

Styrodur® C

Extruded Polystyrene Foam

The green thermal insulation board

Properties and applications



Styrodur® C is the green extruded rigid polystyrene foam from BASF, which is free from CFCs, HCFCs and HFCs.

Styrodur® C is characterised by its good thermal insulation, high compressive strength and low water absorption.

Styrodur® C is flame-retardant and its quality control is officially supervised by independent authorities. Because of the outstanding properties of the product, Styrodur® C is used in a wide variety of areas of building and civil engineering.

Styrodur® C is produced in accordance with the requirements of DIN 18165-1 and the corresponding European standard DIN 13 164.

Carbon dioxide (CO₂) is used as the propellant in the manufacture of Styrodur® C. There is a relatively rapid gas exchange between the CO₂ and the surrounding air. The CO₂ used is taken from an existing material cycle and therefore does not contribute to the greenhouse effect. When the boards are used, the cells are only filled with air.

► Dimensioning

The aim of the German Order on Saving Energy (EnEV) is to limit primary energy consumption. The interplay of system technology and structural thermal insulation creates room for manoeuvre for the dimensioning of individual structures in the skin of the building. However, a minimum thermal resistivity must be maintained in any case.

The table below provides guidance, based on our experience, for the individual building components, although this is not a substitute for the thermal insulation calculation of the annual heating requirement and the annual primary energy consumption according to the EnEV.

► Advantages

Styrodur® C represents a new generation of insulating boards offering the following special features in addition to the classic application advantages of extruded foam:

- Styrodur® C is free from CFCs, HCFCs and HFCs. Its cells contain air. The potential for damaging the ozone layer which products containing HCFCs still involve does not exist at all with Styrodur® C.
- Styrodur® C also offers benefits when it comes to the eco-balance. The raw material requirement for the manufacture of Styrodur® C is low. In many applications, the energy used to product the material is offset within just a few months by the heating energy that is saved.

► Quality

To maintain its high quality standards, the quality of Styrodur® C is monitored by the Forschungsinstitut für Wärmeschutz e.V., Munich.



Approval

The Deutsche Institut für Bautechnik, Berlin, has granted Styrodur® C a general building supervisory/ building law approval under number Z-23.1.2-287.

Recommended insulation thicknesses for Styrodur® C

Application	Structure of the element	Thermal conductivity WLG W/(m K)	Recommended U value			
			New building U value W/(m² K)	Thickness mm	Existing building U value W/(m² K)	Thickness mm
Sloping roof	 Styrodur® C above rafters (interim rafter at 160 mm, TCG 040 insulated)	035 040	0.16 0.16	80 80	0.20 0.20	30 30
Dual/Plus roof	 Existing non-ventilated roof with U = 0.6 W/(m² · K), with add. Styrodur® C insulation layer laid on it	035 040	0.22 0.22	100 120	0.22 0.22	100 120
Ceiling over open passage	 Reinforced concrete ceiling, aus Styrodur® C insulation on underside, with ceiling plaster	035 040	0.22 0.22	100 120	0.35 0.35	80 100
Ext. wall and floor slab against ground	 Cellar wall and concrete floor 150 mm thick, with Styrodur® C insulation against ground	035 040	0.22 0.22	100 120	0.35 0.35	80 100
Solid flat room*	 Protected membrane roof structure- reinforced concrete ceiling with ceiling plaster	035 040	0.28 0.28	140 160	0.32 0.32	120 140

* Protected membrane roof structures only with single-layer insulation, take supplement for thermal transmission coefficient into account

... the universal product

► Types available

Styrodur® C is supplied in the form of boards.

Standard grades are: 2500 C, 2800 C, 3035 CS, 3035 CN, 4000 CS, 5000 CS.

The grades differ primarily in apparent density and compressive strength. The surface of the boards consist of a smooth, closed, water-repellent skin.

Only Styrodur® 2800 C has a thermally embossed surface.

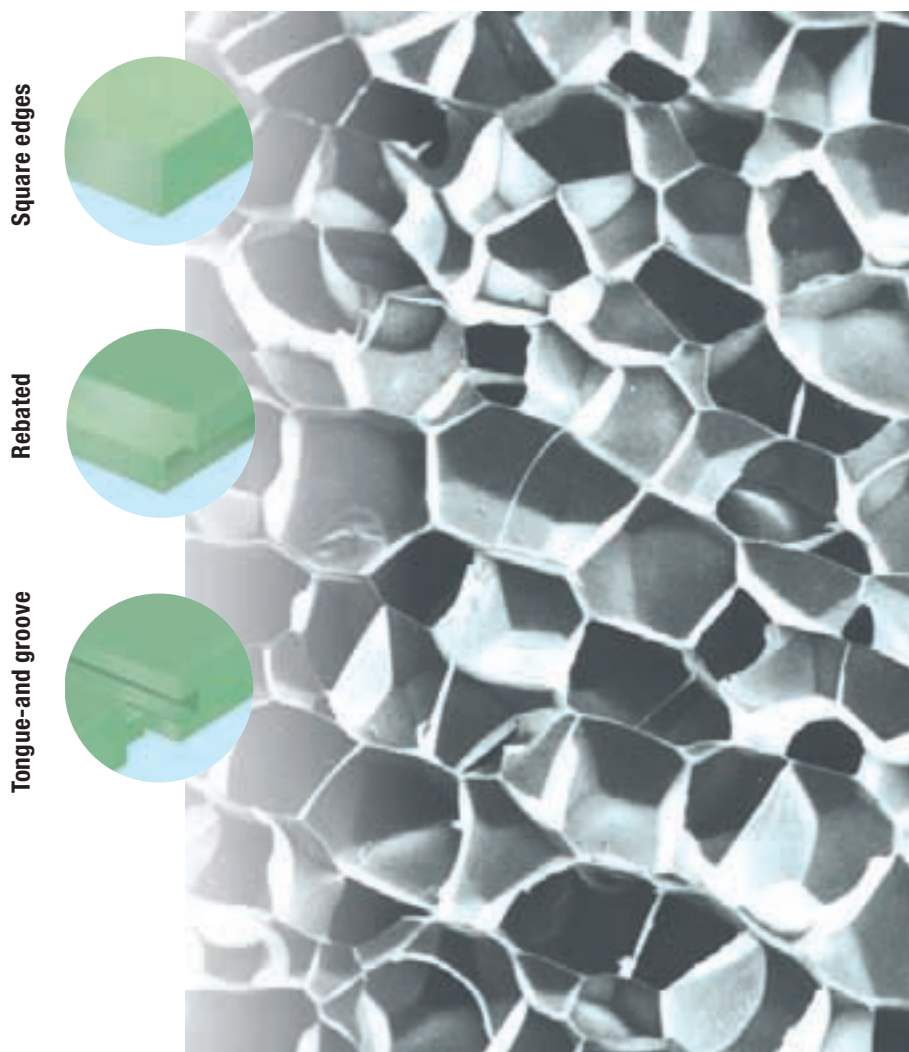
► Edge designs

To avoid cold bridges, to simplify laying or to improve the visual appearance, Styrodur® C boards are available with square edges, rebated or in a tongue-and-groove design.

► Universalprodukt

Styrodur® 2800 is a thermal insulation board embossed with a honey-comb pattern on both sides, for applications in combination with concrete, under renderings and other covering layers and with solvent-free adhesives. The surface finish gives excellent adhesion.

The board is particularly suitable for the insulation of thermal bridges, concrete surfaces in masonry walls and outer surfaces of basement walls. Placing it in the form before the concrete is poured creates a permanent, direct bond over its entire surface. There is generally no need for additional mechanical fixings. Styrodur® 2800 C is also suitable for interior wall insulation and for use on ceilings.



**Styrodur®
2500 C**

**Styrodur®
2800 C**

**Styrodur®
3035 CS**

**Styrodur®
3035 CN**

**Styrodur®
4000 CS**

**Styrodur®
5000 CS**

Its thermal insulation capacity, variety of grades, different compressive strengths and edge designs make Styrodur® C an indispensable insulation material in building and civil engineering, in the transport sector and in the production of composite elements:

Thermal insulation of walls, floors, ceilings and roofs; perimeter insulation, cold bridge insulation; as elements for sandwich boards and as frost protection in road and rail track constructions.

The following application instructions provide an overview of the most important applications for Styrodur® C. For the planning of specific building projects, further construction and handling instructions can also be provided.

► Perimeter insulation

All the product properties of Styrodur® C are required when it is used as heat insulation under buildings and on the outside of basement walls in contact with the ground: resistance to rotting, high compressive strength so that it can constantly resist the pressure of the soil, low water absorption.

Styrodur® C may be installed up to 3.5 m deep in ground water.



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► Cold bridge insulation

Concrete lintels of windows and doors, structural compound units, projecting wall units, corners, etc. are frequently weak points, thermally speaking, in the shell of the building which can be insulated with thermally embossed Styrodur® C. Lohr Element E. Schneider GmbH, in Gemünden, for example, offers prefabricated ceiling edge linings made from Styrodur® 2800 C.



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... and its applications



► Cavity wall insulation

This is the traditional, tried-and-tested type of construction in many areas. The low water absorption and the good thermal insulation properties of Styrodur® C allow installation between the two walls without an additional air gap.



► Protected membrane roof

Styrodur® C is also suitable for protected membrane roofs, where the thermal insulation lies above the waterproofing and thus protects it. In addition, the “protected membrane roof” principle offers a free choice of protective or wearing layers. It can be made as a gravel roof, terrace roof, landscape roof or parking roof.



But Styrodur® C can also be used for dual roofs. With a dual roof, an existing, intact non-ventilated flat roof is combined with a Styrodur® C protected membrane roof to adapt the thermal insulation to the latest energy requirements.

The dual roof is made as a combination of non-ventilated roof with a protected membrane roof with Styrodur® C. Both protected membrane structures protect the waterproofing against thermal, solar and mechanical damage.

Roof gardens

By applying the principle of the protected membrane proof, the sensitive roofing membrane is protected against mechanical damage during gardening work.

Roof renovation

If the insulation of older flat roofs is to be refurbished, Styrodur® C can simply be placed on top of the existing waterproofing, using the protected membrane roof principle.

► Floor insulation

Because of its high compressive strength, Styrodur® C is ideal for the thermal insulation of floor structures. Even floors subject to heavy loading, such as those in warehouses and production plants, can be insulated using Styrodur® C.

Styrodur® C can also be used within the floor structure underneath ice rinks. The insulation material prevents the ground from freezing.



► Ceiling insulation

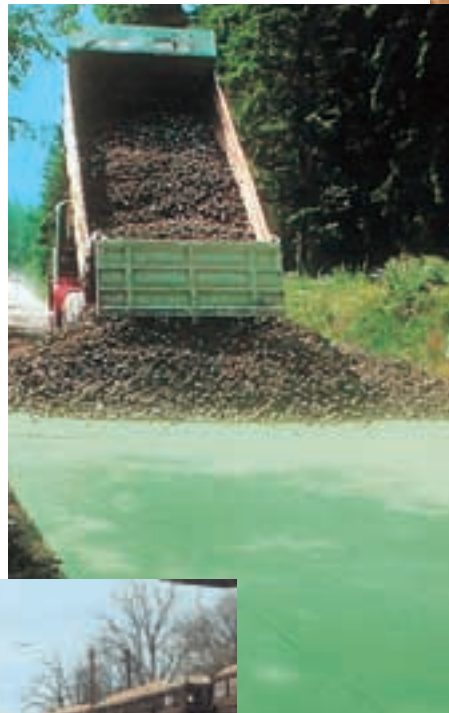
Styrodur® C is fixed under the purlins as the heat insulating layer between the trusses of warehouse structures or suspended as a continuous layer over the full area under the trusses. Large-format tongue-and-groove boards can be laid quickly and easily, have a visually attractive green surface and can be cleaned with high-pressure jets if they become dirty.

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► Road foundations

Due to its high compressive strength, low moisture absorption, good thermal insulation and resistance to rotting, Styrodur® C is also used as an antifrost layer in the construction of roads. Consequently, frost heaving of the carriageway or carriageway deformations are avoided and road maintenance costs are reduced.



► Railway construction

As with road foundations, Styrodur® C can be used here to avoid frost penetration and frost heaving at the approaches to bridges and tunnels. In addition, the thickness of the blanket layer can also be reduced.

... in all sorts of different areas

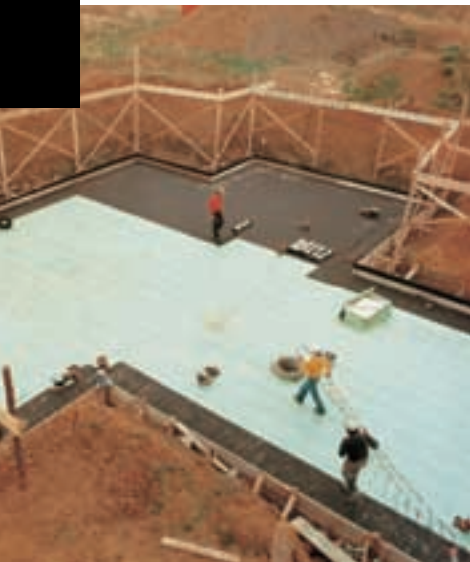
► Foundation boards

Styrodur® C offers architects, structural engineers and developers an ideal, long-lasting solution to the problem of creating a warm, healthy basement.

Styrodur® C is used as heat insulation under load bearing foundation slabs in accordance with Approval Z-23.34-1325, thus complying with the technical regulations.

In the residential and office buildings sector, reinforced concrete foundation slabs are being used increasingly for foundations. To prevent cold bridges, it is a good idea to lay Styrodur® C over the full surface underneath the foundation slab. The rising perimeter insulation of the basement wall is then joined directly to this, without cold bridges once again. The advantage is that the basement or the floor slab of a building is completely and comprehensively enclosed with insulation.

Lohr element E. Schneider GmbH, Gemünden, for example, offers pre-fabricated floor slab linings in which Styrodur® C is used as an edging, thermal insulation and frost screen at the same time.



Styrodur® C as a load bearing thermal insulation:

- with static loads
- as perimeter insulation outside the membrane
- and also in areas with permanent or long-term pressing water (up to max. 3.5 m in ground water)

► Special applications

Apart from the applications and products described above, Styrodur® C can also be used as a backing material that can be combined with other materials. Various manufacturers offer panels coated with wood, plastics, metal and bonded textile fabrics. The applications of such materials range from interior finishing to exterior cladding, from walls and floors of caravans and refrigerated vehicles to the linings of refrigerators and cold chambers. Styrodur® C is also of proven

value as a core material in fitting out ships, for surfboards, pontoons and floats.

If the Styrodur® C board is sandwiched between layers of rendering reinforced with textile-glass fabric, rigid panels are obtained that are particularly suitable as supports for tiles in bathrooms, etc. They can be used for partitions, floors, bathtub enclosures, boxing round pipework and shelves.

Styrodur®		2500 C	2800 C	3035 CS	3035 CN	4000 CS	5000 CS
Foundation panels and frost screens							
Perimeter insulation							
Cellar wall insulation							
Floor insulation							
Industrial and refrigeration room floors							
Cavity insulation							
Interior wall insulation							
Cold bridge insulation							
Flat room insulation							
Terrace roof							
Sloping roof insulation							
Agriculture							

Property	Unit ^①	Designation code according to EN 13164	2500 C		2800 C		3035 CS		3035 CN		4000 CS		5000 CS		Standard
Edge profil															
Surface			skin		embossed		skin		skin		skin		skin		
Length x width	mm		1,250 x 600		1,250 x 600		1,265 x 615		2,515 x 615 ^⑥		1,265 x 615		1,265 x 615		
Density	kg/m³		25		30		33		33		35		45		EN 1602
Thermal conductivity	λ _D [w/(mK)]		λ _D		λ _D		λ _D		λ _D		λ _D		λ _D		EN 13164
Thermal resistance	R _D [m²K/W]														
Thickness	20 mm 30 mm 40 mm 50 mm 60 mm 80 mm 100 mm 120 mm 140 mm 160 mm 180 mm	– – – – – – – – – – –	0.032 0.032 0.034 0.034 0.034 – – – – – –	0.65 0.95 1.25 1.50 1.80 – – – – – –	0.032 0.032 0.034 0.034 0.034 – 0.038 0.038 – – –	0.65 0.95 1.25 1.50 1.80 2.30 2.80 3.20 – – –	– 0.032 0.034 0.034 0.034 0.036 0.038 0.038 0.038 0.038 0.038 0.040	– 0.95 1.25 1.50 1.80 2.30 2.80 3.20 3.65 4.20 4.45	– 0.032 0.034 0.034 0.034 0.036 0.038 0.038 – – – –	– 0.95 1.25 1.50 1.80 2.30 2.80 – – – – –	– 0.032 0.034 0.034 0.034 0.036 0.038 0.038 0.038 ^⑤ – – – –	– 0.95 1.25 1.50 1.80 2.30 2.80 3.20 ^⑤ – – – –	– – 0.034 0.034 0.034 0.036 0.038 – – – – –	– – 1.25 1.50 1.80 2.30 2.80 – – – – –	
Compressive stress or compressive strenght at 10% deformation	kPa	CS (10/Y)	200–250 ^③		200–300 ^③		300		300		500		700		EN 826
Compressive creep	kPa	CC (2/1, 5/50)	60		80–100 ^④		130		–		180		250		EN 1606
Certificated compressive stress under load bearing floor slab	kPa	–	–		–		120		–		170		240		DIBT Z-23.34-1325
Adhesive strength on concrete	kPa	–	–		>200		–		–		–		–		EN 1607
Shear strength	kPa	SS	>300		>300		>300		>300		>300		>300		EN 12090
Compressive modulus of elasticity	kPa	CM	15.000		15.000		20.000		20.000		30.000		40.000		EN 826
Dimensional stability 70°C; 90% r.h.	%	DS (TH)	≤5%		≤5%		≤5%		≤5%		≤5%		≤5%		EN 1604
Deformation behaviour: load 20 kPa; 80°C	%	DLT (1) 5	≤5%		≤5%		≤5%		≤5%		≤5%		≤5%		EN 1605
Deformation behaviour: load 40kPa; 70°C	%	DLT (2) 5	–		≤5%		≤5%		≤5%		≤5%		≤5%		EN 1605
Linear thermal expansion coefficient	mm/(m · K)	–	0.08		0.08		0.08		0.08		0.08		0.08		DIN 53752
Longitudinal		–	0.06		0.06		0.06		0.06		0.06		0.06		
Reaction to fire	Class	–	E		E		E		E		E		E		EN 11925/2
Long term water absorption by immersion	Vol.-%	WL (T) 0.7	0.2		0.3		0.2		0.2		0.2		0.2		EN 12087
Long term water absorption by diffusion ^②	Vol.-%	WD (V) 5	2–5		3–5		2–4		2–4		2–4		2–4		EN 12088
Water vapour transmission ^②	–	MU	200–100		200–80		150–50		150–100		150–80		150–100		EN 12086
Freeze-thaw-resistance	Vol.-%	FT2	≤1		≤1		≤1		≤1		≤1		≤1		EN 12091
Maximum service temperature	°C	–	75		75		75		75		75		75		

① N/mm² = MPa = 10³ kPa

② Depends on thickness

③ From 50 mm board thickness

④ From 30 mm board thickness

⑤ On request

⑥ Thickness 30 and 40 mm: 2510 mm x 610 mm

Styrodur® C
from BASF.
Green and good.

Further data is provided in our Technical Information sheets.

Styrodur® C is available from building materials suppliers.

Please note

The information submitted in this publication is based on our current knowledge and experience. It does not imply any legally binding assurance. Whenever used, the special conditions of the particular application must be taken into consideration, particularly those regarding physical, technical and legal aspects concerning construction.