

## Jabtherm Classic on a Flat Roof



Table 1

Thickness	U-value					
	0.25 W/m²K	0.27 W/m²K	0.28 W/m²K	0.29 W/m²K	0.30 W/m²K	0.31 W/m²K
100	0.18	0.19	0.20	0.21	0.22	0.23
150	0.17	0.18	0.19	0.20	0.21	0.22
200	0.16	0.17	0.18	0.19	0.20	0.21
250	0.15	0.16	0.17	0.18	0.19	0.20
300	0.14	0.15	0.16	0.17	0.18	0.19
350	0.13	0.14	0.15	0.16	0.17	0.18
400	0.12	0.13	0.14	0.15	0.16	0.17
450	0.11	0.12	0.13	0.14	0.15	0.16
500	0.10	0.11	0.12	0.13	0.14	0.15

# APPLICATION:

## Roof insulation – flat roofs

### Product: Jabtherm

**Jabtherm is designed for use in warm-deck flat-roof constructions using high-performance built-up felt or mastic-asphalt weatherproofing. It can be used to meet the relevant Building Regulations' insulation requirements for flat roofs in both domestic and non-domestic buildings.**

#### Jabtherm

Jabtherm consists of Jablite EPS, in tapered or uniform thickness, with a factory-bonded layer of roofing felt on one or both faces creating a 100mm seldge on one side each of the length and width of the top face. Jabtherm is suitable for use with all types of flat-roof constructions.

#### Easy to handle

Jabtherm is manufactured from expanded polystyrene (EPS), which is lightweight and easy to handle on site.

#### Permanent

Jabtherm is rot-proof and durable will remain effective for the life of the building.

#### Versatile

Jabtherm is intended for use with standard built-up felt roofing using either oxidised, SBS-modified or APP-modified high-performance capping sheets or systems, EPDM, liquid applied membranes or mastic asphalt in conjunction with a suitable overlay board. It is suitable for all types of new and existing flat roofs, with decks of concrete, profiled metal, woodwool or timber.

#### Environment

Expanded polystyrene has been awarded an A+ rating by the BRE's Green Guide to Specification.

#### Drainage

Jabtherm is available to order for 'cut-to-falls' schemes. Free surveys and technical advice are available.

#### Type

Jabtherm is supplied as EPS 100 or EPS 150 as defined in BS EN 13163 – Reaction to Fire Class E, containing a flame-retardant additive.

EPS 100 material should be selected for use on roofs which will be subject to 'maintenance' traffic only.

EPS 150 material should be used for roofs which will be subject to a high level of traffic, for example, balconies, terraces, etc. Additional grades of material are available for applications subject to higher loads; further information is available from Vencel Resil's technical services department.

#### Approvals

Jabtherm has been assessed and approved by the British Board of Agrément for use with both built-up felt and mastic asphalt finishes: Certificate number 01/3812.

#### Dimensions

##### Uniform thickness boards:

1200 x 900mm.

##### Tapered and 'cut-to-falls' boards:

1200 x 900mm and 600 x 900mm.

**Thickness:** 20mm up to 600mm in a single layer in 5mm increments.

An additional layer of material will be required for thicknesses above 600mm. The felt seldge overlaps the top of the board by 100mm on one side of the length and width.

#### Finish

Jabtherm is supplied with a factory-bonded felt overlay to one or both faces; where the board is laminated on both sides the felt overlay with 100mm seldge is applied to the flat top face. (See Table 31.5).

#### Variations

Table 31.5 shows the range of Jabtherm products available and lists suitable weatherproofing systems. All products are available in uniform or tapered thickness.

#### Fire

When properly installed, the polystyrene insulation is fully protected by the structural elements of the roof and the weatherproofing membrane and will have no adverse effect on either the fire resistance or the external fire exposure rating of the completed roof construction.

#### U-values

Approved documents L1A and L2B will recommend the required U-value for a flat roof. Tables 31.1 – 31.4 illustrate thicknesses of Jabtherm required to achieve various U-values when used on decks of concrete, profiled metal, woodwool, or timber with a plasterboard ceiling finish. The calculations are based on a single capping sheet and mastic asphalt finishes and either EPS 100 with a k-value of 0.036W/mK for the insulation or EPS 150 with a k-value of 0.035W/mK for the insulation.

# Roof insulation – flat roofs

Table 31.1

## Jabtherm Type 100E

U value required (W/m <sup>2</sup> K)	Timber deck	Concrete deck	Metal deck	Woodwool deck
	Thickness in mm			
0.30	100	110	105	85
0.25	125	135	130	110
0.22	145	155	150	130
0.20	160	170	165	145
0.18	180	190	185	165
0.15	215	225	220	200
0.10	325	335	330	310

Table 31.2

## Jabtherm Type 150E

U value required (W/m <sup>2</sup> K)	Timber deck	Concrete deck	Metal deck	Woodwool deck
	Thickness in mm			
0.30	100	110	105	85
0.25	125	130	125	105
0.22	140	150	145	125
0.20	155	165	160	145
0.18	175	185	180	160
0.15	195	220	215	195
0.10	320	325	325	305

### Constructions:

#### Timber deck

12.5mm plasterboard, joist void, 18mm plywood deck, vapour-control layer, Jabtherm, felt membrane

#### Concrete deck

150mm concrete deck, vapour-control layer, Jabtherm, felt membrane

#### Metal deck

12.5mm plasterboard, ceiling void, profile metal deck, vapour-control layer, Jabtherm, felt membrane

#### Woodwool deck

12.5mm plasterboard, ceiling void, 50mm woodwool deck, vapour-control layer, Jabtherm, felt membrane

Table 31.3

## Jabtherm Plus Type 100

U value required (W/m <sup>2</sup> K)	Timber deck	Concrete deck	Metal deck	Woodwool deck
	Thickness in mm			
0.30	85	95	90	70
0.25	110	115	110	95
0.22	130	135	130	115
0.20	145	150	145	130
0.18	165	170	165	150
0.15	200	210	205	185
0.10	310	320	315	295

Table 31.4

## Jabtherm Plus Type 150

U value required (W/m <sup>2</sup> K)	Timber deck	Concrete deck	Metal deck	Woodwool deck
	Thickness in mm			
0.30	85	90	85	70
0.25	105	115	110	90
0.22	125	130	130	110
0.20	140	145	145	125
0.18	160	165	160	145
0.15	195	200	200	180
0.10	305	310	305	290

### Constructions:

#### Timber deck

12.5mm plasterboard, joist void, 18mm plywood deck, vapour-control layer, Jabtherm 3B plus, 20mm perlite, 20mm asphalt

#### Concrete deck

150mm concrete deck, vapour-control layer, Jabtherm 3B plus, 20mm perlite, 20mm asphalt

#### Metal deck

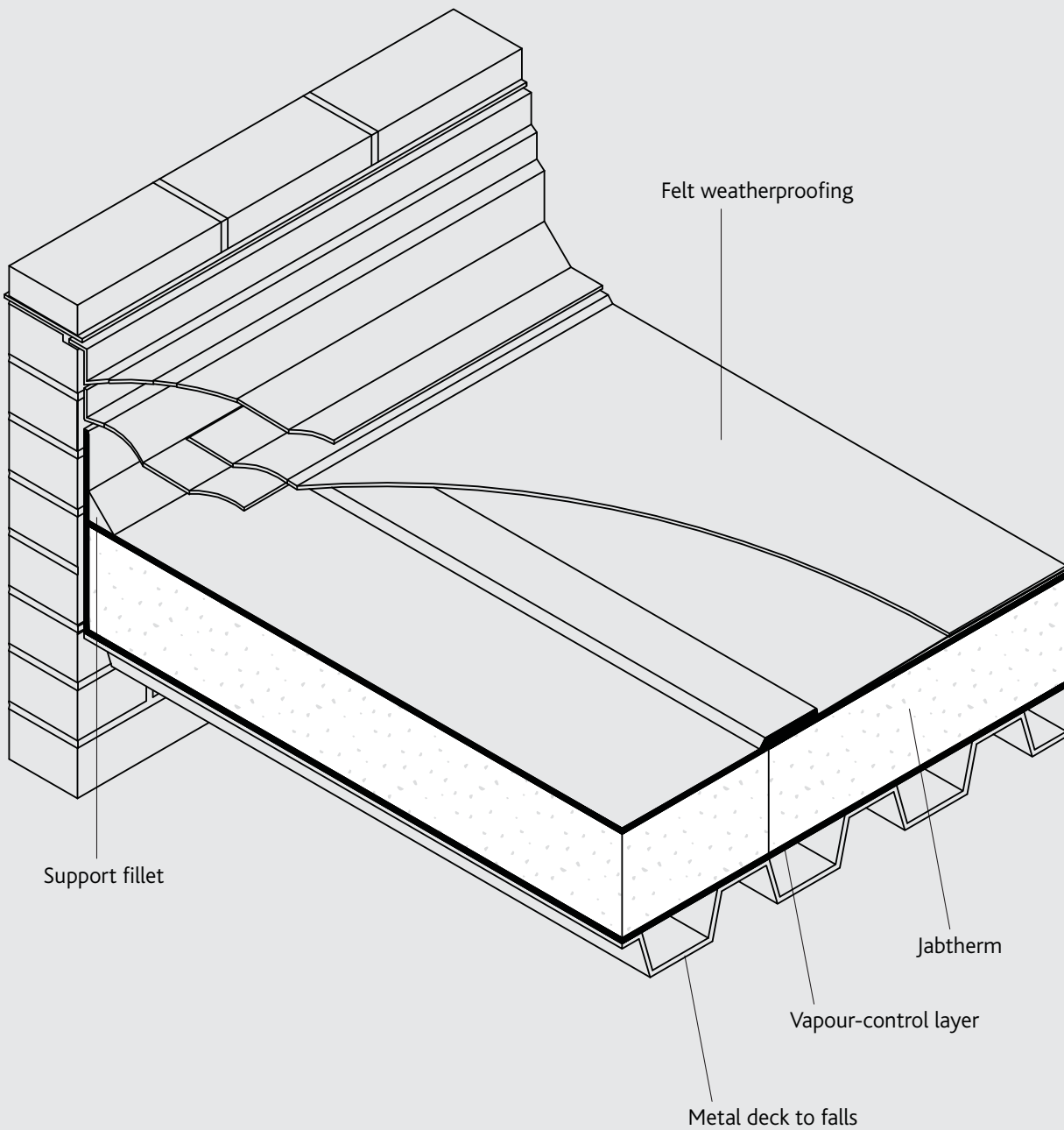
12.5mm plasterboard, ceiling void, profile metal deck, vapour-control layer, Jabtherm 3B plus, 20mm perlite, 20mm asphalt

#### Woodwool deck

12.5mm plasterboard, ceiling void, 50mm woodwool deck, vapour-control layer, Jabtherm 3B plus, 20mm perlite, 20mm asphalt

# APPLICATION: Roof insulation – flat roofs

Figure 31.1



NOTE: Jabtherm comprises Jablite EPS with a factory-bonded layer of roofing felt.  
Vapour-control layer minimum Type 3B felt (BS747) or Type 1F felt (BS747) if laid on a profiled metal deck.

# Roof insulation – flat roofs

## INSTALLATION

### Selection of thickness

The thickness of Jabtherm should be selected to provide the required U-value. In the case of profiled metal deck roofs, the minimum thickness will be governed by the width of the trough; further information is available from Vencel Resil's technical services department.

### Preparation

The roof deck must be level and even, and any deck joints should be taped. If necessary, an in-situ levelling screed should be applied to concrete decks which have a tamped finish, or which are constructed from precast planks. For refurbishment work, the existing weatherproofing should be stripped back to the structure, and any defects should be made good before proceeding. Where it is not practical to strip the existing finish without damaging the decking, it is acceptable to remove any loose chippings and to cut and seal any surface blisters to provide a sound surface. This surface may be used as the vapour-control layer. Where necessary, the roof deck should be primed to ensure satisfactory adhesion.

### Vapour control

By virtue of the felt facing, Jabtherm provides significant resistance to the passage of water vapour, but it should not be considered as a vapour-control layer. An appropriate vapour-control layer should be incorporated in the construction below the Jabtherm: subject to the chosen membrane and the specified installation method, this layer may be loose-laid or bonded. BS 8217 recommends a minimum Type 3B roofing felt (to BS 747), either fully or partially-bonded to the decking; if the decking is of profiled metal, the felt should be a minimum Type 1F. Alternatively, a high-performance vapour-control layer can be used as recommended by the manufacturer of the membrane. The vapour-control layer should be turned up to the full thickness of the Jabtherm boards at all perimeters and upstands.

Table 31.5

Jabtherm product	Felt type	Suitable weatherproofing systems
Jabtherm 3B	Type 3B, one side	High-performance felts as specified, on an overlay of bitumen-impregnated fibreboard, cork or perlite. Single-ply membranes designed for use over bitumen felt.
Jabtherm HP	SBS, one side	High-performance single- or double-layer felt, applied by pour-and-roll techniques. Single-ply membranes designed for use over bitumen felt.
Jabtherm HP Torch	SBS, one side	High-performance single- or double-layer felt, applied by torch-on techniques.
Jabtherm Plus	Type 3B, both sides	Mastic asphalt applied on a sheathing felt laid over cork or perlite roofboards

# APPLICATION:

## Roof insulation – flat roofs

### Jabtherm

The boards are laid with the felt surface uppermost, and should be bonded by mopping a coat of hot bitumen to the vapour-control layer. Bitumen should be applied to cover the area of one board at a time. The hot bitumen should not be allowed to 'pool' under the Jabtherm boards since this can result in damage to the underside of the insulation. For Jabtherm Plus, the boards should be laid with the felt selvedge surface uppermost.

Alternatively, Jabtherm can be bonded using cold-applied stripbonding bitumen adhesive or similar; further information is available from Vencel Resil's technical services department. The boards should be laid with their edges tightly-butted together, and with the joints staggered. For tapered 'cut-to-falls' projects, the boards should be installed in accordance with the Vencel Resil layout guide provided. The joints should be sealed by bonding the felt overlap at the sides and end. As well as providing an immediately weatherproof surface, this helps to prevent the ingress of hot bitumen when bonding the cap sheet. If the roof finish is of mastic asphalt, the Jabtherm Plus boards should be set back from any upstand by 50mm. In accordance with the recommendations of the Mastic Asphalt Council (MAC), a rigid infill consisting of a mix of earth/damp-sand/cement, or other suitable proprietary infill product should be used to fill the gap, and to provide a rigid support for the mastic-asphalt angle fillet.

(See figure 31.2).

### Weatherproofing: Jabtherm 3B

Jabtherm 3B provides a suitable base for fully-bonded, built-up felt roofing systems. It should be used with an overlay of bitumen-impregnated fibreboard, or cork or perlite insulation board, with a minimum thickness of 13mm: this acts as a barrier to heat generated by the hot bitumen when the weatherproofing is being laid. The overlay material should be bonded to the pre-felted surface of the Jabtherm 3B by either cold-applied adhesives or mopping a coat of hot bitumen on the surface of the overlay. The upstand of the vapour-control membrane should be bonded to the top of the overlay material. In all cases, the capping sheet must be applied in accordance with the manufacturer's instructions.

### Weatherproofing: Jabtherm HP and HP Torch

Jabtherm HP and HP Torch provide the first layer of a fullybonded, high-performance weathering system. Subsequent application of a high-performance capping sheet, by either cold-applied adhesive, pour-and-roll (Jabtherm HP) or torch-on techniques (Jabtherm HP Torch) should be in accordance with the manufacturer's instructions. During installation, the felt surface of the Jabtherm HP and HP Torch acts as an insulator, protecting the EPS from the hot bitumen or the torch flame.

### Weatherproofing: Jabtherm Plus

Jabtherm Plus provides a suitable base for the application of mastic asphalt weatherproofing. A cork or perlite overlay board, of minimum thickness 20mm, should be bonded to the pre-felted surface of the Jabtherm Plus boards by mopping a coat of hot bitumen on the surface of the overlay. The overlay board should be set back from all upstands by 25mm.

A Type 4A(i) sheathing felt, to BS 747, should be loose-laid on the overlay board, and covered with a minimum 20mm mastic-asphalt weatherproofing in accordance with BS 8218 Code of practice for asphalt roofing.

### Protection from heat

Containers of hot bitumen should not be placed directly on the pre-felted surface of Jabtherm.

## Roof insulation – flat roofs

Figure 31.2  
Jabtherm Plus "cut-to-falls" on concrete deck

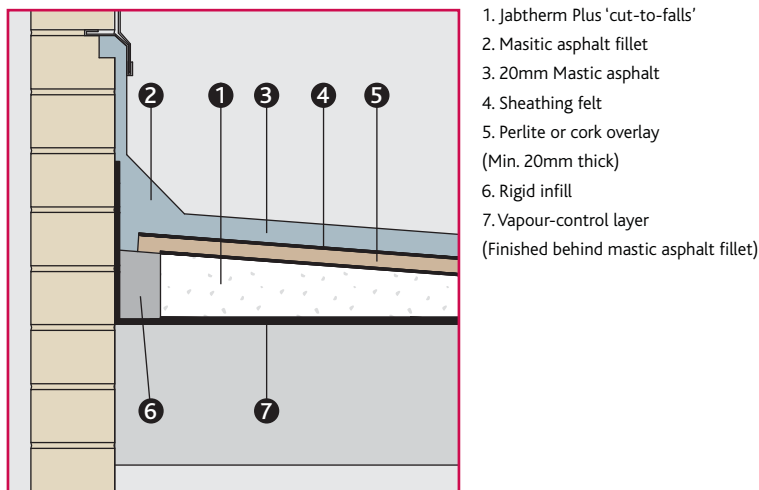
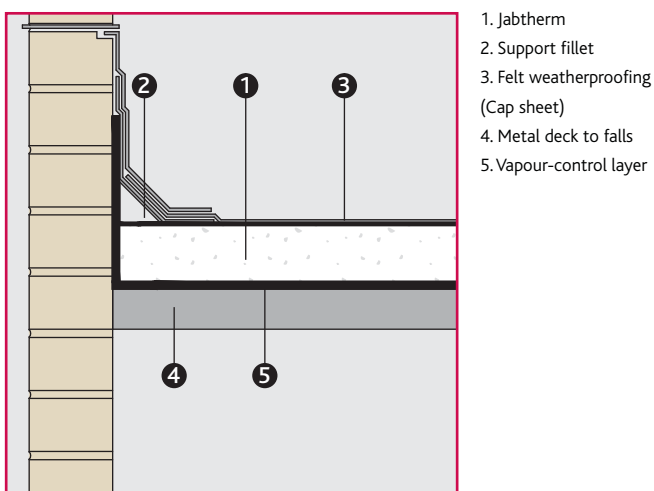


Figure 31.3  
Jabtherm on metal deck to falls



### References

- BS 747 Specification for roofing felts.
- BS 8217 Code of practice for built-up felt roofing.
- BS 8218 Code of practice for asphalt roofing.
- BS EN 13163 Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – Specification.

# Jablite

## Expanded Polystyrene (EPS) Technical Information

Jablite EPS is a lightweight cellular plastic material suitable for a wide range of building-insulation applications. It is an excellent insulating medium which exhibits consistent thermal performance over the range of temperatures normally encountered in buildings.

The material is versatile, light in weight, clean and easy to handle, and provides a cost-effective means of including permanent insulation in floors, walls and roofs to meet, and exceed, the standards laid down in the Building Regulations.

### Technical Description

#### Composition

Jablite insulation products are manufactured from EPS. The material comprises expandable beads of polystyrene pre-foamed and fused together in a steam-heated mould under pressure. This produces a block of material, up to 7314mm long, which is then cut to and/or shape. After cutting to size, the material may be faced or laminated with other materials to suit its application. Alternatively, the beads may be moulded into a finished, shaped section which requires no further processing.

#### Material Type

The following types of material are available, as defined in BS EN 13163: EPS 70, EPS 100, EPS 150, EPS 200, EPS 250.

In addition, each type is available as either Euroclass F, or Euroclass E containing a flame-retardant additive.

Additional types are also available for specific applications; for example, types with compressive-stress values, at 10%, of 400 and 500kPa.

#### Shape and size

After moulding, the 'block' material is cut to size, thickness and taper, if required, according to the intended end use; see individual product and application data.

Typical properties of Jablite					
Jablite Type	EPS 70	EPS 100	EPS 150	EPS 200	EPS 250
<b>Mechanical Properties</b>					
Compressive strength @ 10% compression (kPa)	70	100	150	200	250
Compressive strength @ 1% nominal strain (kPa)	20	45	70	90	100
Bending strength (kPa)	115	150	200	250	350
<b>Moisture Properties</b>					
Water vapour diffusion resistance factor $\mu$	20-40	30-70	30-70	40-100	40-100
Water vapour permeability $\delta$ mg/(Pa.h.m)	0.018-0.036	0.010-0.024	0.010-0.024	0.007-0.018	0.007-0.018
Vapour resistivity (MNs/gm)	145	200	238	238	238
<b>Thermal Properties</b>					
Thermal conductivity (W/mK, at 10°C)	0.038	0.036	0.035	0.034	0.034
Thermal resistivity (mK/W)	26.32	27.78	28.57	29.41	29.41

## Technical Description (continued)

### Tolerances

In accordance with BS EN 13163 tolerances on the cut dimensions are defined as follows:

**Length:**  $\pm 3\text{mm}$  or  $\pm 0.6\%$  whichever is greater (L1)

**Width:**  $\pm 3\text{mm}$  or  $\pm 0.6\%$  whichever is greater (W1)

**Thickness:**  $\pm 2\text{mm}$  (T1)

**Squareness:**  $\pm 5\text{mm}$  per 1000mm (S1)

Alternative tolerances can be provided for specific applications.

### Dimensional stability

In accordance with BS EN 13163 = DS(N)5  $\pm 0.5\%$  under constant laboratory conditions.

### Density

The density range is 15-35kg/m<sup>3</sup> for EPS types shown below.

### Nominal Densities

EPS 70	15kg/m <sup>3</sup>
EPS 100	20kg/m <sup>3</sup>
EPS 150	25kg/m <sup>3</sup>
EPS 200	30kg/m <sup>3</sup>
EPS 250	35kg/m <sup>3</sup>

### Standards

Where relevant, Jablite products are produced to the requirements of BS EN 13163 'Thermal insulation products for buildings – Factory made products of expanded polystyrene (EPS) – specification'.

Vencel Resil Limited has been assessed and approved to BS EN ISO 9001:2000 'Quality systems; for quality assurance in production, installation and servicing'.

## Properties & Performance

(Please refer to the table on the previous page)

### Mechanical properties

Jablite EPS has a high strength to weight ratio.

### Tensile strength

Ranges from 20-400kPa, according to type and product.

### Compressive strength

Ranges from 70-250kPa, according to type and product; method of test, BS EN 826.

### Bending strength

Ranges from 115-350kPa, according to grade and product; method of test BS 4370:Part 1, method 4.

### Design load

Ranges from 20-100kPa for 1% nominal strain, according to type and product; method of test EN 826.

## Moisture Properties

Although Jablite has significant resistance to the passage of water vapour, it should not be regarded as a damp-proof membrane or vapour-control layer, and will not provide a barrier against damp penetration.

A suitable damp-proof membrane or vapour-control layer will be required in most forms of construction: see individual product and application data.

## Fire Properties

In common with all organic materials, EPS is combustible. However, provided it is specified and installed correctly and in accordance with the manufacturer's instructions and BS 6203, it will not present any undue fire hazard. The standard recommends that for all applications, the material should be protected by either a laminated facing layer, or should be protected by being fully enclosed by the form of construction. Euroclass E 'flame-retardant' additive material is available for most applications: this reduces the rate of flame spread but should not be considered as offering enhanced fire performance.

### Combustion

EPS is 'combustible' as defined in BS 476:Part 4.

When burning, EPS behaves like other hydrocarbons such as wood and paper. For Euroclass F material, the products of uncontrolled combustion are carbon monoxide, carbon dioxide, styrene, and water vapour; the decomposing styrene will give off a certain amount of dense black soot. Euroclass E material also emits hydrogen bromide when burning.

### Ignition temperature

Flash ignition temperature is between 350 and 490°C depending on the application and the exact circumstances of use.

Under certain circumstances the material can be readily ignited by a naked flame but providing it is correctly installed, this does not present any disadvantage in use.

### Calorific value

40MJ/kg.

### Specific heat capacity

1.13kJ/kg°C.

### Surface spread of flame

Unfaced material, regardless of type, should not be exposed when installed in habitable areas.

# Jablite

## Expanded Polystyrene (EPS) Technical Information

### Biological Properties

EPS will not sustain mould growth, and has no nutrient value to insects or vermin.

The material is non-biodegradable and care should be taken to dispose of waste and offcuts at a licensed waste site.

### Thermal Properties

#### Thermal movement

Coefficient of linear expansion,  $0.6 \times 10^{-6}/^{\circ}\text{C}$ .

The material is sufficiently resilient and flexible that no allowance need be made for thermal expansion in the method of installation.

Jablite EPS is suitable for meeting, and in many cases exceeding, the thermal insulation requirements set out in the Building Regulations Approved Documents:

#### L1A

Conservation of fuel and power in new dwellings.

#### L1B

Conservation of fuel and power in existing dwellings.

#### L2A

Conservation of fuel and power in new buildings other than dwellings.

#### L2B

Conservation of fuel and power in existing buildings other than dwellings.

Reference can be made to individual products sections to obtain specific details on meeting thermal values with Jablite products.

### Working temperature range

EPS can be used within the temperature range  $-150^{\circ}\text{C}$  to  $+80^{\circ}\text{C}$ .

Jablite EPS is unaffected by the normal range of climatic temperatures and can be safely used in cold stores and similar applications.

During installation, and in service, contact with hot-water pipes or other surfaces where the temperature is likely to exceed  $80^{\circ}\text{C}$  for continuous periods should be avoided.

A minimum 12mm air gap should be maintained between the insulation and hot-water pipes, or they should be lagged.

In roofing applications, care should be taken that hot bitumen is not allowed to 'pool' under the insulation during installation since this can result in burning of the underside.

### Compatibility with other materials

EPS is soluble in aromatic, halogenated solvents and ketones; it should be protected from contact with hydrocarbons and strong solvents using a suitable membrane.

The material is unaffected by contact with solvent-free bitumen providing that, where necessary, the precautions set out above regarding temperature are observed.

EPS should not be permitted to come into contact with PVC-sheathed electrical cables since this will lead to migration of plasticiser from the PVC resulting in embrittlement of the cable sheath. Cables should be protected by the use of a physical barrier, for example by being enclosed in a conduit or by an air gap.

### Service Life

Providing it is correctly installed and protected, Jablite will remain effective for the life of the building.

### Storage

Store Jablite boards under cover, protected from high winds and out and out of direct sunlight. Care should be taken in storage not to bring the boards into contact with highly flammable materials such as paint, solvent or petroleum products. Smoking should be prohibited in the storage area and the products must not be exposed to flame or other ignition source.

# Floors | Walls | Roofs

Table 2.1

U-value	U-values					
	0.25 W/m <sup>2</sup> K	0.22 W/m <sup>2</sup> K	0.20 W/m <sup>2</sup> K	0.18 W/m <sup>2</sup> K	0.15 W/m <sup>2</sup> K	0.10 W/m <sup>2</sup> K
0.00	00	00	00	00	00	00
0.01	01	01	01	01	01	01
0.02	02	02	02	02	02	02
0.03	03	03	03	03	03	03
0.04	04	04	04	04	04	04
0.05	05	05	05	05	05	05
0.06	06	06	06	06	06	06
0.07	07	07	07	07	07	07
0.08	08	08	08	08	08	08
0.09	09	09	09	09	09	09
0.10	10	10	10	10	10	10
0.11	11	11	11	11	11	11
0.12	12	12	12	12	12	12
0.13	13	13	13	13	13	13
0.14	14	14	14	14	14	14
0.15	15	15	15	15	15	15
0.16	16	16	16	16	16	16
0.17	17	17	17	17	17	17
0.18	18	18	18	18	18	18
0.19	19	19	19	19	19	19
0.20	20	20	20	20	20	20
0.21	21	21	21	21	21	21
0.22	22	22	22	22	22	22
0.23	23	23	23	23	23	23
0.24	24	24	24	24	24	24
0.25	25	25	25	25	25	25
0.26	26	26	26	26	26	26
0.27	27	27	27	27	27	27
0.28	28	28	28	28	28	28
0.29	29	29	29	29	29	29
0.30	30	30	30	30	30	30
0.31	31	31	31	31	31	31
0.32	32	32	32	32	32	32
0.33	33	33	33	33	33	33
0.34	34	34	34	34	34	34
0.35	35	35	35	35	35	35
0.36	36	36	36	36	36	36
0.37	37	37	37	37	37	37
0.38	38	38	38	38	38	38
0.39	39	39	39	39	39	39
0.40	40	40	40	40	40	40
0.41	41	41	41	41	41	41
0.42	42	42	42	42	42	42
0.43	43	43	43	43	43	43
0.44	44	44	44	44	44	44
0.45	45	45	45	45	45	45
0.46	46	46	46	46	46	46
0.47	47	47	47	47	47	47
0.48	48	48	48	48	48	48
0.49	49	49	49	49	49	49
0.50	50	50	50	50	50	50
0.51	51	51	51	51	51	51
0.52	52	52	52	52	52	52
0.53	53	53	53	53	53	53
0.54	54	54	54	54	54	54
0.55	55	55	55	55	55	55
0.56	56	56	56	56	56	56
0.57	57	57	57	57	57	57
0.58	58	58	58	58	58	58
0.59	59	59	59	59	59	59
0.60	60	60	60	60	60	60
0.61	61	61	61	61	61	61
0.62	62	62	62	62	62	62
0.63	63	63	63	63	63	63
0.64	64	64	64	64	64	64
0.65	65	65	65	65	65	65
0.66	66	66	66	66	66	66
0.67	67	67	67	67	67	67
0.68	68	68	68	68	68	68
0.69	69	69	69	69	69	69
0.70	70	70	70	70	70	70
0.71	71	71	71	71	71	71
0.72	72	72	72	72	72	72
0.73	73	73	73	73	73	73
0.74	74	74	74	74	74	74
0.75	75	75	75	75	75	75
0.76	76	76	76	76	76	76
0.77	77	77	77	77	77	77
0.78	78	78	78	78	78	78
0.79	79	79	79	79	79	79
0.80	80	80	80	80	80	80
0.81	81	81	81	81	81	81
0.82	82	82	82	82	82	82
0.83	83	83	83	83	83	83
0.84	84	84	84	84	84	84
0.85	85	85	85	85	85	85
0.86	86	86	86	86	86	86
0.87	87	87	87	87	87	87
0.88	88	88	88	88	88	88
0.89	89	89	89	89	89	89
0.90	90	90	90	90	90	90
0.91	91	91	91	91	91	91
0.92	92	92	92	92	92	92
0.93	93	93	93	93	93	93
0.94	94	94	94	94	94	94
0.95	95	95	95	95	95	95
0.96	96	96	96	96	96	96
0.97	97	97	97	97	97	97
0.98	98	98	98	98	98	98
0.99	99	99	99	99	99	99
1.00	100	100	100	100	100	100

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