™ from prolonged exposure to sunlight to prevent degradation of the surface of the board.

Durability

Properly installed, STYROFOAM™ boards have a service life comparable with that of the building or structure.

Environmental

STYROFOAM™ is non bio-degradable and does not present an environmental hazard.

Disposal

Where circumstances allow STYROFOAM™ can be:

- recycled
- disposed of as landfill
- incinerated to recover the energy content.

Product overview

Table 1: Common properties of STYROFOAM™ products

Properties	Standard	Unit	Value
Specific heat	—	kJ/kgK	1.4
Coefficient of linear thermal expansion	BS 4370: Part 3: 1988:Method 13	mm/mK	0.07
Working temperature range	—	°C	-50 to +75
Fire classification: reaction to fire	BS EN 13164 + BS EN 13501: Euroclass E		

FLOORMATE™-A

FLOORMATE™-A is the STYROFOAM™ Solution for insulating floors, and is currently available in three grades, FLOORMATE™ 300-A, 500-A and 700-A. FLOORMATE™-A insulation is available in a range of compressive strengths to match the loading requirements of individual projects.

FLOORMATE™-A insulation can be installed under or over the slab in ground bearing concrete floors and is suitable for use with suspended beam and block and timber floors.

PERIMATE™ DI-A

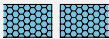



PERIMATE™ DI-A is the STYROFOAM™ Solution for insulating structures below ground. PERIMATE™ DI-A boards have vertical channels cut into one face, to drain water away, with a filter fabric bonded to the face to prevent soil particles blocking the channels.

Product data tables

Declared thermal resistance (RD) - m².K/W

Thickness mm	FLOORMATE™ 300-A	FLOORMATE™ 500-A	FLOORMATE™ 700-A	PERIMATE™ DI-A
50	1.50	1.45	1.45	—
75	2.20	2.15	—	—
80	—	—	—	—
100	2.95	—	2.85	2.95
120	—	—	—	—
125	3.65*	—	—	—

* Made to order

Properties	Standard	Unit	CE Code	FLOORMATE™			PERIMATE™
				300-A	500-A	700-A	DI-A
Thermal conductivity* ≤ 70mm	BS EN 12667	W/mK	λ_D	0.033	0.034	0.034	–
71-80mm	BS EN 12667	W/mK	λ_D	0.033	0.035	–	–
81-100mm	BS EN 12667	W/mK	λ_D	0.034	–	0.035	0.034
101-120mm	BS EN 12667	W/mK	λ_D	0.034	–	–	–
≥ 121mm	BS EN 12667	W/mK	λ_D	0.036	–	–	–
Compressive strength or compressive stress at 10% deformation (90 days)	BS EN 826	kPa	CS(10/Y)	300	500	700	300
Compressive creep (design load) max 2% deflection after 50 years	BS EN 1606	kPa	CC (2/1.5/50) σ_c	130	180	250	–
Water vapour diffusion resistance factor	BS EN 12086 EN ISO 10456	–	MU	80-200	80-200	80-200	80-200
Water absorption Total immersion	BS EN 12087	Vol-%	WL(T)	≤0.7	≤0.7	≤0.7	≤0.7
Diffusion ≥ 50mm < 80mm	BS EN 12088	Vol-%	WD(V)	–	≤2	≤2	–
≥ 80mm	BS EN 12088	Vol-%	WD(V)	–	≤1	≤1	≤1
Freeze/thaw, after 300 cycles	BS EN 12091	Vol-%	FTCD	–	≤1	≤1	≤2
Deformation under load and temperature 168 hrs at 40kPa/70°C	BS EN 1605	%	DLT(2)5	≤5	≤5	≤5	–
Density (aim, foam only)	BS EN 1602	kg/m ³	–	33	38	42	33
Dimensions Length	BS EN 822	mm	–	2500	1250	1250	1250
Width	BS EN 822	mm	–	600	600	600	600
Thickness	BS EN 823	mm	T	50, 75, 100, 125	50, 75	50, 100	100
Fire classification Reaction to fire	BS EN 13164 BS EN 13501	–	Euroclass	E	E	E	E
Appearance Surface	–	–	–	skin	skin	skin	grooved face & geotextile
Edge profile	–	–	–	butt edge 	shiplap 	shiplap 	shiplap 
Application	–	–	–	Floors - domestic and medium load bearing	Floors - high loadbearing	Floors - very high load bearing	Basement walls external

The properties given are typical (unless stated otherwise)
* declared 90/90 value - BS EN 13164

Useful references

Building regulations

- Structure part A
- Conservation of fuel and power (new dwellings) part L1A
- Fire safety - volume 1 dwelling houses part B
- Fire safety - volume 2 buildings other than dwelling houses part B
- Site preparation and resistance to moisture part C
- Conservation of fuel and power (existing dwellings) part L1B
- Conservation of fuel and power (new buildings other than dwellings) part L2A
- Conservation of fuel and power (existing buildings other than dwellings) part L2B
- Approved document - basements for dwellings
- Technical Handbooks to Building Standards Scotland Regulations.

BRE publications

- Thermal insulation: avoiding risks BR 262:2002
- Conventions for U-value calculations
 - B. Anderson BR443: 2006
- BRE 460: 2003. Building Elements: 'Floors and Flooring'
- Foundations, basements and external walls BR 440: 2002
- BRE Digest 295: Stability under wind load of looselaid external roof insulation boards
- BRE Digest 311. Wind scour of gravel ballast on roofs
- BRE IP 1/06. Assessing the effects of thermal bridging at junctions and around openings.

British Standards

- BS 476-10: 2009: Fire tests on building materials and structures. Guide to the principles, selection, role and application of fire testing and their outputs
- BS 476-21: 1987: Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction
- BS 476-3: 2004: Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs
- BS 5250: 2011: Code of practice for control of condensation in buildings.
- BS EN 1995-1-1:2004+A1:2008. Design of timber structures. General. Common rules and rules for buildings
 - Part 4: Fire resistance of timber structures.
 - Section 4.2: 2004: Recommendations for calculating fire resistance of timber stud walls and joisted floor constructions.
 - Part 7: Recommendations for the calculation basis for span tables.
 - Section 7.1: 2004: Domestic floor joists.
- BS 6203: 2003 Guide to fire characteristics and fire performance of expanded polystyrene materials used in building applications
- BS 6229: 2003 Code of practice for flat roofs with continuously supported coverings
- BSEN 1991-1-1: 2005: Eurocode 1. Actions on structures. General actions. Densities, self-weight, imposed loads for buildings

- Part 1: 2005: Code of practice for dead and imposed loads.
- Part 2: 2005: Code of practice for wind loads.
- Part 3: 2005: Code of practice for imposed roof loads.
- BS 8000: Workmanship on building sites
- Part 4: 1989: Code of practice for waterproofing.
 - BS 8102: 2009: Code of practice for protection of below ground structures against water from the ground
 - BS 8103-1:2011 Structural Design of low-rise buildings
 - Part 1: 2011: Code of practice for stability, site investigation, foundations and ground floor slabs for housing.
 - BS EN 1992-1-1:2004: Eurocode 2: Design of concrete structures. General rules and rules for buildings
 - Part 1: 1997: Code of practice for design and construction.
 - BS 8201:2011 Code of practice for flooring of timber, timber products and wood based panel products
 - BS 8204-1: 2003+A1: 2009: Screeds, bases and in situ floorings. Concrete bases and cementitious levelling screeds to receive floorings. Code of practice
 - BS 8218: 1998: Code of practice for mastic asphalt roofing

European standards

- BS EN 12056-3: 2000: Gravity drainage systems inside buildings. Roof drainage, layout and calculation
- BS EN 13164: 2012: Thermal insulation products for buildings. Factory made products of extruded polystyrene foam (XPS). Specification
- BS EN 13501-1:2007+A1: 2009: Fire classification of construction products and building elements. Classification using test data from reaction to fire tests
 - Part 1: Classification using test data from reaction to fire tests
- BS EN ISO 13370:2007: Thermal performance of buildings. Heat transfer via the ground. Calculation methods
- BS EN 13788: 2012 Hygrothermal performance of building components and building elements
 - Internal surface temperature to avoid critical surface humidity and interstitial condensation
 - Calculation methods.
- BS EN ISO 13789: 2007: Thermal performance of buildings. Transmission and ventilation heat transfer coefficients. Calculation method

International standards

- BS EN ISO 6946: 2007: Building components and building elements. Thermal resistance and thermal transmittance. Calculation method

Other publications

- CIBSE Guide A (2006)
- DEFRA/DTLR Robust Details - Limiting thermal bridging and air leakage: Robust Construction details for dwellings and similar buildings. 2002
- BBA information bulletin 4 2012
- European organisation for technical approvals ETAG 031

Recommendations

XENERGY™ products contain a flame retardant additive to inhibit accidental ignition from a small fire source. XENERGY™ is however, combustible and if exposed to an intensive fire may burn rapidly.

During shipment, storage, installation and use XENERGY™ products should not be exposed to flames or other ignition sources.

Fire classification is based on small scale tests, which may not reflect the reaction of the products in its end use state under actual fire conditions. XENERGY™ products should, when installed, be adequately protected from direct exposure to fire.

Recommendations about the methods, use of materials and construction details are given as a service to designers and contractors. These are based on the experience of Dow with the use of XENERGY™ products. Any drawings offered by Dow are meant only to illustrate various possible applications and should not be taken as a basis for design.

Since Dow is a materials supplier and exercises no control over the installation of XENERGY™ products, no responsibility is accepted for such drawings and recommendations.

In particular, no responsibility is accepted by Dow for the systems in which XENERGY™ products are used or the method of application by which they are installed. The legal obligations of Dow in respect of any sale of XENERGY™ products shall be determined solely by the terms of the respective sales contract.

Visit www.dowxenergy.co.uk for further information on XENERGY™ SL insulation products as well as adhesives and sealants from Dow Building Solutions. For technical enquiries email FKLTECH@dow.com.

Dow Chemical Company Limited

Diamond House, Lotus Park
Kingsbury Crescent, Staines,
TW18 3AG
Tel.: 020 3139 4000

www.styrofoam.co.uk
www.dowxenergy.co.uk

Note: The information and data contained in this brochure do not represent exact sales specifications. The features of the products mentioned may vary. The information contained in this document has been provided in good faith, however Dow excludes as far as possible any liability relating to it and does not give any guarantee or assurance of product performance. It is the purchaser's responsibility to determine whether these Dow products are suitable for the application desired and to ensure that the site of work and method of application conform with current legislation. No licence is hereby granted for the use of patents or other industrial or intellectual property rights. If Dow products are purchased, we advise following the most up-to-date suggestions and recommendations.