A waterproof sheet structure for a cool roof includes a waterproof sheet layer and a top reinforce layer placed on one side of the waterproof layer. The top reinforce layer is impregnated in a liquid polymer and then dried, and is treated to have a light color. The liquid polymer has fire retardant property. The top reinforce layer is made of a fiberglass cloth, which includes a plurality of glass fibers woven with one another. The polymer fill gaps between the woven fibers. The polymer is impregnated onto the fiberglass cloth in such a thickness so that there are no glass fibers exposed out of the polymer. The waterproof sheet is made by forming the fiberglass cloth, and then coating asphalt on the fiberglass cloth with a constant thickness.
WATERPROOF SHEET STRUCTURE FOR A COOL ROOF

CROSS REFERENCE TO RELATED APPLICATIONS


BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention is related to a waterproof sheet structure for a cool roof. More particularly, the invention is related to a waterproof sheet that has fire retardancy and light reflectivity while using common and cheap materials.

[0004] 2. Background of the Related Art

[0005] In general, a waterproof material is applied to the rooftop of the building or the top floor of the parking lot, in order to prevent a water leakage due to rain, or the like. Commonly, water-soluble or oil-soluble paint film waterproof material, asphalt waterproof material, and asphalt sheet waterproof material are employed.

[0006] In case of the paint film waterproof material, a liquid waterproof agent is repeatedly coated on the surface of a structure, to thereby form a film of paint. A tight waterproof layer can be formed, and a narrow and difficult area can be waterproofed with a simple process. However, a uniform thickness of waterproof layer cannot be achieved, and the peel-off of the waterproof layer is prone to occur by vapor pressure due to water contained in the concrete bottom floor. If a crack is generated in the structure, then the paint film also is cracked, thereby leading to a water leakage.

[0007] In case of the asphalt waterproofing material, a waterproof layer is formed using asphalt as its main material. In this process, asphalt is heated to melt and the melted asphalt is coated repeatedly in the area to be waterproofed to thereby form a waterproof layer. Alternatively, asphalt is rubberized and formed in the form of a sheet, and in installation process, the asphalt sheets are arranged with their edges being overlapped. Then, the overlapped connecting portions are heated and adhered with a torch or the like.

[0008] Among the above asphalt waterproofing processes, the asphalt sheet process has been widely used because its installation is simple, a uniform thickness of waterproof layer can be obtained, and the construction period can be shortened.

[0009] However, in case where the asphalt sheet process is carried out in an exposed waterproofing mode, as the waterproof sheet is exposed to the sunlight for a longer period of time, the surface thereof is deteriorated and thus the service life is disadvantageously shortened. That is, the ultraviolet rays contained in the sunlight accelerates the polymerization of hydrocarbon molecules in the waterproof asphalt sheet and thus carbonizes the surface thereof, thereby causing a crack in the asphalt and thus a water leakage therefrom. In addition, the asphalt material is susceptible to heat, and thus when a fire is caught, it is easily melted down and generates poisonous gases.

[0010] In order to solve these problems, commonly a protective mortar layer or a crushed aggregate layer has been formed on top of the asphalt sheet. In particular, U.S. Pat. No. 5,906,759 discloses a protection structure of an asphalt sheet, in which an aluminum foil is laminated on the asphalt sheet to protect the lower asphalt layer. The aluminum foil, which is attached to the top of the waterproof asphalt sheet, reflects the sunlight and blocks harmful ultraviolet rays from asphalt, thereby lengthening the service life of the waterproof asphalt sheet. In addition, since aluminum is very resistant to heat, with the aluminum foil attached, the fire-retardancy of the entire waterproof structure including the waterproof asphalt sheet is significantly improved.

[0011] However, in case of the conventional waterproof asphalt sheet having an aluminum surface, the aluminum foil laminated on top thereof reacts with oxygen in the air and thus is easily oxidized. If the aluminum foil is oxidized, rust is created in the surface thereof so that its fire-retardancy is deteriorated and at the same time its surface gloss is lost thereby lowering the reflectivity to the sunlight. Consequently, the function as a cool roof system is lost.

[0012] The cool roof system is one of various approaches for minimizing the electric energy consumed for cooling purpose. In other words, light colored materials having a higher reflectivity to the sunlight are applied to the rooftop of buildings, instead of traditional dark colored ones. Therefore, the solar heat is prevented from being transferred into the inside of the building, thereby minimizing heating-up of the interior of the building. As a method of realizing the cool roof system, a white colored polymer layer is formed on the roof surface, or a roof shingle is installed. Generally, the former method has been widely used.

[0013] As described above, in case of the aluminum foil, the sunlight is reflected to some extent to thereby serve as a cool roof system. However, as time passes, its surface is oxidized to reduce the reflectivity to the sunlight, and the aluminum foil is contacted with alkaline component of the bottom concrete and easily corroded. Therefore, an adequate reflectivity to be acceptable as a cool roof system cannot be maintained. There is a need to provide an improved solution.

[0014] The process for placing the conventional waterproof asphalt sheet including the aluminum-laminated asphalt sheet is hereafter explained. First, a primer is coated, and then the waterproof asphalt sheet is installed. The waterproof asphalt sheets are placed in a way that they are arranged in such a way that the edges of neighboring sheets are overlapped. Thereafter, the overlapped connecting portions (edges) are heat-melted and adhered using a torch or the like, to thereby provide waterproofing.

[0015] However, in this method, since the connecting portions are heated up and melted in order to adhere them together, excessive heat may result in damage and deformation of the sheet. In contrast, if an adequate amount of heat is not applied, the connecting portions cannot be adhered uniformly, which may lead to a water leakage.

[0016] In order to solve the above problems, Korean Laid-open Patent No. 2001-95666 discloses a joint sealing structure (also known as an L-joint structure) for the waterproof asphalt sheets. This joint structure is composed of asphalt sheets installed with a certain gap in between, a melted asphalt filled in the gap, a reinforced fiber cloth
installed above the melted asphalt, and another melted asphalt coated on the reinforced fiber cloth. In case where this joint sealing structure can be used, the connecting portions of the sheet can be uniform covered by the melted asphalt, thereby enabling a perfect waterproofing treatment.

[0017] However, the above-described 1-joint structure fails to guarantee fire-retardancy for the connecting portions between the sheets, even in the case of the aluminum-surfaced asphalt sheet as described previously. It is because the connecting portions between the sheets are composed of only asphalt, although the asphalt sheet itself has a fire-retardancy by means of the aluminum foil attached to the surface of the asphalt sheet. As described above, if the connecting portions between the sheets do not exhibit a proper fire-retardancy, the fire-retardancy for the whole waterproofing system would not be acceptable.

[0018] Therefore, even in case where a fire-retardancy is provided as in the aluminum-surfaced asphalt waterproof sheet, in order to apply the 1-joint sealing structure to the connection portions between the sheets, an appropriate improvement is required so as to provide an adequate fire-retardancy to the connecting portions.

SUMMARY OF THE INVENTION

[0019] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide a waterproof asphalt sheet suitable for a cool roof system, in which the problems with the aluminum waterproof sheet is eliminated, its fire-retardancy is maintained semi-permanently, and at the same time a high reflectivity to the sunlight is achieved.

[0020] Another object of the invention is to provide a waterproof asphalt sheet, which does not require any separate cool roof coating work.

[0021] A further object of the invention is to provide a joint sealing structure for the waterproof asphalt sheet for a cool roof, in which, in the case where the conventional 1 joint process is applied to the waterproof asphalt sheet for a cool roof according to the invention, its fire-retardancy can be maintained over the entire waterproofing area including the connecting portion between the sheets.

[0022] To accomplish the above objects, according to an aspect of the present invention, there is provided a waterproof sheet structure suitable for a cool roof system and having fire-retardancy.

[0023] The waterproof sheet structure includes a waterproof sheet layer, and a top reinforce layer placed on one side of the waterproof layer. The top reinforce layer is impregnated in a liquid polymer and then dried, and is treated to have a light color so that the waterproof layer that lies under the top reinforce layer is prevented from being heated.

[0024] The waterproof sheet layer may be made of an asphalt sheet.

[0025] Preferably, the asphalt sheet has a thickness in a range from about one (1) to about five (5) mm. More preferably, the asphalt sheet has a thickness in a range from about one half (1.5) to about three (3) mm.

[0026] The liquid polymer has fire retardant property so that the top reinforce layer, and thus the entire sheet structure has fire retardant property that is required for a roof.

[0027] The top reinforce layer may be made of a fiber glass cloth.

[0028] The fiberglass cloth includes a plurality of glass fibers woven with one another, and wherein the polymer fill gaps between the woven fibers.

[0029] The polymer is impregnated onto the fiberglass cloth in such a thickness so that there are no glass fibers exposed out of the polymer.

[0030] Each of the waterproof sheets is made by forming the fiberglass cloth, and then coating asphalt on the fiberglass cloth with a constant thickness.

[0031] The fiber glass cloth is soaked in the liquid polymer, and then dried at a temperature in a range from about 100 to about 150 degree Celsius for a time period in a range from about 3 to about 5 minutes.

[0032] Preferably, the fiberglass cloth has a thickness in a range from about 0.1 to about 0.3 mm.

[0033] The waterproof sheet structure may further include a base layer placed on the other side of the waterproof layer.

[0034] The top reinforce layer and the base layer are laminated on the sides of the waterproof layer.

[0035] The base layer may be a fiber non-woven fabric, a fine sand layer, or a polyester film.

[0036] The liquid polymer is selected from the group consisting of acrylic resin, epoxy resin, polyurea resin, and polyurethane.

[0037] The fiber non-woven fabric functions to enhance the tensile strength of the asphalt sheet.

[0038] The fiberglass cloth functions to prevent the lower asphalt sheet from the ultraviolet rays of the sunlight, and is laminated above the asphalt sheet to provide a fire-retardancy.

BRIEF DESCRIPTION OF THE DRAWINGS

[0039] The above and other objects, features and advantages of the present invention will be apparent from the following detailed description of the preferred embodiments of the invention in conjunction with the accompanying drawings, in which:

[0040] FIGS. 1(a) and 1(b) are a perspective view and a cross-section showing a waterproof sheet structure for a cool roof according to one embodiment of the invention;

[0041] FIGS. 2(a) and 2(b) are a perspective view and a cross-section showing a waterproof sheet structure for a cool roof according to another embodiment of the invention;

[0042] FIGS. 3(a) and 3(b) are a perspective view and a cross-section showing a waterproof sheet structure for a cool roof according to further embodiment of the invention;

[0043] FIG. 4 illustrates a joint sealing structure of waterproof sheets according to the invention;

[0044] FIG. 5 illustrates a practical construction of the joint sealing structure of the invention;

[0045] FIG. 6 schematically shows glass fibers of which a fiberglass cloth is consisting;
FIG. 7 is a schematic cross section that illustrates the glass fibers are completely impregnated in polymer;

FIG. 8 is a schematic cross sectional view illustrating an asphalt layer is formed on the fiberglass cloth that is impregnated with the polymer; and

FIG. 9 is a cross sectional view showing a fiberglass tape covered directly over the joining region of two waterproof sheets.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference will now made in detail to the preferred embodiment of the present invention with reference to the attached drawings.

FIGS. 1(a) and 1(b) illustrate a waterproof sheet structure 4 of a cool roof according to one embodiment of the invention. The waterproof asphalt sheet 4 of the invention comprises a fiber non-woven fabric 10, an asphalt sheet 20, and a glass fiber fabric 30 which will be hereafter explained in sequence from the lowest layer.

The fiber non-woven fabric 10 constitutes the lowest layer of the waterproof sheet structure. The fiber non-woven fabric 10 serves as reinforcement for strengthening the waterproof sheet structure of the invention. The specific material for the fiber non-woven fabric 10 is not particularly limited, and a non-woven fabric made of a synthetic fiber such as polyester can be employed in common.

The fiber non-woven fabric 10 is composed of numerous fibers and serves as enhancing the tensile strength of the waterproof asphalt sheet for a cool roof. At the same time, in case where the waterproof asphalt sheet 20 for a cool roof according to the invention employs an I-joint for connecting plural sheets, a liquid polymer to be filled from above permeates between the fiber non-woven fabrics and adhered thereto. Therefore, the bonding between the waterproof sheet and the polymer liquid is more strengthened to thereby further improve the effect of waterproofing. The fiber non-woven fabric 10 is laminated or adhered with the asphalt sheet 20 by heat-melting or by an adhesive material.

The asphalt sheet 20 is formed above the fiber non-woven fabric 10. According to the invention, the thickness of the asphalt sheet 20 varies with applications. In practice, a thickness of 1.5-5 mm is applied. However, preferably a thickness of 1.5-3 mm is suitable.

Above the asphalt sheet 20 is formed a fiberglass cloth 30. According to the invention, the fiberglass cloth 30 is woven transversally and longitudinally of fiberglass. The fiberglass cloth 30 holds a thickness of 0.1-0.3 mm such that the waterproof sheet structure has an adequate fire-resistant property. The fiberglass cloth 30 is laminated or adhered with the asphalt sheet 20 by heat-melting or by an adhesive material.

The fiberglass cloth 30 is formed by a method in which transversely and longitudinally woven fiberglass is embedded into a liquid polymer 31 and then dried. The fiberglass cloth 30 is treated to have a light color such that it reflects the sunlight to prevent the lower layer from heating up.

In other words, the fiberglass cloth 30 is fabricated in such a manner that fiberglass is soaked in the liquid polymer 31, and the fiberglass soaked with the liquid polymer 31 is dried in a drying chamber at 100-150°C. for 3-5 minutes through hot air, thereby curing the polymer 31.

As the polymer 31, acrylic resin, epoxy resin, polyurea, and polyurethane are preferred. Particularly, acrylic resin is most preferred. In addition, it is preferable that the polymer 31 is fire-retard-treated and thus has a fire resistance in itself.

The fiberglass cloth 30 constitutes the uppermost layer of the waterproof asphalt sheet of the invention. The fiberglass cloth 30 reflects the sunlight such that the lower layers of the waterproof asphalt sheet and the roof structure are prevented from being heated up due to the sunlight. Therefore, the fiberglass cloth 30 has a color having a high reflectivity to the sunlight. In particular the while color is preferable.

The fiberglass cloth 30 is cured with the polymer 31, and then may be introduced into a construction site and installed, independently from the asphalt sheet 20. It is however preferred to be formed integrally with the fiber non-woven fabric 10 and the asphalt sheet 20 in the factory. In this way, in case where the fiberglass cloth 30, the asphalt sheet 20 and the fiber non-woven fabric 10 are integrally formed in a factory and delivered to the construction site, if the waterproof asphalt sheet for a cool roof according to the invention is installed at the construction site, a waterproof work, a fire-resistance work, and a cool roof coating work are simultaneously carried out.

FIGS. 2(a) to 3(b) illustrate a waterproof asphalt sheet for a cool roof according to another embodiment of the invention.

FIGS. 2(a) and 2(b) show another embodiment of the invention, in which below the asphalt sheet 20 is formed a fine sand layer 11 instead of the fiber non-woven fabric 10. In FIGS. 3(a) and 3(b), a polyester film 12 is formed, instead of the fiber non-woven fabric 10.

FIG. 4 illustrates a joint sealing structure for the asphalt sheets according to one embodiment of the invention. In FIG. 4, a joint sealing structure between neighboring two waterproof asphalt sheets is illustrated. A first asphalt sheet 100 and a second waterproof asphalt sheet 200 for a cool roof are installed in such a manner that their edges are spaced apart from each other with a desired gap in-between. A liquid polymer is coated above the connecting portion between the first and second waterproof asphalt sheets 100, 200 and filled inside the gap in-between. A polymer filled portion 40 is formed in such a way to be projected in a convex form upwards the first and second waterproof asphalt sheet 100, 200. Each of the first and second waterproof asphalt sheet 100, 200 is composed of an asphalt sheet 20, a fiberglass cloth 30 laminated on top of the asphalt sheet 20, and a fiber non-woven fabric 10 formed underneath the asphalt sheet 20. The fiberglass cloth 30 is impregnated with a liquid polymer 31 and dried, and treated to have a light color such that the lower layer thereof can be prevented from being heated up by reflecting the sunlight. The polymer 31 itself has a fire-retardant property.

On the other hand, a fine sand layer 11 may be formed as shown in FIGS. 2(a) and 2(b), or a polyester film 12 may be formed as depicted in FIGS. 3(a) and 3(b), instead of the fiberglass cloth 10.
The polymer used for the polymer filled portion 40 has a waterproofing property and also a fire-retardant characteristic. The polymer is selected from acrylic resin, epoxy resin, polyurethane, polyurea, and asphalt. In particular, polyurethane, or polyurea can be placed in a liquid state at room temperature, and, similar to where asphalt is used, they do not require any heating process so that they can be used very conveniently.

Similar to the polymer 31 impregnated and cured in the fiberglass cloth 30, the polymer used in the polymer filled portion 40 employs one treated to have a light color. Therefore, the entire waterproofing area including the connecting portion forms a cool roof system, including the area where the waterproof asphalt sheet of the invention is placed.

Referring back to FIG. 4, a fiberglass tape 50 is further provided above the polymer filled portion 40, in such a way to enclose the polymer filled portion along the gap between the first and second waterproof asphalt sheets 100, 200. Similar to the fiberglass cloth 30, the fiberglass tape 50 is impregnated with a liquid polymer having a waterproofing and fire-retardant properties, and then dried. Similarly, it is treated to have a light color so as to reflect the sunlight and thus prevent the heating-up of the lower layers.

In this way, in case where the fiberglass tape 50 is installed additionally, the fire-retardant characteristic of the waterproof asphalt sheet of the invention is further strengthened. It is because the polymer filled portion 40 itself has a fire-retardant property and also the fiberglass tape 50 installed above the polymer filled portion 40 has a fire-retardant characteristic.

In case where the fire-retardancy of the polymer filled portion 40 is determined to be adequate, the fiberglass tape 50 may be omitted.

Referring to FIG. 5, a method of forming the joint sealing structure between the waterproof asphalt sheets is explained.

First, the waterproof asphalt sheets 100 and 200 for a cool roof are spread-installed on the roof surface in such a manner that the two neighboring waterproof asphalt sheets 100 and 200 have a desired gap in-between. Preferably, the gap between the neighboring waterproof asphalt sheets 100 and 200 is about 0.7-1.5 cm, and more preferably, about 1.0 cm.

The connecting portion formed between the neighboring waterproof asphalt sheets 100 and 200 is coated with a liquid polymer such as polyurethane so as to fill the gap between the sheets. In this step, the liquid polymer is coated adequately to the extent that it can fill the entire gap between the waterproof asphalt sheets 100 and 200 and further cover slightly the upper portion thereof.

The fiberglass tape 50 is installed above the polymer filled portion 40, which is filled with a liquid polymer as described above. In this step, the width of the fiberglass tape 50 is chosen to be wider than the gap between the waterproof asphalt sheets 100 and 200, such that the whole waterproofing area is covered with fiberglass. In case where the gap between the waterproof asphalt sheets 100 and 200 is 1 cm, the width of the tape is suitable to be about 10-15 cm. For the convenience of installation, the fiberglass tape 50 is preferred to be manufactured in the form of a self-adhesive type.

In this way, the whole area to be waterproofed, which includes the asphalt sheet 20 and the polymer filled portion 40, is covered with the fiberglass cloth 30 and the fiberglass tape 50. The fiberglass cloth 30 and the fiberglass tape 50 are impregnated and dried in the liquid polymer 31, and treated to have a light color so as to prevent heating-up of the lower layer by reflecting the sunlight. Therefore, the whole waterproofing area serves as a cool roof system.

As shown in FIGS. 6 and 7, the fiberglass cloth 30 includes a plurality of glass fibers 52 woven with one another. When the fiberglass cloth 30 is impregnated with the polymer 31, the polymer 31 fill gaps between the woven fibers 52. The polymer 31 is impregnated onto the fiberglass cloth 30 in such a thickness so that there are no glass fibers 52 exposed out of the polymer 31.

As shown in FIG. 8, the waterproof sheet is made by forming the fiberglass cloth 30 as explained above referring FIGS. 6 and 7, and then coating asphalt 54 on the fiberglass cloth 30 with a constant thickness.

This process of forming an asphalt layer is commonly called ‘asphalt knife coating.’ As shown in FIG. 8, molten asphalt 54 is poured over the fiberglass cloth 30. A knife 56 regulates the thickness of the asphalt sheet 20 as the asphalt solidifies. Since the fiberglass cloth 30 is made so that a fluid cannot penetrate into it, molten asphalt can be poured directly onto the fiberglass cloth 30 without the problem of leaking.

With the above construction, manufacture of the waterproof asphalt sheet 4 is substantially simplified. This is because the top reinforce layer, or the fiberglass cloth provides light color and fire retardancy, which are required for external portion of a waterproof structure, and provides a fluid tight layer that facilitates asphalt coating.

The present invention also has a great advantage over the prior art in the aspect of maintaining uniform appearance. In the prior art, waterproof sheets were joined by overlapping edges of adjacent waterproof sheets, and surface layer such as aluminum layer was not provided on the overlapping portion of the waterproof sheet. This increased complexity of manufacturing. Since the waterproof sheet of the present invention does not require overlapping to join the sheets, the entire sheet can be manufactured as a single uniform sheet.

Referring back to FIG. 4, preferably, the width a of the gap between the first and second waterproof sheets is in a range from about 0.7 cm to about 1.5 cm, and the width b of the fiberglass tape 50 is in a range from about 10 cm to 15 cm.

As shown in FIG. 9, the fiberglass tape 50 may be installed over the area that the edges of the first waterproof sheet and the second waterproof sheet are adjacent positioned without a polymer-filled portion between the sheets.

The present invention provides the following advantageous effects.

First, the invention eliminates the problems with the aluminum waterproof sheet, maintains its fire-retardancy.
semi-permanently, and at the same time has a high reflectivity to the sunlight, thereby providing a waterproof asphalt sheet suitable for a cool roof system.

[0083] That is, in the case of the conventional waterproof asphalt sheet having an aluminum surface, the aluminum foil laminated on top thereof reacts with oxygen in the air and thus is oxidized easily, so that its fire-retardancy is deteriorated. Also, the gloss of the aluminum foil surface is easily lost so that the reflectivity to the sunlight is significantly lowered. Therefore, it cannot function properly as a cool roof system. In the present invention, however, on top of the asphalt sheet 20 is installed the fiberglass cloth 30, which is treated to have a light color, such that its fire-retardancy and reflectivity to the sunlight can be maintained for a long time. Therefore, a waterproof asphalt sheet suitable for a cool roof system can be achieved.

[0084] Second, the present invention provides a waterproof asphalt sheet, which does not require any separate cool roof coating work.

[0085] In other words, according to the present invention, the asphalt sheet 20 is integrally formed with the fiberglass cloth 30, which is treated to have a light color and formed above the asphalt sheet 20. The waterproof asphalt sheet of the invention can be simply cut and installed in the construction site to thereby provide a cool roof system. As such, it does not require any separate coating process for enhancing the reflectivity to the sunlight.

[0086] Third, in the case where the joint process is adopted to the waterproof asphalt sheet for a cool roof according to the invention, a joint sealing structure for the waterproof asphalt sheet for a cool roof can be provided, in which its fire-retardancy can be maintained over the entire waterproofing area including the connecting portion between the sheets.

[0087] In other words, the connecting portion between the first and second waterproof asphalt sheets 100 and 200 is coated with a liquid polymer having a waterproofing and fire-retardant characteristics, to thereby form the polymer filled portion 40. Above the polymer filled portion 40 is additionally installed the fiberglass tape 50 having a fire-retardancy. Therefore, a fire-retardancy can be maintained over the entire waterproofing area including the connecting portion.

[0088] While the present invention has been described with reference to the particular illustrative embodiments, it is not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

What is claimed is:

1. A waterproof sheet structure for a cool roof comprising:
   a) a waterproof sheet layer; and
   b) a top reinforce layer placed on one side of the waterproof layer;

wherein the top reinforce layer is impregnated in a liquid polymer and then dried, and is treated to have a light color.

2. The waterproof sheet structure according to claim 1, wherein the waterproof sheet layer comprises an asphalt sheet.

3. The waterproof sheet structure according to claim 1, wherein the asphalt sheet has a thickness in a range from about one (1) to about five (5) mm.

4. The waterproof sheet structure according to claim 3, wherein the asphalt sheet has a thickness in a range from about one half (1.5) to about three (3) mm.

5. The waterproof sheet structure according to claim 1, wherein the liquid polymer has fire retardant property.

6. The waterproof sheet structure according to claim 1, wherein the top reinforce layer comprises a fiberglass cloth.

7. The joint sealing structure according to claim 7, wherein the fiberglass cloth comprises a plurality of glass fibers woven with one another, and wherein the polymer fills gaps between the woven fibers.

8. The joint sealing structure according to claim 8, wherein the polymer is impregnated onto the fiberglass cloth in such a thickness so that there are no glass fibers exposed out of the polymer.

9. The joint sealing structure according to claim 7, wherein each of the waterproof sheets is made by forming the fiberglass cloth, and then coating asphalt on the fiberglass cloth with a constant thickness.

10. The waterproof sheet structure according to claim 7, wherein the fiber glass cloth is soaked in the liquid polymer, and then dried at a temperature in a range from about 100 to about 150 degree Celsius.

11. The waterproof sheet structure according to claim 11, wherein the fiber glass cloth is dried for a time period in a range from 3 to about 5 minutes.

12. The waterproof sheet structure according to claim 7, wherein the fiber glass cloth has a thickness in a range from about 0.1 to about 0.3 mm.

13. The waterproof sheet structure according to claim 12, further comprising a base layer placed on the other side of the waterproof layer.

14. The waterproof sheet structure according to claim 13, wherein the top reinforce layer is laminated on one side of the waterproof sheet layer, and wherein the base layer is laminated on the other side of the waterproof layer.

15. The waterproof sheet structure according to claim 14, wherein the base layer comprises a fiber non-woven fabric.

16. The waterproof sheet structure according to claim 15, wherein the base layer comprises a fine sand layer.

17. The waterproof sheet structure according to claim 14, wherein the base layer comprises a polyester film.

18. The waterproof sheet structure according to claim 17, wherein the base layer comprises a polyester film.

19. The waterproof sheet structure according to claim 1, wherein the liquid polymer is selected from the group consisting of acrylic resin, epoxy resin, polyurea resin, and polyurethane.

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