

# British Board of Agrément

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Authorised and notified according to Article 10 of the Council Directive (89/106/EEC) of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products.



## European Technical Approval ETA-05/0144

*Second issue\**

### Trade name:

Styro Stone Permanent Insulating Formwork (PIF) System

### Holder of approval:

Styro Stone International  
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### Generic type and use of construction product:

Permanent Insulating Formwork

### Valid from: to:

1st September 2005  
30th September 2010

### Validity extended to:

1st September 2015

### Manufacturing plant:

HSV Packaging  
Frankeneng 19  
NL-6710 BJ  
Ede  
Netherlands

### This European Technical Approval contains:

8 pages including two Annexes which form an integral part of the document



European Organisation for Technical Approvals

## I LEGAL BASES AND GENERAL CONDITIONS

1 This European Technical Approval is issued by the British Board of Agrément in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 [Construction Products Directive (CPD)] on the approximation of laws, regulations and administrative provisions of Member States relating to construction products<sup>(1)</sup>, modified by the Council Directive 93/68/EEC of 22 July 1993<sup>(2)</sup>.
- UK implementation of CPD Statutory Instruments 1991, No 1620. The Building and Building Construction Products Regulations 1991 — made 15 July 1991, laid before Parliament 22 July 1991, coming into force 27 December 1991, and amended by the Construction Products (Amendment) Regulations 1994 (Statutory Instruments 1994, No 3051).
- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC<sup>(3)</sup>.
- Guideline for European Technical Approval of *Non-loadbearing permanent shuttering kits/systems based on hollow blocks or panels of insulating materials and sometimes concrete* ETAG 009, edition June 2002.

2 The British Board of Agrément is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 This European Technical Approval may be withdrawn by the British Board of Agrément, in particular after information by the Commission on the basis of Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European Technical Approval, including transmission by electronic means, shall be in full. However, partial reproduction can be made with the written consent of the British Board of Agrément. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 The European Technical Approval is issued by the approval body in its official language. This version should correspond to the version circulated within EOTA. Translations into other languages have to be designated as such.

(1) Official Journal of the European Communities No L40, 11.2.1989, p12.

(2) Official Journal of the European Communities No L220, 30.8.1993, p1.

(3) Official Journal of the European Communities No L17, 20.1.1994, p34.

## II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

### 1 Definition of product and intended use

#### 1.1 Definition of the system

The Styro Stone Permanent Insulating Formwork (PIF) System comprises a panel of two walls of expanded polystyrene (white Styropor or grey Neopor) separated by a nominal distance of 145 mm, by moulded, solid or expanded polystyrene spacers, cast-in during production. The formwork components are:

- expanded polystyrene Styropor and Neopor panels:
  - nominal density both grades: 25 kg/m<sup>3</sup>
  - nominal thermal conductivity:

Styropor	0.034 W/(m·K)
Neopor	0.031 W/(m·K)
- spacers — solid black or grey polystyrene, about 2.5 mm thick with rebates to locate reinforcing bars. Spacers in expanded polystyrene are nominally 163 mm wide by 65 mm high
- end stops — lock into the internal-tapered grooves running vertically
- the panels are available either 125 mm or 250 mm high, each nominally 1000 mm long and in two types: Standard or RR. The two types interlock together. The standard panel has walls 50 mm thick and the RR has the wall-to-external face 150 mm thick.

Upper and lower surfaces of the polystyrene panels are castellated and the vertical mating surfaces are tongue-and-groove to form a tight fit when joined together. The rigid formwork does not require supporting falsework. The inner surfaces have tapered grooves running vertically and are offset on opposite faces to ensure uniform concrete thickness. They also form locks for end stops. The outer surfaces are grooved vertically at 50 mm centres to aid cutting and trimming.

The elements interlock and build up horizontally and vertically into a tight rigid formwork. The wall is formed by filling with concrete.

The formwork is used in conjunction with:

- steel reinforcement — where required
- concrete — Grade C20/25 to EN 206-1 : 2004
- aggregate — a recommended maximum size of 10 mm and should contain an admixture complying with EN 934-2 : 2001 to allow placement by either rodding or free flow and allow adequate site time. Vibrating equipment must not be used
- external render — should be a mix of cement, sand and polymer (proprietary packs may be used), reinforced with coated polypropylene. The basecoat is reinforced with either a stainless steel lath or a polypropylene mesh
- external masonry — may be brickwork or stonework fixed in accordance with national regulations. The type of masonry unit shall be to the relevant part of EN 771 and, where masonry tests are required, they shall be to the relevant part(s) of EN 1052.
- internal finish — typically 12.5 mm thick plasterboard fixed directly or on battens or a dry-lined finish with a plaster skin coat

- brickwork/stonework ties
- trestle supports — supplied by the ETA holder.

## 1.2 Intended use

The system is for use as a loadbearing and non-loadbearing internal or external wall incorporating insulating material, filled on site with concrete and remaining as a permanent part of the wall. The solid or expanded polystyrene spacers incorporated during production, connect the shuttering leaves and resist the pressure of the concrete during filling and can also support reinforcing bars when required.

The system provides permanent formwork for in-situ dense aggregate concrete walls and contributes to the thermal insulation of the finished construction.

## 1.3 Intended life

The provisions made in this ETA are based on an assumed working life for the system of at least 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be used as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

## 2 Characteristics of product and methods of verification

The system's PIF components are available in the range given in Annex 1 of this ETA and have the characteristics listed in Annex 2.

The characteristic values and respective tolerances for the components of the system are stated in the Manufacturer's Technical Dossier (MTD) (Styrostone Technical Manual) to this ETA.

The composition of the components of the system and the manufacturing and quality control procedures are deposited with the British Board of Agrément.

The ETA is issued for the system on the basis of the product composition held by the British Board of Agrément. Changes to the components of the system or in the production process of the components, that could result in the details being held by the British Board of Agrément being incorrect, should be notified to the British Board of Agrément before the changes are introduced. The British Board of Agrément will decide whether the changes affect the ETA and consequently the validity of the CE marking and whether further assessment and alterations to the ETA are required.

## 3 Evaluation of Conformity and CE marking

### 3.1 Attestation of Conformity system

The system of attestation of conformity applied to this product shall be that laid down in the CPD, Annex III, 2(ii) (referred to as System 2+).

### 3.2 Responsibilities

#### 3.2.1 Tasks for the manufacturer, Factory production control

The manufacturer continues to operate a factory production control system. All elements, requirements and provisions adopted by the manufacturer are documented. This ensures the product conforms with this ETA.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan<sup>(4)</sup>. The raw materials shall be subject to agreed controls and tests by the manufacturer before acceptance. Checks on incoming materials, such as polystyrene bead and solid polystyrene spacers, shall include control of the certificates of conformity presented by suppliers (comparison with nominal values) by verifying dimensions and determining material properties, eg chemical composition and physical properties.

The manufactured components are checked for dimensional compliance and visually for surface and other defects.

The frequency of controls and tests conducted during production and on the finished panel is laid down in the prescribed test plan, taking account of the manufacturing process.

The results of factory production control are recorded and evaluated. The records include at least:

- designation of the product
- type of control or testing
- date of manufacture of the product and dates of testing of the product or basic material and components
- result of control and testing and, if appropriate, comparison with requirements
- signature of person responsible for factory production control.

The records shall be presented to the inspection body involved in the continuous surveillance.

Details of the extent, nature and frequency of testing and controls to be performed within the factory production control shall correspond to the prescribed test plan included in the technical documentation of this ETA.

#### 3.2.2 Tasks for approved bodies

##### 3.2.2.1 Initial type-testing of the product

For initial type-testing<sup>(5)</sup> the results of tests, assessments and calculations performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases the necessary type-testing has to be agreed between the British Board of Agrément and the approved body involved.

##### 3.2.2.2 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory, in particular the staff and equipment, and the factory production control, are suitable to ensure a continuous and orderly manufacturing of the panel with the specifications given in part II, section 2 and the accompanying Annexes to this ETA.

(4) The prescribed test plan is deposited with the British Board of Agrément and is made available to the approved bodies involved in the conformity attestation process.

(5) In the context of ETAG 009, initial type-testing may be by testing and/or by calculation.

### 3.2.2.3 Continuous surveillance

The approved body shall visit the factory at least once a year for routine inspections. It shall be verified that the system of factory production control and the specified manufacturing processes are maintained, taking account of the prescribed test plan.

The results of continuous surveillance shall be made available on demand from the approved body to the British Board of Agrément. Where the provisions of the European Technical Approval and the prescribed test plan are no longer fulfilled, the certificate of conformity shall be withdrawn by the certification body.

### 3.3 CE marking

The CE marking shall be affixed to the packaging of the panels. The CE symbol shall be accompanied by the following information:

- identification number of the notification body
- identification of the product
- name or identification mark of manufacturer
- the last two digits of the year in which the CE marking was affixed
- number of the European Technical Approval
- number of the EC certificate of conformity.

## 4 Assumptions under which the fitness of the product for the intended use was favourably assessed

### 4.1 Manufacturing

Styro Stone panels (Styropor and Neopor) are produced in a heat-moulded chamber where the dimensions, castellations and spacer positions are controlled by the template of the mould. The panels are manufactured in accordance with the ETA using the manufacturing processes as identified in the inspection of the plant by the British Board of Agrément and the approved body and laid down in the technical documentation.

### 4.2 Packaging, transport and storage

The panels are wrapped in plastics bearing the manufacturer's name, product type, dimensions, quantity, date of fabrication and batch reference details.

In relation to transportation and storage, the panels should be treated as conventional insulation products.

### 4.3 Installation

#### 4.3.1 Formwork

In accordance with the ETA holder's installation instructions, the interlocked panels must be aligned into vertical formwork. One side of the formwork is braced against the ETA holder's proprietary trestles. These trestles can be adjusted during concreting work to maintain verticality.

#### 4.3.2 Concreting

Ready-mixed concrete shall be to the relevant parts of EN 206-1 : 2004 with control according to Annex C of this Standard. Whenever possible, concrete shall be purchased under an approved scheme where there is continuous certification and testing of the supplier. Where such schemes/controls are not available it is the responsibility of the purchaser of the concrete to ensure fitness for purpose.

#### 4.3.3 Criteria

The fitness for use of the system can be assumed if the panels are installed correctly in accordance with the following requirements:

- installation is carried out under the direction of personnel who have experience with this type of construction technique
- installation is in accordance with the manufacturer's specifications and drawings prepared for that purpose, and the appropriate tools are used
- the specified panels and trestles are used.

### 4.4 Use, maintenance and repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life.

Should repair prove necessary before concreting, replacement is advised. If required after concreting then cutting out and face replacement or foam spray repair is advisable.



On behalf of the British Board of Agrément

Date of Second issue: 12th October 2010

Brian Chamberlain  
Head of Approvals — Engineering

Greg Cooper  
Chief Executive

## ANNEX 1 PRODUCT RANGE

Table 1 Components

Ref	Description	Spacers (ties)	Type	Length x height x width (mm)
0001	Standard Styropor	EPS	Standard	1000 x 250 x 250
0601	Standard Styropor	Hard	Standard	1000 x 250 x 250
0701	Standard Styropor	Hard	Standard	1000 x 250 x 250
0111	Standard Styropor	EPS	RR	1000 x 250 x 350
0911	Standard Styropor	Hard	RR	1000 x 250 x 350
0604	Corner Styropor	Hard	Standard	750/500 x 250 x 250
0704	Corner Neopor	Hard	Standard	750/500 x 250 x 250
0703	Floor/ceiling edge Neopor	Hard	Standard	1000 x 125/350/250
0913	Floor/ceiling edge Neopor	Hard	RR	1000 x 125/350 x 350
0702	Half height Neopor	Hard	Standard	1000 x 125 x 250
9065	Height adjuster Styropor	EPS	Standard	1000 x 50 x 250
9070	Console Styropor	Hard	Standard	1000 x 350 x 250
0130	Lintel Neopor	N/A	Standard	1000 x 125 x 250
2551	Bay Neopor	Hard	Standard	626/374 x 125 x 250
2552	Bay Neopor	Hard	RR	665/415 x 125 x 350
9211	Trestle	—	—	—
—	End closure	—	—	—
—	Adaptor	—	—	—

Figure 1 Components

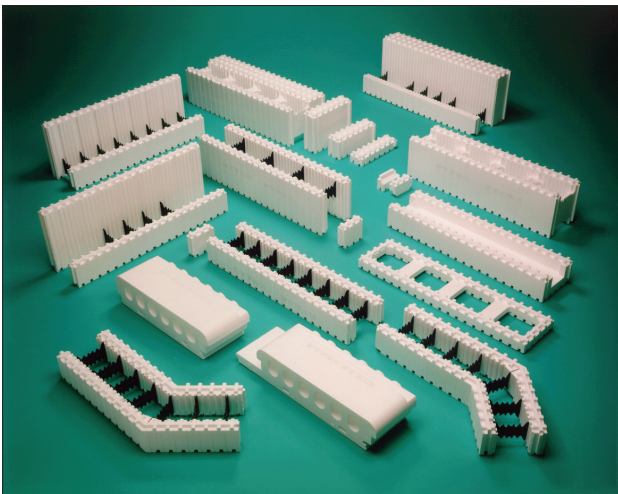


Figure 2 Standard panel

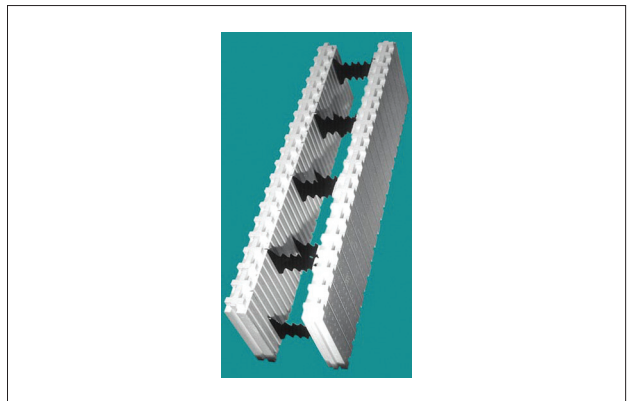


Figure 3 Plan views of standard Styro Stone (all dimensions in mm)

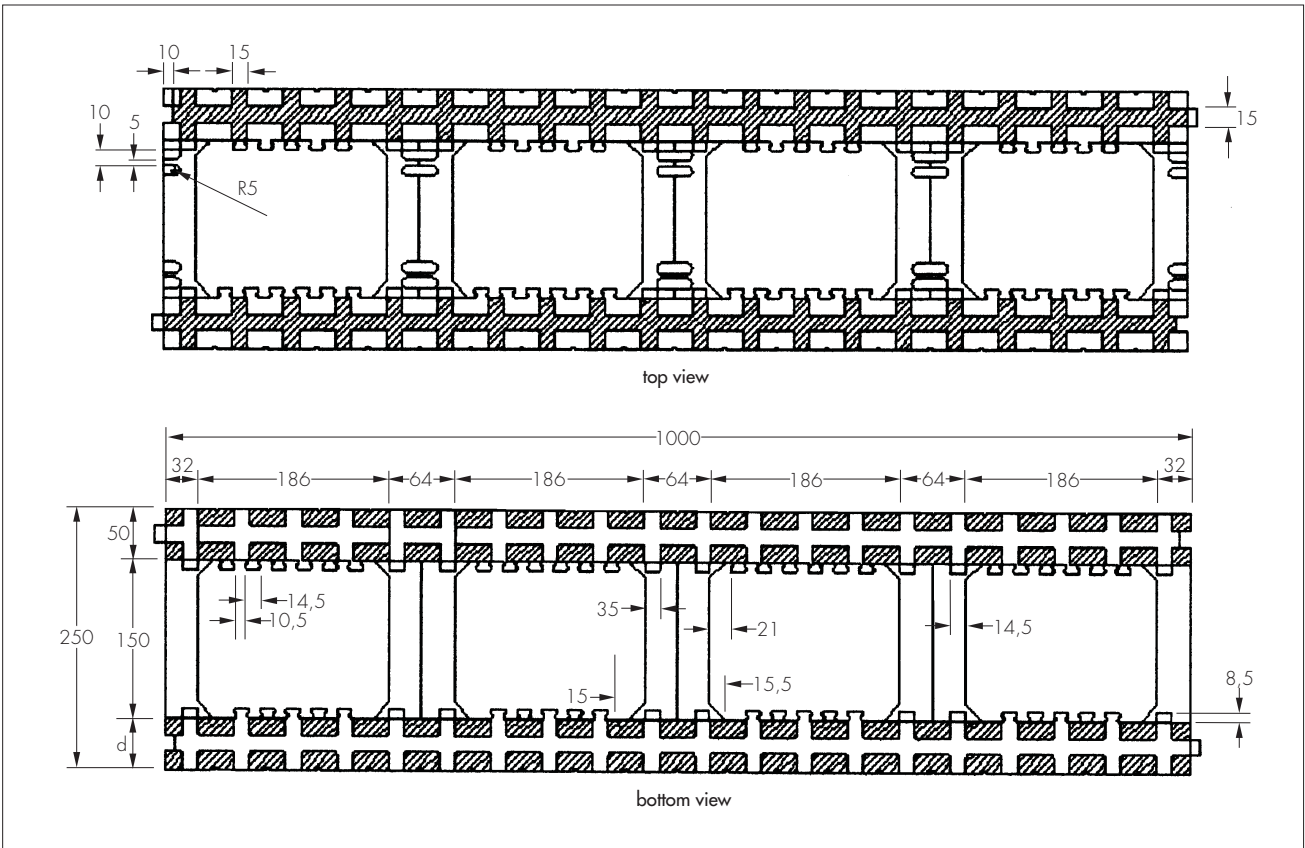


Figure 4 Construction site with trestles



## ANNEX 2 CONSTRUCTION DETAILS

Table 1 Product performance and characteristics

Property	Performance									
Structural pattern	Continuous									
Filling efficiency	Best to use self-compacting concrete									
Steel reinforcement	Possible									
Reaction to fire (Insulation)	Class E to EN 13501-1 : 2003									
Dangerous substances	None									
Water vapour permeability	A $\mu$ design value of 60 may be taken for the EPS									
Resistance to impact	Slight indentation from hard body (10J) test									
Filling pressure resistance	Slight joint leakage. Formwork needs verticality adjustment/checks during filling									
Thermal properties	Using the following thermal conductivity [ $\lambda$ in W/(m·K)] data									
	<table border="1"> <thead> <tr> <th>Product</th> <th><math>\lambda</math></th> <th>Source of information</th> </tr> </thead> <tbody> <tr> <td>Styropor Styro Stone</td> <td>0.034</td> <td>KIWA Report 11.3154 of 11.10.04</td> </tr> <tr> <td>Neopor Styro Stone</td> <td>0.031</td> <td>KIWA Report 11.3154 of 11.10.04</td> </tr> </tbody> </table>	Product	$\lambda$	Source of information	Styropor Styro Stone	0.034	KIWA Report 11.3154 of 11.10.04	Neopor Styro Stone	0.031	KIWA Report 11.3154 of 11.10.04
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	The resistance in m <sup>2</sup> ·K/W for the PIF were calculated as:									
	<table border="1"> <thead> <tr> <th></th> <th>Standard</th> <th>RR</th> </tr> </thead> <tbody> <tr> <td>Styropor Styro Stone</td> <td>3.017</td> <td>4.488</td> </tr> <tr> <td>Neopor Styro Stone</td> <td>3.302</td> <td>4.915</td> </tr> </tbody> </table>		Standard	RR	Styropor Styro Stone	3.017	4.488	Neopor Styro Stone	3.302	4.915
	Standard	RR								
Styropor Styro Stone	3.017	4.488								
Neopor Styro Stone	3.302	4.915								
	The total wall resistance, and consequently its U value, would be a function of the construction									
Physical, chemical and biological agent	No effect									
Duct incorporation	To be designed before construction									



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