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(54) **Water-proofing materials and methods for the production thereof**

(57) A water-proofing sheet material comprising a support layer of a cross-orientated polypropylene laminate and a layer of a pressure-sensitive, water-proofing adhesive, which may be based on coal-tar pitch or bitumen, has

application for example in the building industry for the provision of damp-proof courses. The material may optionally also comprise a layer of a protective release material, e.g. siliconised paper.

The invention also extends to methods for the production of such sheet materials.

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## SPECIFICATION

## Water-proofing materials and methods for the production thereof

This invention relates to water-proofing materials, particularly such materials in the form of sheets for incorporation into concrete structures as a damp-proof course, and methods for the production thereof. 5

It is known to provide damp-proof courses in concrete structures by means of a water-proofing sheet material comprising a support layer of plastics material, a layer of a pressure-sensitive, bituminous adhesive, and, if desired, a layer of release paper which serves to protect the bituminous adhesive until the water-proofing sheet material is ready for application on to a concrete substrate. When the time comes for application, the layer of release paper is removed, the water-proofing sheet material is placed on to the surface of the concrete substrate and pressure is applied to activate the bituminous adhesive. It is often advantageous to prime the concrete surface with a bituminous emulsion or solution to improve the adhesion. Once the water-proofing sheet material is in position adhered to the substrate, further concrete can be applied so that the water-proofing sheet material is embedded in the concrete structure thereby providing a damp-proof course therein. 15

The plastics material used for the support layer is commonly polythene. We have found, however, that polythene sheeting when used for the support layer has the disadvantage that its tear strength and puncture resistance are too low for the polythene sheeting to withstand the wear and tear to which it is frequently subjected prior to, during and after application of the water-proofing sheet material on to a concrete substrate. Thus, it often happens that the polythene sheeting is torn or punctured by the time that the water-proofing sheet material is embedded in the concrete, and this means that the polythene sheeting does not provide an effective second line of defence (the bituminous layer being the first line of defence) to the passage of water. 20

There are very numerous other plastics materials which are available in sheet form and which could in theory be used instead of polythene sheeting. In order to provide a practical alternative with advantages over polythene, however, the plastics sheeting used must be compatible with both the adhesive and the concrete, must be capable of acting as a barrier to the passage of water when embedded in concrete over a prolonged period of time, and must have sufficiently high tear strength and puncture resistance to make damage unlikely as a result of the wear and tear to which the water-proofing sheet material will inevitably be subjected prior to, during and after its incorporation into a concrete structure. Furthermore it is desirable that the plastics sheeting used shall not be unduly thick; otherwise, although a sufficiently high tear strength and puncture resistance may thereby be achieved, the cost of the plastics sheeting will inevitably be high due to the large weight of plastics material therein. 25

The present invention is based upon the discovery that a particular form of polypropylene sheeting can with advantage be used in water-proofing sheet material of the kind referred to above. The particular form of polypropylene sheeting concerned is a laminate of layers formed of propylene homopolymer or copolymer either alone or blended with other plastics material e.g. ethylene homopolymer or copolymer, in which the layers of the laminate are molecularly orientated with adjacent layers orientated in different directions. Such sheeting is hereinafter referred to as "cross-orientated polypropylene laminate". 30

Thus, according to one feature of the present invention, there is provided a water-proofing sheet material which comprises a support layer of a cross-orientated polypropylene laminate, a layer of a pressure-sensitive, water-proofing adhesive and, if desired, a protective release layer on the surface of the adhesive remote from the support layer. 35

According to a further feature of the present invention, there is provided a method of producing a water-proofing sheet material according to the invention as hereinbefore defined in which a layer of pressure-sensitive, water-proofing adhesive is applied to a cross-orientated polypropylene laminate. If desired, a release layer can thereafter be applied as a protective layer on to the exposed surface of the adhesive, this release layer being removable prior to use of the water-proofing sheet material. 40

In carrying out the method according to the invention as hereinbefore defined, the adhesive is preferably applied at a temperature not in excess of about 80°C. A problem can arise if the adhesive is applied above this temperature due to the fact that cross-orientated polypropylene laminates in general have rather poor dimensional stability at high temperatures. We have thus experienced difficulties in manufacturing the materials according to the invention by the method as hereinbefore defined where application of the pressure-sensitive, water-proofing adhesive to the cross-orientated polypropylene laminates is to be carried out at above 80°C and have devised an alternative method of producing the water-proofing sheet material which can with advantage be used where such hot application of the adhesive is desired. 45

Thus, according to a still further feature of the present invention, there is provided a method of producing a waterproofing sheet material according to the invention as hereinbefore defined in which a layer of pressure-sensitive, water-proofing adhesive is applied to a release surface of a sheet material (i.e. the release layer), a layer of the cross-orientated polypropylene laminate is applied on to the exposed surface of the layer of pressure-sensitive, water-proofing adhesive and, if desired, the release 50

layer is subsequently removed to expose one surface of the pressure-sensitive, waterproofing adhesive.

The cross-orientated polypropylene laminate is preferably one which will provide adequate tear strength and puncture resistance at thicknesses within the range of from 0.10 to 0.30 mm, thicknesses of from 0.12 to 0.18 mm being particularly preferred. Such laminates which can be used with particular advantage are those described in United Kingdom Patent Specification Nos. 1,526,722/3/4. These are described as laminates comprising at least two biaxially oriented films bonded to one another, each film comprising polymeric material having a fibrillar grain structure that imparts a predominant orientation of splittability to that film but that follows a zig-zag course through the film, and in which the films are bonded to one another with the said orientations transverse to each other and the bonding between the films is sufficiently weak that local delamination of the films can occur upon tearing of the laminate. The films can be made for example from blends of polypropylene and polyethylene, the polypropylene being provided by propylene homopolymers and copolymers as desired.

The pressure-sensitive, water-proofing adhesive can for example be provided by a bituminous adhesive, such adhesives being described for example in United Kingdom Patent Specification No. 1,409,312. Another adhesive which can conveniently be used is one based on coal-tar pitch as for example described in United Kingdom Specification No. 974,310.

The release layer is conveniently provided by release paper e.g. siliconised paper.

In the methods according to the invention, the adhesive is conveniently applied by spreading. Where an adhesive based on bitumen, coal-tar pitch or the like is used, the step of applying the adhesive will need to be carried out at an elevated temperature, conveniently at the temperature in the range of from 70 to 130°C. The thickness of the adhesive layer applied will in general need to be at least 0.5 mm, and thicknesses within the range of from 0.5 to 2.00 mm, and advantageously 1.0 to 1.5 mm, are preferred. When a release layer is used, it is preferably left in position as protection for the adhesive layer, and once the adhesive has cooled the water-proofing sheet material can be rolled up and stored ready for use.

The preferred thickness of the cross-orientated polypropylene laminate, i.e. 0.12 to 0.18 mm, compares with a usual thickness of about 0.25 mm for the polythene sheet in the hitherto known water-proofing sheet materials referred to above. Despite this reduction in the thickness of the plastics sheet material used as support layer, the cross-orientated polypropylene laminate has much improved tear strength and puncture resistance as compared with the polythene sheeting in the hitherto known material and this represents a very substantial advantage of the products of the present invention.

The following Example illustrates the invention:—

#### EXAMPLE

An adhesive composition is prepared having the following formulation:

35	Powdered coal	21.2%	35
	Coal Tar Pitch	18.6%	
	Mineral Filler (Slate powder)	21.2%	
	Creosote Oil	21.8%	
	Aromatic Oil (Hydrogenated Terphenyls)	8.4%	
40	Butadiene Acrylonitrile Elastomer	6.8%	40

The adhesive composition is heated to 100°C and is spread at a thickness of 1.25 mm on to a siliconised paper sheet having a width of 1.05 metres. A cross-orientated polypropylene laminate with a thickness of 0.15 mm and a width of 1.0 metres is then applied on to the exposed surface of the adhesive, the assembly is allowed to cool and is then rolled up for storage prior to use as a damp-proof course for concrete.

#### CLAIMS

1. A water-proofing material which comprises a support layer of a cross-orientated polypropylene laminate and a layer of a pressure-sensitive, water-proofing adhesive.
2. A water-proofing sheet material according to claim 1 additionally comprising a layer of protective release material on the surface of the adhesive remote from the support layer.
3. A water-proofing sheet material according to claim 2 wherein the protective release material comprises siliconised paper.
4. A waterproofing sheet material according to any of the preceding claims in which the adhesive is based on coal-tar pitch.
5. A water-proofing sheet material according to any of claims 1 to 3 in which the adhesive is a bituminous adhesive.

6. A water-proofing sheet material according to any of the preceding claims in which the thickness of the adhesive layer is from 0.5 to 2.0 mm.
7. A water-proofing sheet material according to claim 6 in which the said thickness is from 1.0 to 1.5 mm.
- 5 8. A water-proofing sheet material according to any of the preceding claims in which the thickness 5 of the support layer is from 0.10 to 0.30 mm.
9. A water-proofing sheet material according to claim 8 wherein the said thickness is from 0.12 to 0.18 mm.
- 10 10. A method of forming a water-proofing sheet material which comprises applying a layer of 10 water-proofing, pressure sensitive adhesive to the release surface of a layer of protective release material and applying a layer of cross-orientated polypropylene laminate to the exposed surface of the layer of adhesive.
11. A method according to claim 10 which includes the step of subsequently removing the layer of protective release material to expose one surface of the adhesive.
- 15 12. A method of forming a damp-proof course including incorporating into a concrete structure a 15 water-proofing sheet material according to any of claims 1 to 9, if necessary with prior removal of any layer of protective release material.
13. A water-proofing sheet material substantially as herein described with reference to the Example.
- 20 14. A method of forming a water-proofing sheet material substantially as herein described with 20 reference to the Example.