

TITLE: IMPREGNATED FOAM MATERIALS

THIS INVENTION relates to impregnated foam materials and their use to seal surfaces against the entry of air, water, dust and the like.

5 Elastic and resilient materials are often used as sealing materials against moisture, draughts and dust. A particular application is in the construction of roofs and walls of a building with, for example, overlapping formed metal or cement or similar sheets where a strip is inserted in the overlap of two adjacent sheets to provide the required sealing therebetween. Such sealing strips are also usually required
10 between the underside of such sheets and their supporting battens or rafters. Similar strips are also used to seal adjacent tiles or similar on a roof and between the underside of the tile and its supporting batten or rafter.

Of course, if there is any unevenness or roughness present on either of the surfaces
15 to be sealed, the sealing material must be flexible in order to conform to the surface that is being sealed. Favoured sealing strips are open-pore, absorbent materials impregnated with a substance which, on compression, bonds the open cells of the material together and simultaneously effects the required sealing.

20 It is already known that, by impregnating a flexible foamed plastics material with certain bituminous substances, a sealant is obtained which can provide joint sealing properties. Typical foams include a reticulated, flexible polyester-polyurethane foam having a three-dimensional uniform open cell structure which can be impregnated with a bitumen emulsion.

25 It is the bitumen emulsion which prevents the passage of air, water etc. through the foam material and thus it is advantageous to maximise the amount of bitumen

absorbed by the foam material. It was generally accepted in the art that typical maximum bitumen concentrations were about 120 kg/m³.

However, as described in the present applicant's earlier Australian Patent No. 663,480, the concentration of bitumen present in these foam materials can be increased to about 225 kg/m³ (dry weight).

It has now been found that the concentration of bitumen in these foam materials can be increased further to in excess of 600 kg/m³.

Thus, according to a first aspect of the present invention, there is provided a sealing material, said material including a bitumen-impregnated foam characterised in that said bitumen is present at greater than 225 kg/m³.

Preferably, said bitumen is present at a concentration in the range between 230 kg/m³ to in excess of 600 kg/m³.

Preferably, said foam is an open cellular foam each cell of which is coated with said bitumen.

More preferably, said foam is a polyether-polyurethane foam.

In use, said sealing material is preferably in the shape of an elongated strip, said strip, optionally, having a configuration on one or more faces thereof which conforms to the shape of the surfaces to be sealed.

Of course, the sizes of said strips can vary dependent upon their application but a preferred strip will typically have a base width of 40-50mm and a height of 30-75 mm.

Said sealing material can optionally be coated on its exterior surface with an acrylic emulsion composition.

By coating the material with said acrylic emulsion composition, the bitumen is protected from degradation by exposure to ultraviolet and other radiation. A further
5 advantage of the acrylic emulsion coating is that it renders the material fire retardant.

Said composition may also be coloured to coordinate with an exterior colour of the surfaces to which it is applied.

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The preferred method of manufacturing a sealing material as hereinbefore described is to:

first saturate said foam with said bitumen; and

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remove any excess of said bitumen from said thus-saturated foam.

The foam need not be initially saturated with neat bitumen but a composition based on bitumen may be used. Suitably, the bitumen is selected from the group
20 including bitumen emulsion, hot bitumen and kerosene-diluted bitumen. A preferred bitumen is a bitumen emulsion comprising 40% bitumen and 60% water. In the preferred use of bitumen emulsion, after removal of excess emulsion, the water is allowed to evaporate off.

25 Any suitable means known in the art can be used to saturate the foam and then remove the excess bitumen. For example, the foam could be dipped into a bituminous composition for a suitable period, removed from said bituminous composition and excess bitumen allowed to drain from the foam. As an alternative

to allowing the bitumen to drain from the foam, the saturated foam could be squeezed to remove the excess bitumen, for example, by passing between multiple rollers. In these embodiments, the thus-squeezed or drained foam could be re-dipped into the bituminous composition, removed therefrom and again squeezed or drained to remove the excess bitumen. These dipping and removing excess bitumen procedures could be repeated several times until the desired concentration of bitumen in the foam is obtained.

According to a third aspect of the present invention, there is provided a method of sealing an overlap between two adjacent surfaces, said method including inserting in said overlap a sealing material as hereinbefore described.

In use, the sealing material is pressed into contact with the surfaces to be sealed. If inserting into a pre-existing gap, it is advantageous to apply some pre-compression before inserting the sealing material into the gap in order to accommodate any variations in spacing in that gap. In other cases, where, for example, overlapping roofing or wall sheets are to be bolted together, the nature of that assembly will automatically apply a sufficient compression.

Preferred embodiments of the present invention will now be described with reference to the following examples.

A polyether-polyurethane foam termed "light duty" under Grade No. L27-180 as supplied by JOYCE FOAM PRODUCTS was cut into four (4) strips, each strip of dimensions approximately 2m x 40mm x 30mm, and labelled Sample 1A, Sample 2D, Sample 3D and Sample 4D. In all of the examples below, the bituminous composition was an emulsion of 40% bitumen and 60% water.

Sample 1A strip was dipped into the bituminous composition for a brief period and then removed from the solution. The strip was allowed to drain and air dried. The foam was analysed for bitumen content and found to be 441.0 kg/m³.

5 Sample 2D strip was dipped into the bituminous composition for a brief period and then removed from the solution. The saturated foam was then squeezed between multiple rollers to remove excess bitumen adhering to the foam and air dried. The single-dipped foam was again dipped into the bitumen composition for a further brief period, removed therefrom, passed between the multiple rollers and air dried. The thus double-dipped foam was analysed for bitumen content and found to be
10 313.7 kg/m³.

Sample 3D strip was dipped into the bituminous composition for a brief period and then removed from the solution. The saturated foam was then squeezed between multiple rollers to remove excess bitumen adhering to the foam and air dried. The
15 single-dipped foam was again dipped into the bitumen composition for a further brief period, removed therefrom, passed between the multiple rollers and air dried. The now double-dipped foam was again dipped into the bitumen composition for a further brief period, removed therefrom, passed between the multiple rollers and air dried. The thus triple-dipped foam was analysed for bitumen content and found to
20 be 469.1 kg/m³.

Sample 4D strip was dipped into the bituminous composition for a brief period and then removed from the solution. The saturated foam was then squeezed between multiple rollers to remove excess bitumen adhering to the foam and air dried. The
25 single-dipped foam was again dipped into the bitumen composition for a further brief period, removed therefrom, passed between the multiple rollers and air dried. The now double-dipped foam was again dipped into the bitumen composition for a further brief period, removed therefrom, passed between the multiple rollers and air

dried. The now triple-dipped foam was again dipped into the bitumen composition for a further brief period, removed therefrom, passed between the multiple rollers and air dried. The thus quadruple-dipped foam was analysed for bitumen content and found to be 603.5 kg/m³.

- 5 The present invention can thus provide foam materials impregnated with bitumen to concentrations in excess of 600 kg/m³. When the foam material is a polyether-polyurethane, a much longer life of the sealing material is possible - of the order of four-fold over a polyester-polyurethane. Such impregnated materials with their hitherto unknown high concentrations of bitumen offer improved sealing against
- 10 moisture, draughts and dust.

It will be appreciated by those skilled in the art that the above examples are illustrative only of the present invention and that modifications and alterations can be made without departing from the inventive concept as defined in the following

15 claims.

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**CLAIMS**

- 1 A sealing material, said material including a bitumen-impregnated foam characterised in that said bitumen is present at greater than 225 kg/m³.
- 5 2. A sealing material as defined in claim 1, wherein said bitumen is present at a concentration in a range between 230 kg/m³ to in excess of 600 kg/m³.
3. A sealing material as defined in claim 1 or claim 2, wherein said foam is an open cellular foam each cell of which is coated with said bitumen.
- 10 4. A sealing material as defined in any one of claims 1 to 3, wherein said foam is a polyether-polyurethane foam.
5. A sealing material as defined in any one of claims 1 to 4, wherein said
15 material is in a shape of an elongated strip.
6. A sealing material as defined in claim 5, wherein said strip has a configuration on one or more faces thereof, each configuration being complementary in shape to a surface to be sealed.
- 20 7. A sealing material as defined in any one of claims 1 to 6, wherein said material is coated on its exterior surface with an acrylic emulsion composition.
- 25 8. A sealing material as defined in claim 7, wherein said composition is coloured to coordinate with an exterior colour of a surface to which it is applied.

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9. A method of manufacturing a sealing material as defined in any one of claims 1 to 8, said method including:

first saturating said foam with said bitumen; and

5 then removing excess of said bitumen from said thus-saturated foam.

10. A method as defined in claim 9, wherein said foam is dipped into a bitumen composition, removed therefrom and any excess of said bitumen adhering to said foam is allowed to drain off.

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11. A method as defined in claim 9, wherein said foam is dipped into a bitumen composition, removed therefrom and then passed between multiple rollers or similar to squeeze any excess of said bitumen from said foam.

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12. A method as defined in any one of claims 9 to 11, wherein dipping of said foam into said bitumen, removing therefrom and removal of excess bitumen is multiply repeated until a desired concentration of said bitumen is obtained.

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13. A method as defined in any one of claims 9 to 12, wherein said bitumen composition is selected from a group including bitumen emulsion, hot bitumen and kerosene-diluted bitumen.

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14. A method as defined in claim 13, wherein said bitumen composition is in the form of a bitumen emulsion.

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15. A method of sealing an overlap between two adjacent surfaces, said method including inserting in said overlap a sealing material as defined in any one of claims 1 to 8.
- 5 16. A method as defined in claim 15, wherein said adjacent surfaces are overlapping formed metal or cement or similar sheets.
17. A method as defined in claim 15, wherein said adjacent surfaces are overlapping roofing tiles.
- 10 18. A method as defined in claim 17, wherein said roofing tiles are ridge tiles.

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**AMENDED CLAIMS**

[received by the International Bureau on 21 June 1999 (21.06.99);
original claim 4 cancelled; original claims 1 and 2 amended; original claims 5-18 renumbered as
claims 4-17; remaining claim unchanged (2 pages)]

1. A sealing material, said material including a bitumen-impregnated polyether-polyurethane foam characterized in that said bitumen is present at greater than 225 kg/m³.
2. A sealing material as defined in claim 1, wherein said bitumen is present at greater than 600 kg/m³.
3. A sealing material as defined in claim 1 or claim 2, wherein said foam is an open cellular foam each cell of which is coated with said bitumen.
4. A sealing material as defined in any one of claims 1 to 3, wherein said material is in a shape of an elongated strip.
5. A sealing material as defined in claim 4, wherein said strip has a configuration on one or more faces thereof, each configuration being complementary in shape to a surface to be sealed.
6. A sealing material as defined in any one of claims 1 to 5, wherein said material is coated on its exterior surface with an acrylic emulsion composition.
7. A sealing material as defined in claim 6, wherein said composition is coloured to coordinate with an exterior colour of a surface to which it is applied.
8. A method of manufacturing a sealing material as defined in any one of claims 1 to 7, said method including:

first saturating said foam with said bitumen; and

then removing excess of said bitumen from said thus-saturated foam.

AMENDED SHEET (ARTICLE 19)

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9. A method as defined in claim 8, wherein said foam is dipped into a bitumen composition, removed therefrom and any excess of said bitumen adhering to said foam is allowed to drain off.
- 5 10. A method as defined in claim 8, wherein said foam is dipped into a bitumen composition, removed therefrom and then passed between multiple rollers or similar to squeeze any excess of said bitumen from said foam.
- 10 11. A method as defined in any one of claims 8 to 10, wherein dipping of said foam into said bitumen, removing therefrom and removal of excess bitumen is multiply repeated until a desired concentration of said bitumen is obtained.
- 15 12. A method as defined in any one of claims 8 to 11, wherein said bitumen composition is selected from a group including bitumen emulsion, hot bitumen and kerosene-diluted bitumen.
- 20 13. A method as defined in claim 12, wherein said bitumen composition is in the form of a bitumen emulsion.
- 25 14. A method of sealing an overlap between two adjacent surfaces, said method including inserting in said overlap a sealing material as defined in any one of claims 1 to 7.
- 30 15. A method as defined in claim 14, wherein said adjacent surfaces are overlapping formed metal or cement or similar sheets.
16. A method as defined in claim 14, wherein said adjacent surfaces are overlapping roofing tiles.
17. A method as defined in claim 16, wherein said roofing tiles are ridge tiles.

