

# Rigid polyurethane (PUR) and polyisocyanurate (PIR) foam for building applications —

**Part 3: Specification for two types of  
laminated board (roofboards) with  
auto-adhesively bonded reinforcing  
facings for use as roofboard thermal  
insulation for built-up roofs**

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Plastics and Rubber Standards Policy Committee (PRM/-) to Technical Committee PRM/72, upon which the following bodies were represented:

- Association of Building Component Manufacturers
- Brick Development Association
- British Board of Agrément
- British Plastics Federation
- British Rigid Urethane Foam Manufacturers' Association
- Calcium Silicate Brick Association Limited
- Cavity Foam Bureau
- Department of the Environment (Building Research Establishment)
- Department of the Environment (Construction Directorate)
- Engineering Equipment and Material Users' Association
- European Phenolic Foam Association
- Flat Roofing Contractors' Advisory Board
- Ministry of Defence
- National Federation of Roofing Contractors
- National House-building Council
- Polyethylene Foam Insulation Association
- Royal Institute of British Architects

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

- British Ceramic Research Ltd.
- British Urethane Foam Contractors' Association (BUFCA)
- Department of the Environment
- RAPRA Technology Ltd.

This British Standard, having been prepared under the direction of the Plastics and Rubber Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 January 1994

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## Foreword

This British Standard has been prepared under the direction of the Plastics and Rubber Standards Policy Committee. It supersedes BS 4841-3:1987, which is withdrawn. BS 4841-3:1987 was based on a draft quality assurance guide<sup>1)</sup>, derived from a cooperative study between the British Rigid Urethane Foam Manufacturers' Association (BRUFMA) and the Felt Roofing Contractors' Advisory Board (FRCAB)<sup>2)</sup>. It provided requirements for two types of thermally insulating polyurethane foam cored roofboard, reinforced on the two major faces with auto-adhesively bonded reinforcing facings, and suitable for use beneath built-up bituminized felt roofing material.

This edition introduces technical changes, but it does not reflect a full review or revision of the standard. It is envisaged that this standard will be replaced by a European Standard in due course and that the European Standard will be adopted in the BS EN series.

A requirement has been included for the thermal conductivity of the foam core to be designated by the manufacturer.

Attention is drawn to CP 144-3 which describes the recommended practice for laying the roofboards complying with this standard, into roof structures and their weatherproofing, to maximize their service performance after installation.

Additional information for the guidance of users, installers and designers is given in informative Annex E, Annex G and Annex H to this standard.

Other Parts of BS 4841 already published are:

- *Part 1: Laminated board for general purposes;*
- *Part 2: Laminated board for use as a wall and ceiling insulation.*

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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<sup>1)</sup> First issued by BRUFMA and FRCAB in 1979.

<sup>2)</sup> Now the Flat Roofing Contractors' Advisory Board.

## 1 Scope

This Part of BS 4841 specifies requirements for the construction, composition, designation, dimensional tolerances and physical properties of two types of polyurethane (PUR) and polyisocyanurate (PIR) foam cored thermally insulating laminated board (roofboards) with auto-adhesively bonded reinforcing facings and cores not less than 20 mm thick, for use in roofs under built-up bituminized felt roofing materials. This Part of BS 4841 is not applicable to roofboards with reinforcing facings bonded in place after the foaming process has been completed (see clause 4).

## 2 References

### 2.1 Normative references

This Part of BS 4841 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 4841 only when incorporated in it by updating or revision.

### 2.2 Informative references

This Part of BS 4841 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

## 3 Definition

For the purposes of this Part of BS 4841 the following definition applies.

### **auto-adhesively bonded reinforcing facing**

reinforcing facing that becomes bonded on to the foam core during the foam core forming process

## 4 Construction and composition

### 4.1 General

The roofboards shall consist of a form core (see 4.2) reinforced by two auto-adhesively bonded reinforcing facings of the same construction (see 4.3).

**NOTE** The type of reinforcing facings and the degree of their auto-adhesive bonding are crucial to ensure good service performance for the laminated roofboards.

### 4.2 Foam core

The cores shall be of rigid polyurethane (PUR) or polyisocyanurate (PIR) foam. A material indicated by PUR shall be substantially composed of urethane linkages and one indicated by PIR shall be substantially composed of isocyanurate linkages.

## 4.3 Reinforcing facings

### 4.3.1 General

Both reinforcing facings of the roofboards shall be as specified in 4.3.2 or 4.3.3.

### 4.3.2 Bitumen coated glass reinforcing facing

The bitumen coated glass reinforcing facing shall be a bitumen coated glass tissue made by coating one face of a minimum 60 g/m<sup>2</sup> wet process glass tissue with oxidized bitumen complying with BS 3690-3:1990, in the 95/25 to 115/15 range and stabilized with 20 % to 40 % of finely divided mineral matter.

**NOTE 1** Apart from being coated with bitumen on only one side, the bitumen coated glass is otherwise the same as type 3B bitumen felts (glass fibre based) as specified in BS 747:1977. As such, the bitumen side only is surfaced with the normal surfacing material described for type 3B felts which prevents the facing from sticking during manufacture, in the roll, or in stacked roofboards.

**NOTE 2** The bitumen used improves the moisture resistance of the facing and is highly compatible with bitumen roof covering systems.

### 4.3.3 Glass/polyethylene/glass reinforcing facing

The glass/polyethylene/glass reinforcing facing shall be based on two layers of minimum 40 g/m<sup>2</sup> wet process glass tissue, between which is sandwiched a layer of polyethylene.

The polyethylene layer shall be fully covered and adhered to the glass tissue. There shall be no exposed polyethylene face on either the foam side or the exposed face.

## 5 Designation

The boards shall be designated to indicate the thermal conductivity of the form core (see 6.6).

The designation shall consist of a two component code comprising the following items in the order presented:

- a) the number and date of this standard  
i.e. BS 4841/3:1994;
- b) a double digit number to indicate the thermal conductivity selected in accordance with Table 1.

An example of the designation of a board with a foam core thermal conductivity of 0.020 W/(m · K) is as follows:

BS 4841/3:1994/20

**Table 1 — Designation codes for thermal conductivity**

| Thermal conductivity<br>(see 6.6)<br>W/m · K                                                                                                                      | Code |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| 0.015                                                                                                                                                             | 15   |
| 0.016                                                                                                                                                             | 16   |
| 0.017                                                                                                                                                             | 17   |
| 0.018                                                                                                                                                             | 18   |
| 0.019                                                                                                                                                             | 19   |
| 0.020                                                                                                                                                             | 20   |
| 0.021                                                                                                                                                             | 21   |
| 0.022                                                                                                                                                             | 22   |
| 0.023                                                                                                                                                             | 23   |
| 0.024                                                                                                                                                             | 24   |
| 0.025                                                                                                                                                             | 25   |
| 0.026                                                                                                                                                             | 26   |
| 0.027                                                                                                                                                             | 27   |
| 0.028                                                                                                                                                             | 28   |
| 0.029                                                                                                                                                             | 29   |
| 0.030                                                                                                                                                             | 30   |
| 0.031                                                                                                                                                             | 31   |
| 0.032                                                                                                                                                             | 32   |
| NOTE These values are 30 day values for quality control purposes. For corresponding long term design values the manufacturer's advice should be sought (see E.3). |      |

## 6 Properties

### 6.1 Flatness

#### 6.1.1 Roofboards 25 mm or more in thickness

A board 1 200 mm × 600 mm shall show not more than 6 mm deflection from flatness when measured using a straight edge across any diagonal. This maximum value shall be adjusted proportionately for smaller roofboards.

#### 6.1.2 Roofboards less than 25 mm in thickness

A board 1 200 mm × 600 mm shall show not more than a 12 mm deflection from flatness when measured using a straight edge across any diagonal. This maximum value shall be adjusted proportionately for smaller boards.

### 6.2 Facings adhesion

Roofboards shall have no single area of non-adhesion between the facing and the foam core exceeding 72 cm<sup>2</sup>, and in total the unbonded areas for any one face shall not exceed an area greater than 5 % of that face when tested in accordance with Annex A.

### 6.3 Loadbearing for metal decking use

Roofboards shall comply with the imposed loadbearing requirements of 6.2 and 6.3 of BS 6399-1:1984 when mounted on a troughed metal substrate.

NOTE The trough opening is determined from the roofboard thickness (see E.7).

### 6.4 Dimensional stability in built-up roofing

#### 6.4.1 Roll and pour test

The dimensional stability of the roofboard shall be such that the average change in any dimension shall be not greater than 0.15 % when tested in accordance with Annex B.

#### 6.4.2 Temperature cycling test

The dimensional changes of the roofboard shall be no greater than 0.1 % when fully bonded to one layer of roofing felt and subjected to temperature cycling between + 80 °C and – 5 °C in accordance with Annex C.

### 6.5 Delamination strength

Roofboards shall have a delamination strength of not less than 10 kPa when tested in accordance with methods 1 and 2 of Annex D and complete, without damage, 100 cycles when tested in accordance with method 3 of Annex D.

### 6.6 Thermal conductivity of foam core

Thermal conductivity shall be determined by either method 7A or method 7B of BS 4730-2:1993 at a mean temperature of 10 °C, (30 ± 2) days after manufacture. Board specimens shall be conditioned throughout this period at (23 ± 2) °C and (50 ± 5) % r.h.

NOTE See additional guidance in E.3 concerning the thermal conductivity 3 day values and design values.

### 6.7 Additional properties

Additional properties for roofboards shall be as given in Table 2.