



- (51) International Patent Classification:
E04D 5/14 (2006.01) *E04D 11/02* (2006.01)
- (21) International Application Number:
PCT/US2023/062048
- (22) International Filing Date:
06 February 2023 (06.02.2023)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
63/306,699 04 February 2022 (04.02.2022) US
- (71) Applicant: **HOLCIM TECHNOLOGY LTD.** [CH/CH];
Grafenauweg 10, 6300 Zug (CH).
- (72) Inventor; and
- (71) Applicant (for US only): **TANG, Jiansheng** [CN/US];
13679 Cunningham Drive, Westfield, Indiana 46074 (US).
- (72) Inventors: **MURTY, Bona**; c/o Holcim Technology Ltd.,
26 Century Blvd, Suite 205, Nashville, Tennessee 37214
(US). **SONG, Linyong**; 9983 Soaring Eagle Lane, Fishers,
Indiana 46055 (US).
- (74) Agent: **REGINELLI, Arthur M.** et al.; Renner, Kenner,
106 S. Main Street, Suite 400, Akron, Ohio 44308 (US).
- (81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE,
KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU,
LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG,

(54) Title: METHOD FOR CONSTRUCTING A ROOF SYSTEM USING ADHESIVE TRANSFER FILMS ADHERING CONSTRUCTION COMPONENTS

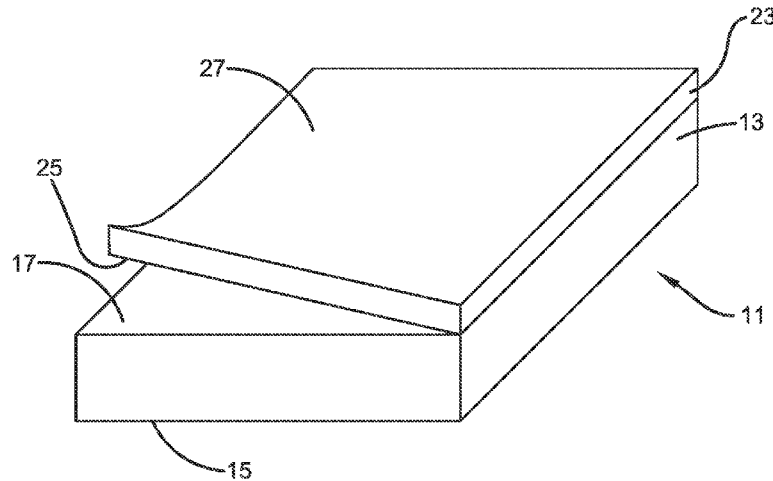


FIG. 1

(57) Abstract: A method for constructing a roof system, the method comprising (i) applying an adhesive transfer film composite to a roof substrate, where the adhesive transfer film composite includes an adhesive body having first and second planar surfaces and a release member removably attached to the second planar surface of the adhesive body, where the adhesive body is devoid of a carrier layer, and where the adhesive body includes a crosslinked network of acrylate-based polymers, whereby said step of applying secures the first planar surface of the adhesive body to the roof substrate; (ii) removing the release member to thereby expose the second planar surface of the adhesive body; and (iii) applying a construction element to the second planar surface of the adhesive body to thereby adhere the construction element to the substrate.



NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

METHOD FOR CONSTRUCTING A ROOF SYSTEM USING ADHESIVE TRANSFER FILMS ADHERING CONSTRUCTION COMPONENTS

[0001] This application claims the benefit of U.S. Provisional Application Serial No. 63/306,699 filed on February 04, 2022, which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] Embodiments of the present invention provide an adhesive transfer film and its use in adhering construction components. Particular embodiments are directed toward methods of constructing roof systems, the method including adhering one or more layers of construction boards, such as insulation board, within the roof system by using the transfer film.

BACKGROUND OF THE INVENTION

[0003] Pressure-sensitive adhesives have been used in the construction industry. For example, in the construction of low-sloped or flat roofs, polymeric single-ply membranes including a layer of pressure-sensitive adhesive have been used. The pressure-sensitive adhesive is used to secure the membrane to the underlying surface. The membrane provides a weather-protective layer for the roof system. These membrane composites are advantageously installed by the so-called “peel-and-stick” method. Numerous advantages are realized by using peel-and-stick methods including reduced installation time and labor, as well as the fact that the adhered systems can be formed without the use of significant volatile organic compounds.

[0004] Also, the construction of membranes carrying a pressure-sensitive adhesive is relatively straightforward since efficient techniques are available for applying the pressure-sensitive adhesive to the membrane within a factory setting. For example, the pressure-sensitive adhesive can be efficiently applied to the surface of a membrane as a hot-melt composition using relatively common coating techniques.

[0005] The skilled person appreciates that many flat or low-sloped roof systems also include one or more layers of construction board disposed between the roof deck and the membrane. In many situations, this may include a multi-layered assembly that includes, for

example, two or more layers of insulation board and a layer of coverboard to protect the insulation board layer. The insulation boards, which are often referred to as board stock, can include a polyisocyanurate foam body that often ranges in thickness of from about 2 to about 4 inches. These boards also typically carry opposed facers that sandwich the foam body. In multi-layered roof systems, the bottom insulation layer is often mechanically fastened to the roof deck, and the subsequent layers, including the coverboard layer, can advantageously be adhered using, for example, a low-rise foam adhesive.

[0006] While low-rise foam adhesives are commonly used where there is a desire to adhere construction boards in place, it has also been proposed to factory-apply a pressure-sensitive adhesive to the facer of the boards. In other words, like the membranes that carry a pressure-sensitive adhesive layer, the construction boards can likewise be installed using the peel-and-stick installation method. Construction boards that carry a pressure-sensitive adhesive layer, however, suffer from several drawbacks. First, it is difficult to apply the pressure-sensitive adhesive to, for example, prior to construction of the foam core. In other words, attempts to apply the pressure-sensitive adhesive to the facer prior to mating the facer to the foam has proven difficult because of the heat associated with the foam-forming process. And, the presence of the pressure-sensitive adhesive can frustrate board finishing, which includes cutting and trimming the boards to a desired size. As a result, construction boards that carry a factory-applied pressure-sensitive adhesive layer are often constructed by applying the pressure-sensitive adhesive layer after construction of the board, which necessitates a fairly time-consuming processes.

SUMMARY OF THE INVENTION

[0007] One or more embodiments of the present invention provide a method for constructing a roof system, the method comprising (i) applying an adhesive transfer film composite to a roof substrate, where the adhesive transfer film composite includes an adhesive body having first and second planar surfaces and a release member removably attached to the second planar surface of the adhesive body, where the adhesive body is devoid of a carrier layer, and where the adhesive body includes a crosslinked network of acrylate-based polymers, whereby said step of applying secures the first planar surface of the adhesive body to the roof substrate; (ii) removing the release member to thereby expose

the second planar surface of the adhesive body; and (iii) applying a construction element to the second planar surface of the adhesive body to thereby adhere the construction element to the substrate.

[0008] Yet other embodiments of the present invention provide a process of constructing a roof system, the process comprising (i) providing a roof system including a first layer of insulation boards mechanically secured to a roof deck, said first layer of insulation boards including an exposed surface; (ii) applying a transfer film composite to a portion of the exposed surface of the first layer of insulation boards, where the transfer film composite includes an adhesive body having first and second planar surfaces and an optional release member removably attached to the second planar surface of the adhesive body, where said step of applying includes mating the first planar surface of the adhesive body to a portion of the exposed surface of the layer of insulation boards; (iii) optionally removing the optional release member to thereby expose the second planar surface of the adhesive body; and (iv) applying a construction board to the second planar surface of the adhesive body to thereby adhere the construction board to a portion of the layer of construction boards.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Fig. 1 is a perspective view of an adhesive composite employed in the present invention.

[0010] Fig. 2 is a perspective view of an adhesive composite employed in the present invention.

[0011] Fig. 3 is a flow diagram outlining processes according to the present invention.

[0012] Fig. 4 is a cross-sectional view of a roof system constructed according to embodiments of the invention.

DETAILED DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0013] Embodiments of the invention are based, at least in part, on the discovery of an adhesive transfer film and its use in building construction, particularly in the construction of a roof system for flat or low-sloped roofs. The adhesive transfer film includes a layer of pressure-sensitive adhesive. While the prior art contemplates adhesive tapes, which include

a substrate, which may be referred to as a backing layer or carrier layer, for use in the construction industry, it has been unexpectedly found that the adhesive films of the present invention, which do not include a substrate or backing layer, provide a technological advantage in securing construction components, particularly on roof surfaces. Without wishing to be bound by any particular theory, it is believed that the absence of the backing layer in combination with the adhesive composition offers advantages over the prior art. As a result, embodiments of the invention also provide methods for installing construction components, such as components of a roof system, by using the adhesive transfer film of the present invention. Moreover, embodiments of the invention are directed toward the discovery that the adhesive transfer films of the invention are useful in securing construction boards to a roof deck or underlying layer of a roof system. While the prior art contemplates the use of construction boards with factory-applied pressure-sensitive adhesive layers, the use of a transfer film during field construction of the roof system overcomes disadvantages associated with the use of construction boards carrying factory-applied pressure-sensitive adhesive layers.

TRANSFER FILM COMPOSITE

[0014] As suggested above, an adhesive transfer film is employed in practicing the present invention. In one or more embodiments, the adhesive transfer film includes an adhesive body that may be provided within a composite that includes the adhesive body and a release member. In this regard, reference can be made to Fig. 1, which shows composite 11 including adhesive body 13 and release member 23. Adhesive body 13 may generally be in the form of a sheet including first planar surface 15 and an opposed second planar surface 17. Release member 23 includes a first contacting surface 25 and an opposed second surface 27. First contacting surface 25 of release member 23 is removably attached to second planar surface 17 of adhesive body 13. In one or more embodiments, release member 23, through contacting surface 25, is in contact with at least substantially all of second planar surface 17 of adhesive body 13.

[0015] In one or more embodiments, the composite is provided to the location of installation (e.g. at a roof site) in the form of a roll. The skilled person appreciates that in order for the roll to be useful, it must be capable of being unwound and installed into place within the roof system. The nature of the release member is therefore important. For

example, where the composite includes a single release member, as shown in Fig. 1, both surfaces of the release member are adapted to be released from the adhesive body. In other words, as the skilled person will appreciate, in order to roll composite 11 onto itself, first planar surface 15 of adhesive body 13 will contact top surface 27 of release member 23 when rolled.

[0016] In other embodiments, the composite includes two opposed release members. In this respect, reference is made to Fig. 2, which shows composite 11' including adhesive body 13, first release member 23, and second release member 33. First release member 23 includes contacting surface 25 and opposed surface 27. Second release member 33 includes contacting surface 37 and opposed surface 35. Contacting surface 25 of release member 23 is removably attached to first surface 17 of adhesive body 13. Similarly, contacting surface 37 of release member 33 is removably attached to first surface 15 of adhesive body 13.

ADHESIVE BODY

[0017] In one or more embodiments, adhesive body 13, which may also be referred to as an adhesive layer 13, includes a pressure-sensitive adhesive. In one or more embodiments, the adhesive body is substantially pressure-sensitive adhesive; for example, the adhesive body may include a homogeneous (or substantially homogeneous) mass of pressure-sensitive adhesive. Reference may also be made to a 100% adhesive body. In one or more embodiments, the adhesive body is devoid of a backing substrate, such as a fabric backing, which commonly serves as a substrate or carrier layer in many tapes.

[0018] From the standpoint of composition, the adhesive body may include a single chemical constituent, or in the other embodiments, the adhesive body may be a blend of chemical constituents that work together to form the pressure-sensitive adhesive.

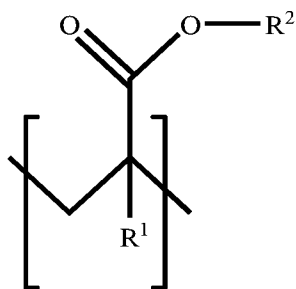
[0019] In one or more embodiments, the adhesive body includes, as major polymeric component, a rubber such as ethylene-propylene-diene rubber, ethylene-propylene rubber, polychloroprene, and/or butyl rubber. Exemplary pressure-sensitive adhesive compositions based upon rubbers are disclosed in U.S. Patent Nos. 9,296,927, 9,068,038, 8,347,932, and 5,859,114, which are incorporated herein by reference.

[0020] In other embodiments, the adhesive body includes a hot-melt pressure-sensitive adhesive composition. Exemplary hot-melt pressure-sensitive adhesive compositions that

may be employed in practicing the present invention include those compositions based upon acrylic polymers, butyl rubber, ethylene vinyl acetate, natural rubber, nitrile rubber, silicone rubber, styrene block copolymers, ethylene-propylene-diene rubber, atactic polyalpha olefins, and/or vinyl ether polymers. In combination with these base polymers, the pressure-sensitive adhesive compositions may include a variety of complementary constituents such as, but not limited to, tackifying resins, waxes, antioxidants, and plasticizers. Pressure-sensitive adhesives that are useful in practicing the present invention are known in the art as described, for example, in U.S. Patent No. 8,968,853, which is incorporated herein by reference.

[0021] In particular embodiments, the adhesive body is a cured, hot-melt pressure sensitive adhesive. Cured pressure-sensitive adhesives that are useful in practicing the present invention are known in the art as described, for example, in International Publ. No. WO 2015/042258, which is incorporated herein by reference.

[0022] In one or more embodiments, the curable hot-melt adhesive that may be used for forming the cured pressure-sensitive adhesive layer may be an acrylic-based hot-melt adhesive. In one or more embodiments, the acrylic-based hot-melt adhesive is a polyacrylate, which may also be referred to as acrylate-based polymers or polyacrylate elastomer. In one or more embodiments, the acrylic-based hot-melt adhesive may include two or more chemically distinct polyacrylates. In one or more embodiments, useful polyacrylates include one or more units defined by the formula:



where each R^1 is individually hydrogen or a hydrocarbyl group and each R^2 is individually a hydrocarbyl group. In the case of a homopolymer, each R^1 and R^2 , respectively, throughout the polymer are same in each unit. In the case of a copolymer, at least two different R^1 and/or two different R^2 are present in the polymer chain.

[0023] In one or more embodiments, hydrocarbyl groups include, for example, alkyl, cycloalkyl, substituted cycloalkyl, alkenyl, cycloalkenyl, substituted cycloalkenyl, aryl, substituted aryl, aralkyl, alkaryl, allyl, and alkynyl groups, with each group containing in the range of from 1 carbon atom, or the appropriate minimum number of carbon atoms to form the group, up to about 20 carbon atoms. These hydrocarbyl groups may contain heteroatoms including, but not limited to, nitrogen, oxygen, boron, silicon, sulfur, and phosphorus atoms. In particular embodiments, each R^2 is an alkyl group having at least 4 carbon atoms. In particular embodiments, R^1 is hydrogen and R^2 is selected from the group consisting of butyl, 2-ethylhexyl, and mixtures thereof.

[0024] In one or more embodiments, the polyacrylates that are useful for forming the adhesive body in the practice of this invention may be characterized by a glass transition temperature (T_g) of less than 0 °C, in other embodiments less than -20 °C, in other embodiments less than -30 °C. In these or other embodiments, useful polyacrylates may be characterized by a T_g of from about -70 to about 0 °C, in other embodiments from about -50 to about -10 °C, and in other embodiments from about -40 to about -20 °C.

[0025] In one or more embodiments, the polyacrylates that are useful as adhesives in the practice of this invention may be characterized by a number average molecular weight of from about 100 to about 350 kg/mole, in other embodiments from about 150 to about 270 kg/mole, and in other embodiments from about 180 to about 250 kg/mole.

[0026] In one or more embodiments, the polyacrylates that are useful as adhesives in the practice of this invention may be characterized by a Brookfield viscosity at 150 °C of from about 20,000 to about 70,000 cps, in other embodiments from about 30,000 to about 60,000 cps, and in other embodiments from about 40,000 to about 50,000 cps.

[0027] Specific examples of polyacrylates that are useful as adhesives in the practice of the present invention include poly(butylacrylate), and poly(2-ethylhexylacrylate). These polyacrylates may be formulated with photoinitiators, solvents, plasticizers, and resins such as natural and hydrocarbon resins. The skilled person can readily formulate a desirable coating composition. Useful coating compositions are disclosed, for example, in U.S. Patent Nos 6,720,399, 6,753,079, 6,831,114, 6,881,442, and 6,887,917, which are incorporated herein by reference.

[0028] In other embodiments, the polyacrylates may include polymerized units that serve as photoinitiators. These units may derive from copolymerizable photoinitiators including acetophenone or benzophenone derivatives. These polyacrylate elastomers and the coating compositions formed therefrom are known as disclosed in U.S. Patent Nos 7,304,119 and 7,358,319, which are incorporated herein by reference.

[0029] Useful adhesive compositions are commercially available in the art. For example, useful adhesives include those available under the tradename acResin (BASF), those available under the tradename AroCure (Ashland Chemical), Loctite Duro-Tak (Henkel), and NovaMeltRC (NovaMelt). In one or more embodiments, these hot-melt adhesives may be cured (i.e., crosslinked) by UV light.

[0030] In one or more embodiments, the adhesive body substantially includes a cured polyacrylate. In other words, the adhesive body is substantially devoid of other constituents such as plasticizers and the like. In one or more embodiments, the adhesive body includes greater than 90 wt %, in other embodiments greater than 95 wt %, and in other embodiments greater than 99 wt % of the cured polyacrylate, based upon the total weight of the adhesive body.

[0031] In one or more embodiments, the curable adhesive is at least partially cured after being applied to a release member, as will be discussed in greater detail below. In one or more embodiments, the adhesive is cured to an extent that it is not thermally processable in the form it was prior to cure. In these or other embodiments, the cured adhesive is characterized by a cross-linked infinite polymer network. While at least partially cured, the adhesive layer of one or more embodiments is essentially free of curative residue such as sulfur or sulfur crosslinks and/or phenolic compounds or phenolic-residue crosslinks. In one or more embodiments, the adhesive body is characterized by a degree of cure that can be quantified based upon gel content. As the skilled person appreciates, gel content can be determined based upon the level of insoluble material following solvent extraction, which for purposes of this specification refers to solvent extraction using THF at its boiling point following four hours of extraction. These extraction techniques can be performed, for example, using Soxhlet extraction devices. In one or more embodiments, the gel content of the cured adhesive layer, based upon a THF extraction at the boiling point of THF after four hours, is greater than 50%, in other embodiments greater than 55%, and in other

embodiments greater than 60% by weight. In these or other embodiments, the gel content is less than 95%, in other embodiments less than 90%, in other embodiments less than 85%, and in other embodiments less than 80%. In one or more embodiments, the gel content is from about 50% to about 95%, in other embodiments from about 55% to about 90%, and in other embodiments from about 60% to about 85% by weight.

[0032] In one or more embodiments, the adhesive body may be cured by employing one or more curing techniques including, but not limited to, UV curing, electron beam curing, and thermal curing. In particular embodiments, UV curing is employed, and in this respect reference can be made to U.S. Publication Nos. 2016/0230392, 2017/0015083, 2017/0114543, 2019/0071872, 2019/0316359, and 2020/0299965, which are incorporated herein by reference.

[0033] In one or more embodiments, the cure characteristics of the adhesive body are substantially homogeneous through the thickness of the adhesive body. In other words, the degree of cure at any given point along the thickness of the adhesive body does not change appreciably, which refers to deviations that are less than would otherwise have an appreciable impact on the practice of the invention. In other embodiments, the degree of cure varies such that a cure continuum exists from one planar surface to the other planar surface through the thickness of the membrane. In these embodiments, the degree of cure at one planar surface is appreciably greater than the degree of cure at the opposed planar surface such that the adhesive characteristics will be appreciably different at the opposed surfaces to an extent that it will vary practice of the present invention as well as the results thereof.

[0034] In one or more embodiments, the adhesive body is characterized as a solid adhesive mass. In other embodiments, the adhesive body is a cellular body; for example, the adhesive body is foamed. Where the adhesive body is foamed, the adhesive body may be characterized by a density of greater than 0.3, in other embodiments greater than 0.5, and in other embodiments greater than 0.7 g/cm³. In these or other embodiments, the adhesive body may be characterized by a density of less than 1.06, in other embodiments less than 1.03, and in other embodiments less than 1.0 g/cm³. In one or more embodiments, the adhesive body may be characterized by a density of from about 0.3 to about 1.06, in other

embodiments from about 0.5 to about 1.03, and in other embodiments from about 0.7 to about 1.0 g/cm³.

DIMENSIONS OF ADHESIVE BODY

[0035] In one or more embodiments, the adhesive body (e.g. body 13) has a thickness of greater than 25 μm, in other embodiments greater than 50 μm, in other embodiments greater than 75 μm, and in other embodiments greater than 100 μm. In these or other embodiments, the adhesive body may have a thickness of less than 2,000 μm, in other embodiments less than 1,750 μm, in other embodiments less than 1,500 μm, in other embodiments less than 1,250 μm, and in other embodiments less than 1,000 μm. In one or more embodiments, the adhesive body has a thickness of from about 25 μm to about 2,000 μm, in other embodiments from about 50 μm to about 1,750 μm, in other embodiments from about 75 μm to about 1,500 μm, and in other embodiments from about 100 μm to about 1,250 μm. In one or more embodiments, the thickness of the adhesive body is substantially constant over the width of the adhesive body. For example, in one or more embodiments, the thickness varies by less than 5%, in other embodiments less than 3%, and in other embodiments less than 1.5%.

[0036] In one or more embodiments, the adhesive body (e.g. body 13) has a width of greater than 30 cm, in other embodiments greater than 45 cm, in other embodiments greater than 60 cm, and in other embodiments greater than 75 cm. In these or other embodiments, the adhesive body may have a width of less than 15 m, in other embodiments less than 12 m, in other embodiments less than 9 m, and in other embodiments less than 6 m. In one or more embodiments, the adhesive body has a width of from about 30 cm to about 15 m, in other embodiments from about 45 cm to about 12 m, in other embodiments from about 60 cm to about 9 m, and in other embodiments from about 75 cm to about 6 m.

[0037] In one or more embodiments, the composite is provided in the form of a roll, and therefore the adhesive body (e.g. body 13), may have an extended length. In one or more embodiments, the adhesive body has a length of greater than 30 cm, in other embodiments greater than 6 m, in other embodiments greater than 10 m, and in other embodiments greater than 50 m. In these or other embodiments, the adhesive body may have a length of less than 900 m, in other embodiments less than 750 m, in other embodiments less than 600

m, in other embodiments less than 300 m, and in other embodiments less than 100 m. In one or more embodiments, the adhesive body has a length of from about 30 cm to about 900 m, in other embodiments from about 6 m to about 750 m, in other embodiments from about 10 m to about 600 m, and in other embodiments from about 20 m to about 300 m.

RELEASE MEMBER

[0038] In one or more embodiments, the release liner (e.g. liners 23 and 33), which may also be referred to as release members, includes a polymeric film or extrudate. This polymeric film or extrudate may include a single polymeric layer or may include two or more polymeric layers laminated or coextruded to one another. In other embodiments, the release liner includes a cellulosic substrate having a polymeric film or coating applied thereon, which film or coating may be referred to as a polymeric layer.

[0039] Inasmuch as the transfer film composite employed in the present invention is typically provided to its location of installation in the form of a roll, the nature and construction of the release member will facilitate this mode of transport, storage and delivery. For example, where the transfer film composite includes a single release member, as generally described with reference to Fig. 1 above, then both planar surfaces of the release member will be adapted to removably adhere or attach to the adhesive body; in other words, both planar surfaces of the release member are adapted to release from the adhesive body.

[0040] Suitable materials for forming a release liner that is a polymeric film or extrudate include polypropylene, polyester, high-density polyethylene, medium-density polyethylene, low-density polyethylene, polystyrene or high-impact polystyrene. Suitable materials for forming a polymeric layer on a cellulosic-based release liner include siloxane-based materials, butadiene-based materials, organic materials (e.g., styrene-butadiene rubber latex), as well as those polymeric materials employed to form a film or extrudate as described above. These polymeric materials may offer a number of advantageous properties including high moisture resistance, good resistance to temperature fluctuations during processing and storage, and increased tear and wrinkle resistance. The above referenced films and materials may be coated with a release agent, (e.g., silicone).

[0041] In one or more embodiments, the release member is characterized by a thickness of from about 15 to about 80 μm , in other embodiments from about 15 to about

150 μm , in other embodiments from about 18 to about 75 μm , in other embodiments from about 18 to about 100 μm , and in other embodiments from about 20 to about 50 μm .

METHOD FOR CONSTRUCTING ROOF SYSTEM

[0042] As suggested above, the methods of this invention employ an adhesive transfer film to secure one or more construction articles, such as construction boards, into a roof system. These methods generally include contacting a planar surface of the adhesive body to a roof substrate, removing a release member to expose the upper planar surface of the adhesive body, and contacting the construction article to the upper surface of the adhesive body. In so doing, the construction article is adhered to the roof substrate.

[0043] Methods of one or more embodiments of the invention can be described in greater detail with reference to Fig. 3. According to one or more embodiments, installation process 101 includes a step 103 of providing a roll of an adhesive transfer film composite, and a step 105 of positioning the roll on a surface of the roof, which may be referred to as a substrate. The process further includes a step 107 of unwinding the roll, which may also be referred to as a step of unrolling the roll. Where the composite includes upper and lower release members, the process may include a step 109 of removing the lower release member so that a surface of the adhesive body can be contacted to the roof substrate. The skilled person will appreciate that where the composite includes a single release member, the release member can be removably adhered to the upper surface of the adhesive body, and therefore the act of unrolling the composite allows the adhesive body to be directly contacted to the substrate without the need to remove the release member. Once the lower surface of the adhesive body is exposed, the process includes a step 111 of placing the lower surface of the adhesive body in contact with the substrate at a location where installation of the adhesive (and ultimately the construction board to be installed) is desired. The skilled person will appreciate that the act of unrolling the composite can take place in conjunction with (i.e. simultaneously with) contacting the adhesive body to the substrate. With the adhesive body in contact with the substrate at its desired location, the process continues with an optional step 113 of applying force to the upper release member to thereby increase adhesion between the adhesive body and the substrate. The process continues with a step 115 of removing the upper release member, which exposes the upper planar surface of the adhesive body and allows for step 117 of placing a construction board into contact with the

upper surface of the adhesive body. The adhesion between the board and the adhesive body, as well as the adhesion between the adhesive body and the substrate, can be enhanced by a step 119 of applying force (e.g. pressure) to the construction board after placing the construction board in contact with the adhesive body.

[0044] As the skilled person will appreciate, the nature of the composite can impact the order in which the various steps of the installation process are performed. For example, where the composite includes a single release member (i.e. only includes an upper release member), the process may allow for simultaneously performing step 109 of unrolling and step 111 of contacting the adhesive to the substrate (e.g. the adhesive is contacted during the unrolling step). Step 113 of applying pressure can likewise be performed conjunction with the steps of unwinding and contacting. In other words, as the composite roll is unwound and the exposed portion of the adhesive body is placed into contact with the substrate, a force can be applied, such as by a roller, at a location downstream of where the composite roll is unrolled and contacted to the substrate.

ROOF SYSTEM

[0045] The use of the adhesive transfer film in conjunction with the methods of the present invention provide a unique roof system. An exemplary roof system according to the present invention can be described with reference to Fig. 4, which shows a roof system 201 built on roof deck 203. A first layer of insulation board 205 is disposed above roof deck 203. As the skilled person appreciates, first layer of insulation 205 may include a plurality of insulation boards (which may be referred to as board stock) arranged in a pattern that may be conventionally employed in the art, such as a staggered pattern. As specifically shown in Fig. 4, layer 205 includes first board 205A and second board 205B. First layer of insulation board 205 may optionally be secured to roof deck 203 via mechanical fasteners 221, 221'.

[0046] Disposed above (relative to deck 203) and adhered to first layer 205 is a layer of adhesive film 231 applied to layer 205 according to the present invention. Disposed above (relative to deck 203) and adhered to adhesive film 231 is an optional second layer of insulation board 209. As with layer 205, layer 209 includes a plurality of insulation boards arranged in a pattern that may be conventionally employed in the art (e.g. staggered horizontally relative to other boards in the layer and staggered vertically relative to the

boards in first layer 205). As specifically shown in Fig. 4, layer 209 includes a first board 209A, a second board 209B, and a third board 209C. It will be appreciated that according to the present invention, two or more boards within a single layer of boards are secured to the substrate (i.e. the underlying layer) via a common film adhesive. As specifically shown in Fig. 4, relative to second layer of insulation 209, boards 209A, 209B, and 209C may be adhered to the substrate (i.e. first layer of insulation board 205) via a common adhesive film 231.

[0047] Disposed above (relative to deck 203) and adhered to second layer 209 is a layer of adhesive film 233 applied to layer 209 according to the present invention. Disposed above (relative to deck 203) and adhered to adhesive film 233 is an optional coverboard layer 213. As with layers 205 and 209, layer 213 includes a plurality of coverboards arranged in a pattern that may be conventionally employed in the art (e.g. staggered horizontally relative to other boards in the layer and staggered vertically relative to the boards of second layer 209). As specifically shown in Fig. 4, layer 213 includes first coverboard 213A and second coverboard 213B. As with second layer 209 and adhesive film 231, the present invention provides that two or more of the coverboards of layer 213 are adhered to layer 209 via a common adhesive film 233.

[0048] Disposed above (relative to deck 203) coverboard layer 213 is a membrane layer 217. The skilled person appreciates that membrane layer 217 may be formed from a plurality of membrane panels seemed together to form a water impervious layer to protect the building structure. Membrane layer 217 can be secured to the roof deck, either directly or indirectly, by employing various techniques known in the art. For example, membrane layer 217, and specifically the individual membrane panels of layer 217, can be mechanically attached to roof deck 203. Alternatively, the membrane panels of membrane layer 217 can be adhered to the underlying substrate such as coverboard layer 213. For example, the various panels of layer 217 can carry a pressure-sensitive layer.

CONSTRUCTION BOARDS

[0049] As explained above, the roof systems that may be constructed pursuant to embodiments of the present invention include two or more layers of construction board. These construction boards may include, but are not limited to, insulation boards (also referred to as board stock) and coverboards. The insulation boards may include board stock

that includes a foam body with optional facers on the opposed planar surfaces of the foam body. The coverboards may include fiber boards, masonite board, wall board, gypsum board, gypsum products such as DensDeck, perlite boards, and high density foam boards. As with the insulation boards, these coverboards may carry facers on the opposed planar surfaces of the board.

FOAM BODY

[0050] As described above, the construction boards employed in practicing the present invention may include a foam body. In one or more embodiments, the foam body of the construction boards may include an insulating foam. Examples of insulating foams that can be used include foamed polystyrene, such as expanded polystyrene, and polyurethane and/or polyisocyanurate foam. In particular embodiments, the foam body is a polyisocyanurate or polyurethane foam. As the skilled person will appreciate, polyisocyanurate and/or polyurethane foams can be manufactured by mixing a first stream that includes an isocyanate-containing compound with a second stream that includes an isocyanate-reactive compound. Using conventional terminology, the first stream (i.e., the stream including an isocyanate-containing compound) may be referred to as an A-side stream, an A-side reactant stream, or simply an A stream. Likewise, the second stream (i.e., the stream including an isocyanate-reactive compound) may be referred to as a B-side stream, B-side reactant stream, or simply B stream. In any event, the reaction that ensues produces a foam that, according to one or more kinetic and/or thermodynamic properties, develops over a period of time. Unless otherwise specified, therefore, the term developing foam will be understood to refer to the mixture of the polyurethane and/or polyisocyanurate reactants as they exist prior to cure, which when the reaction mixture is appreciably immobile (e.g., is no longer flowable).

[0051] In one or more embodiments, either stream may carry additional ingredients including, but not limited to, flame-retardants, surfactants, blowing agents, catalysts, emulsifiers/solubilizers, fillers, fungicides, anti-static substances, and mixtures of two or more thereof.

A-SIDE STREAM

[0052] In one or more embodiments, the A-side stream may only contain the isocyanate-containing compound. In one or more embodiments, multiple isocyanate-

containing compounds may be included in the A-side. In other embodiments, the A-side stream may also contain other constituents such as, but not limited to, flame-retardants, surfactants, blowing agents and other non-isocyanate-reactive components. In one or more embodiments, the complementary constituents added to the A-side are non-isocyanate reactive.

[0053] Suitable isocyanate-containing compounds useful for the manufacture of polyisocyanurate construction board are generally known in the art and embodiments of this invention are not limited by the selection of any particular isocyanate-containing compound. Useful isocyanate-containing compounds include polyisocyanates. Useful polyisocyanates include aromatic polyisocyanates such as diphenyl methane diisocyanate in the form of its 2,4'-, 2,2'-, and 4,4'-isomers and mixtures thereof. The mixtures of diphenyl methane diisocyanates (MDI) and oligomers thereof may be referred to as "crude" or polymeric MDI, and these polyisocyanates may have an isocyanate functionality of greater than 2. Other examples include toluene diisocyanate in the form of its 2,4' and 2,6'-isomers and mixtures thereof, 1,5-naphthalene diisocyanate, and 1,4' diisocyanatobenzene. Exemplary polyisocyanate compounds include polymeric Rubinate 1850 (Huntsmen Polyurethanes), polymeric Lupranate M70R (BASF), and polymeric Mondur 489N (Bayer).

B-SIDE STREAM

[0054] In one or more embodiments, the B-side stream may only include the isocyanate-reactive compound. In one or more embodiments, multiple isocyanate-reactive compounds may be included in the B-side. In other embodiments, the B-side stream may also contain other constituents such as, but not limited to, flame-retardants, surfactants, blowing agents and other non-isocyanate-containing components. In particular embodiments, the B-side includes an isocyanate reactive compound and a blowing agent. In these or other embodiments, the B-side may also include flame retardants, catalysts, emulsifiers/solubilizers, surfactants, fillers, fungicides, anti-static substances, water and other ingredients that are conventional in the art.

[0055] An exemplary isocyanate-reactive compound is a polyol. The term polyol, or polyol compound, includes diols, polyols, and glycols, which may contain water as generally known in the art. Primary and secondary amines are suitable, as are polyether polyols and polyester polyols. Useful polyester polyols include phthalic anhydride based PS-2352

(Stepen), phthalic anhydride based polyol PS-2412 (Stepen), terephthalic based polyol 3522 (Kosa), and a blended polyol TR 564 (Oxid). Useful polyether polyols include those based on sucrose, glycerin, and toluene diamine. Examples of glycols include diethylene glycol, dipropylene glycol, and ethylene glycol. Suitable primary and secondary amines include, without limitation, ethylene diamine, and diethanolamine. In one or more embodiments, a polyester polyol is employed. In one or more embodiments, the present invention may be practiced in the appreciable absence of any polyether polyol. In certain embodiments, the ingredients are devoid of polyether polyols.

CATALYSTS

[0056] Catalysts, which are believed to initiate the polymerization reaction between the isocyanate and the polyol, as well as a trimerization reaction between free isocyanate groups when polyisocyanurate foam is desired, may be employed. While some catalysts expedite both reactions, two or more catalysts may be employed to achieve both reactions. Useful catalysts include salts of alkali metals and carboxylic acids or phenols, such as, for example potassium octoate; mononuclear or polynuclear Mannich bases of condensable phenols, oxo-compounds, and secondary amines, which are optionally substituted with alkyl groups, aryl groups, or aralkyl groups; tertiary amines, such as pentamethyldiethylene triamine (PMDETA), 2,4,6-tris[(dimethylamino)methyl]phenol, triethyl amine, tributyl amine, N-methyl morpholine, and N-ethyl morpholine; basic nitrogen compounds, such as tetra alkyl ammonium hydroxides, alkali metal hydroxides, alkali metal phenolates, and alkali metal cholates; and organic metal compounds, such as tin(II)-salts of carboxylic acids, tin(IV)-compounds, and organo lead compounds, such as lead naphthenate and lead octoate.

SURFACTANTS, EMULSIFIERS AND SOLUBILIZERS

[0057] Surfactants, emulsifiers, and/or solubilizers may also be employed in the production of polyurethane and polyisocyanurate foams in order to increase the compatibility of the blowing agents with the isocyanate and polyol components. Surfactants may serve two purposes. First, they may help to emulsify/solubilize all the components so that they react completely. Second, they may promote cell nucleation and cell stabilization.

[0058] Exemplary surfactants include silicone co-polymers or organic polymers bonded to a silicone polymer. Although surfactants can serve both functions, it may also be useful to ensure emulsification/solubilization by using enough emulsifiers/solubilizers to

maintain emulsification/solubilization and a minimal amount of the surfactant to obtain good cell nucleation and cell stabilization. Examples of surfactants include Pelron surfactant 9920, Goldschmidt surfactant B8522, and GE 6912. U.S. Patent Nos. 5,686,499 and 5,837,742 are incorporated herein by reference to show various useful surfactants.

[0059] Suitable emulsifiers/solubilizers include DABCO Ketene 20AS (Air Products), and Tergitol NP-9 (nonylphenol + 9 moles ethylene oxide).

FLAME RETARDANTS

[0060] Flame Retardants may be used in the production of polyurethane and polyisocyanurate foams, especially when the foams contain flammable blowing agents such as pentane isomers. Useful flame retardants include tri(monochloropropyl) phosphate (a.k.a. tris(chloro-propyl) phosphate), tri-2-chloroethyl phosphate (a.k.a. tris(chloro-ethyl) phosphate), phosphonic acid, methyl ester, dimethyl ester, and diethyl ester. U.S. Patent No. 5,182,309 is incorporated herein by reference to show useful blowing agents.

BLOWING AGENTS

[0061] Useful blowing agents include isopentane, n-pentane, cyclopentane, alkanes, (cyclo)alkanes, hydrofluorocarbons, hydrochlorofluorocarbons, fluorocarbons, fluorinated ethers, alkenes, alkynes, carbon dioxide, hydrofluoroolefins (HFOs) and noble gases.

AMOUNT OF REACTANTS

[0062] An isocyanurate is a trimeric reaction product of three isocyanates forming a six-membered ring. The ratio of the equivalence of NCO groups (provided by the isocyanate-containing compound or A-side) to isocyanate-reactive groups (provided by the isocyanate-containing compound or B side) may be referred to as the index or ISO index. When the NCO equivalence to the isocyanate-reactive group equivalence is equal, then the index is 1.00, which is referred to as an index of 100, and the mixture is said to be stoichiometrically equal. As the ratio of NCO equivalence to isocyanate-reactive groups equivalence increases, the index increases. Above an index of about 150, the material is generally known as a polyisocyanurate foam, even though there are still many polyurethane linkages that may not be trimerized. When the index is below about 150, the foam is generally known as a polyurethane foam even though there may be some isocyanurate linkages. For purposes of this specification, reference to polyisocyanurate and polyurethane will be used interchangeably unless a specific ISO index is referenced.

[0063] In one or more embodiments, the concentration of the isocyanate-containing compound to the isocyanate-reactive compounds within the respective A-side and B-side streams is adjusted to provide the foam product with an ISO index of greater than 150, in other embodiments greater than 170, in other embodiments greater than 190, in other embodiments greater than 210, in other embodiments greater than 220, and in other embodiments greater than 250. In these or other embodiments, the concentration of the isocyanate-containing compound to the isocyanate-reactive compounds within the respective A-side and B-side streams is adjusted to provide the foam product with an ISO index of less than 400, in other embodiments less than 350, and in other embodiments less than 300. In one or more embodiments, the concentration of the isocyanate-containing compound to the isocyanate-reactive compounds within the respective A-side and B-side streams is adjusted to provide the foam product with an ISO index of from about 150 to about 400, in other embodiments from about 170 to about 350, and in other embodiments from about 190 to about 330, and in other embodiments from about 220 to about 280.

[0064] In one or more embodiments, where an alkane blowing agent is employed, the amount of alkane blowing agent (e.g., pentanes) used in the manufacture of polyisocyanurate foam construction board according to the present invention may be described with reference to the amount of isocyanate-reactive compound employed (e.g., polyol). For example, in one or more embodiments, greater than 12 parts by weight (pbw), in other embodiments greater than 14 pbw, and in other embodiments greater than 18 pbw alkane blowing agent per 100 pbw of polyol may be used. In these or other embodiments, less than 40 pbw, in other embodiments less than 36 pbw, and in other embodiments less than 33 pbw alkane blowing agent per 100 pbw of polyol may be used. In one or more embodiments, from about 12 to about 40, in other embodiments from about 14 to about 36, and in other embodiments from about 18 to about 33 of alkane blowing agent per 100 parts by weight of polyol may be used.

[0065] In one or more embodiments, where a hydrofluoroolefin blowing agent is employed, the amount of hydrofluoroolefin blowing agent used in the manufacture of polyisocyanurate foam construction board according to the present invention may be described with reference to the amount of isocyanate-reactive compound employed (e.g., polyol). For example, in one or more embodiments, greater than 15 parts by weight (pbw),

in other embodiments greater than 18 pbw, and in other embodiments greater than 20 pbw hydrofluoroolefin blowing agent per 100 pbw of polyol may be used. In these or other embodiments, less than 50, in other embodiments less than 45 pbw, and in other embodiments less than 40 pbw hydrofluoroolefin blowing agent per 100 pbw of polyol may be used. In one or more embodiments, from about 15 to about 50, in other embodiments from about 18 to about 45, and in other embodiments from about 20 to about 40 of hydrofluoroolefin blowing agent per 100 parts by weight of polyol may be used.

[0066] In one or more embodiments, the amount of surfactant (e.g., silicone copolymer) used in the manufacture of polyisocyanurate foam construction board according to the present invention may be described with reference to the amount of isocyanate-reactive compound employed (e.g., polyol). For example, in one or more embodiments, greater than 1.0 parts by weight (pbw), in other embodiments greater than 1.5 pbw, and in other embodiments greater than 2.0 pbw surfactant per 100 pbw of polyol may be used. In these or other embodiments, less than 5.0 pbw, in other embodiments less than 4.0 pbw, and in other embodiments less than 3.0 pbw surfactant per 100 pbw of polyol may be used. In one or more embodiments, from about 1.0 to about 5.0, in other embodiments from about 1.5 to about 4.0, and in other embodiments from about 2.0 to about 3.0 of surfactant per 100 parts by weight of polyol may be used.

[0067] In one or more embodiments, the amount of flame retardant (e.g., liquid phosphates) used in the manufacture of polyisocyanurate foam construction board according to the present invention may be described with reference to the amount of isocyanate-reactive compound employed (e.g., polyol). For example, in one or more embodiments, greater than 5 parts by weight (pbw), in other embodiments greater than 10 pbw, and in other embodiments greater than 12 pbw flame retardant per 100 pbw of polyol may be used. In these or other embodiments, less than 30 pbw, in other embodiments less than 25 pbw, and in other embodiments less than 20 pbw flame retardant per 100 pbw of polyol may be used. In one or more embodiments, from about 5 to about 30, in other embodiments from about 10 to about 25, and in other embodiments from about 12 to about 20 of flame retardant per 100 parts by weight of polyol may be used.

[0068] In one or more embodiments, the amount of catalyst(s) employed in practice of the present invention can be readily determined by the skilled person without undue

experimentation or calculation. Indeed, the skilled person is aware of the various process parameters that will impact the amount of desired catalyst. Also, the amount of catalyst employed can be varied to achieve various desired properties such as the desired index.

CHARACTERISTICS OF FOAM BODY

[0069] As indicated above, the foam body may include a polyurethane and/or polyisocyanurate foam. As is generally understood in the art, a foam is a cellular structure that may include an interconnected network of solid struts or plates that form the edges and faces of cells. These cellular structures may, in one or more embodiments, also be defined by a “relative density” that is less than 0.8, in other embodiments less than 0.5, and in other embodiments less than 0.3. As those skilled in the art will appreciate, “relative density” refers to the density of the cellular material divided by that of the solid from which the cell walls are made. As the relative density increases, the cell walls thicken and the pore space shrinks such that at some point there is a transition from a cellular structure to one that is better defined as a solid containing isolated pores.

[0070] In one or more embodiments, the foam body is characterized by a relatively low density. In one or more embodiments, this foam may have a density defined according to ASTM C 303 that is less than 2.5 pounds per cubic foot (12 kg/m^2), in other embodiments less than 2.0 pounds per cubic foot (9.8 kg/m^2), in other embodiments less than 1.9 pounds per cubic foot (9.3 kg/m^2), and still in other embodiments less than 1.8 pounds per cubic foot (8.8 kg/m^2). In one or more embodiments, foam may be characterized by having a density that is greater than 1.50 pounds per cubic foot (7.32 kg/m^2) and optionally greater than 1.55 pounds per cubic foot (7.57 kg/m^2).

[0071] In other embodiments, the foam body is characterized by a relatively high density. In one or more embodiments, the foam has a density, as defined by ASTM C303, of greater than 2.5 pounds per cubic foot (12.2 kg/m^2), as determined according to ASTM C303, in other embodiments the density is greater than 2.8 pounds per cubic foot (13.7 kg/m^2), in other embodiments greater than 3.0 pounds per cubic foot (14.6 kg/m^2), and still in other embodiments greater than 3.5 pounds per cubic foot (17.1 kg/m^2). In one or more embodiments, the density may be less than 20 pounds per cubic foot (97.6 kg/m^2), in other embodiments less than 10 pounds per cubic foot (48.8 kg/m^2), in other embodiments less

than 6 pounds per cubic foot (29.3 kg/m²), in other embodiments less than 5.9 pounds per cubic foot (28.8 kg/m²), in other embodiments less than 5.8 pounds per cubic foot (28.3 kg/m²), in other embodiments less than 5.7 pounds per cubic foot (27.8 kg/m²), in other embodiments less than 5.6 pounds per cubic foot (27.3 kg/m²), and still in other embodiments less than 5.5 pounds per cubic foot (26.9 kg/m²).

[0072] In one or more embodiments, the foam body is characterized by a desired ISO index. As the skilled person understands, ISO index correlates to PIR/PUR ratio and can be determined by IR spectroscopy using standard foams of known index (note that ratio of 3 PIR/PUR provides an ISO Index of 300), of greater than 150, in other embodiments greater than 180, in other embodiments greater than 200, in other embodiments greater than 220, in other embodiments greater than 240, in other embodiments greater than 260, in other embodiments greater than 270, in other embodiments greater than 285, in other embodiments greater than 300, in other embodiments greater than 315, and in other embodiments greater than 325. In these or other embodiments, the foam may be characterized by an ISO index of less than 350, in other embodiments less than 300, in other embodiments less than 275, in other embodiments less than 250, in other embodiments less than 225, and in other embodiments less than 200.

CONSTRUCTION BOARD FACERS

[0073] The construction board facers can be the same or different. In one or more embodiments, the facers may include a variety of materials or compositions, many of which are known or conventional in the art. Useful facers include those comprising aluminum foil, cellulosic fibers, reinforced cellulosic fibers, craft paper, coated glass fiber mats, uncoated glass fiber mats, chopped glass, and combinations thereof. Useful facer materials are known as described in U.S. Patent Nos. 6,774,071, 6,355,701, RE 36674, 6,044,604, and 5,891,563, which are incorporated herein by reference.

[0074] The thickness of the facer material may vary; for example, it may be from about 0.01 to about 1.00 inches thick (0.025-2.54 cm) or in other embodiments from about 0.015 to about 0.050 inches thick (0.04-0.13 cm), or in other embodiments from about 0.015 to about 0.030 inches thick (0.04-0.07 cm). The facer materials can also include more robust or rigid materials such as fiber board, perlite board, or gypsum board. The thickness of the

rigid facer can vary; for example, the thickness of the rigid facer can be from about 0.2 to about 1.5 inches (0.51-3.8 cm), or in other embodiments from about 0.25 to about 1.0 inches (0.64-2.54 cm).

[0075] In one or more embodiments, facers are optional. Therefore, in one or more embodiments, the construction board may be facerless. The ability to produce facerless construction boards is known as described in U.S. Patent No. 6,117,375, which is incorporated herein by reference.

[0076] In other embodiments, the facers may be generally solid material such as wood, particle, or fiber board. In one or more embodiments, the facer is a wood board such as plywood, luan board, or oriented-strand board (OSB). In other embodiments, the facer board is a particle or fiber board such as fiber boards, masonite board, wall board, gypsum board, gypsum products such as DensDeck, perlite boards, and high density foam boards.

OTHER ROOF SYSTEM COMPONENTS

[0077] Practice of this invention is not limited by the selection of any particular roof deck. Accordingly, the roofing systems of this invention can include a variety of roof decks. Exemplary roof decks include concrete pads, steel decks, wood beams, and foamed concrete decks.

[0078] Practice of this invention is likewise not limited by the selection of any water-protective layer or membrane. As is known in the art, several membranes can be employed to protect the roofing system from environmental exposure (e.g. weather proof membranes), particularly environmental moisture in the form of rain or snow. Useful membranes include those that are known as single-ply roofing membranes. Useful protective membranes include polymeric membranes. Useful polymeric membranes include both thermoplastic and thermoset materials. For example, and as is known in the art, membrane prepared from poly(ethylene-co-propylene-co-diene) terpolymer rubber or poly(ethylene-co-propylene) copolymer rubber can be used. Roofing membranes made from these materials are well known in the art as described in U.S. Patent Nos. 6,632,509, 6,615,892, 5,700,538, 5,703,154, 5,804,661, 5,854,327, 5,093,206, and 5,468,550, which are incorporated herein by reference. Other useful polymeric membranes include those made from various thermoplastic polymers or polymer composites. For example, thermoplastic olefin (i.e. TPO), thermoplastic vulcanizate (i.e. TPV), or polyvinylchloride (PVC) materials can be used.

The use of these materials for roofing membranes is known in the art as described in U.S. Patent Nos. 6,502,360, 6,743,864, 6,543,199, 5,725,711, 5,516,829, 5,512,118, and 5,486,249, which are incorporated herein by reference. In one or more embodiments, the membranes include those defined by ASTM D4637-03 and/or ASTM D6878-03.

[0079] Still in other embodiments, the protective membrane can include bituminous or asphalt membranes. In one embodiment, these asphalt membranes derive from asphalt sheeting that is applied to the roof. These asphalt roofing membranes are known in the art as described in U.S. Patent Nos. 6,579,921, 6,110,846, and 6,764,733, which are incorporated herein by reference. In other embodiments, the protective membrane can derive from the application of hot asphalt to the roof.

[0080] Other layers or elements of the roofing systems are not excluded by the practice of this invention. For example, and as is known in the art, another layer of material can be applied on top of the protective membrane. Often these materials are applied to protect the protective membranes from exposure to electromagnetic radiation, particularly that radiation in the form of UV light. In certain instances, ballast material is applied over the protective membrane. In many instances, this ballast material simply includes aggregate in the form of rock, stone, or gravel; U.S. Patent No. 6,487,830, is incorporated herein in this regard.

[0081] Various modifications and alterations that do not depart from the scope and spirit of this invention will become apparent to those skilled in the art. This invention is not to be duly limited to the illustrative embodiments set forth herein.

CLAIMS

What is claimed is:

1. A method for constructing a roof system, the method comprising:
 - (i) applying an adhesive transfer film composite to a roof substrate, where the adhesive transfer film composite includes an adhesive body having first and second planar surfaces and a release member removably attached to the second planar surface of the adhesive body, where the adhesive body is devoid of a carrier layer, and where the adhesive body includes a crosslinked network of acrylate-based polymers, whereby said step of applying secures the first planar surface of the adhesive body to the roof substrate;
 - (ii) removing the release member to thereby expose the second planar surface of the adhesive body; and
 - (iii) applying a construction element to the second planar surface of the adhesive body to thereby adhere the construction element to the substrate.
2. The method of claim 1, where said step of applying an adhesive transfer film composite includes providing the adhesive transfer film composite in the form of a roll, unrolling the roll of adhesive transfer film composite, and mating the first planar surface of the adhesive planar body to the substrate.
3. The method of any of the preceding claims, where the substrate is selected from the group consisting of a roof deck, an insulation board, a coverboard, and an existing membrane.
4. The method of any of the preceding claims, where the substrate is a first layer of construction boards.
5. The method of claim 4, where the first layer of construction boards is mechanically fastened into place.

6. The method of any of the preceding claims, where the construction element is selected from the group consisting of a coverboard, an insulation board, and a membrane panel.
7. The method of any of the preceding claims, where the substrate is a roof deck and the roof deck is selected from the group consisting of a concrete deck, a corrugated metal deck, and a wood deck.
8. The method of any of the preceding claims, where the adhesive body includes a UV-cured polyacrylate adhesive.
9. The method of any of the preceding claims, where the adhesive body is characterized by a degree of cure where less than 5% of the adhesive body is soluble in xylene at 25 °C after 24 hours.
10. The method of any of the preceding claims, where the adhesive body has a thickness of from about 25 μm to about 2,000 μm .
11. The method of any of the preceding claims, where the adhesive body has a width of from about 30 cm to about 15 m.
12. The method of any of the preceding claims, where the adhesive body is compositionally homogeneous.
13. The method of any of the preceding claims, where said adhesive body is UV-cured by subjecting the first planar surface of the body to UV radiation.
14. The method of any of the preceding claims, where the cure characteristics of the first planar surface of the adhesive body are distinct from the cure characteristics of the second planar surface of the adhesive body.

15. The method of any of the preceding claims, where the adhesive body is foamed.
16. A process of constructing a roof system, the process comprising:
 - (i) providing a roof system including a first layer of insulation boards mechanically secured to a roof deck, said first layer of insulation boards including an exposed surface;
 - (ii) applying a transfer film composite to a portion of the exposed surface of the first layer of insulation boards, where the transfer film composite includes an adhesive body having first and second planar surfaces and an optional release member removably attached to the second planar surface of the adhesive body, where said step of applying includes mating the first planar surface of the adhesive body to a portion of the exposed surface of the layer of insulation boards;
 - (iii) optionally removing the optional release member to thereby expose the second planar surface of the adhesive body; and
 - (iv) applying a construction board to the second planar surface of the adhesive body to thereby adhere the construction board to a portion of the layer of construction boards.
17. The process of claim 16, wherein said step of applying a construction board to the second planar surface of the adhesive body forms a second layer of construction boards having an upper planar surface, the process further comprising:
 - (v) applying a transfer film composite to a portion of the second layer of construction boards having an upper planar surface, where the transfer film composite includes an adhesive body having first and second planar surfaces and an optional release member removably attached to the second planar surface of the adhesive body, where the transfer film composite is devoid of a carrier layer, where said step of applying includes mating the first planar surface of the adhesive body to a portion of the second layer of construction boards having an upper planar surface;
 - (vi) optionally removing the optional release member to thereby expose the second planar surface of the adhesive body; and

- (vii) applying a construction board to the second planar surface of the adhesive body to thereby adhere the construction board to a portion of the second layer of construction boards, and thereby form a third layer of construction boards.
18. The process of claims 16-17, further comprising the step of applying a membrane system over said second layer of construction boards or said third layer of construction boards.
 19. The process of claims 16-18, where said step of applying includes providing the adhesive transfer film composite in the form of a roll, unrolling the roll of adhesive transfer film composite, and mating the first planar surface of the adhesive planar body to the substrate.
 20. The process of claims 16-19, where the construction board employed to make the third layer of construction boards is a coverboard.
 21. The process of claims 16-20, where the construction board employed to make the second layer of construction boards is an insulation board.
 22. The process of claims 16-20, where the construction board employed to make the second layer of construction boards is a coverboard.
 23. The process of claims 16-22, where the adhesive body includes a UV-cured polyacrylate adhesive.
 24. The process of claims 16-23, where the adhesive body is characterized by a degree of cure where less than 5% of the adhesive body is soluble in xylene at 25 °C after 24 hours.

25. The process of claims 16-24, where the adhesive body has a thickness of from about 25 μm to about 890 μm .
26. The process of claims 16-25, where the adhesive body has a width of from about 30 cm to about 15 m.
27. The process of claims 16-26, where the adhesive body is compositionally homogeneous.
28. The process of claims 16-27, where said adhesive body is UV-cured by subjecting the first planar surface of the body to UV radiation.
29. The process of claims 16-28, where the cure characteristics of the first planar surface of the adhesive body are distinct from the cure characteristics of the second planar surface of the adhesive body.
30. The process of claims 16-29, where the adhesive body is foamed.

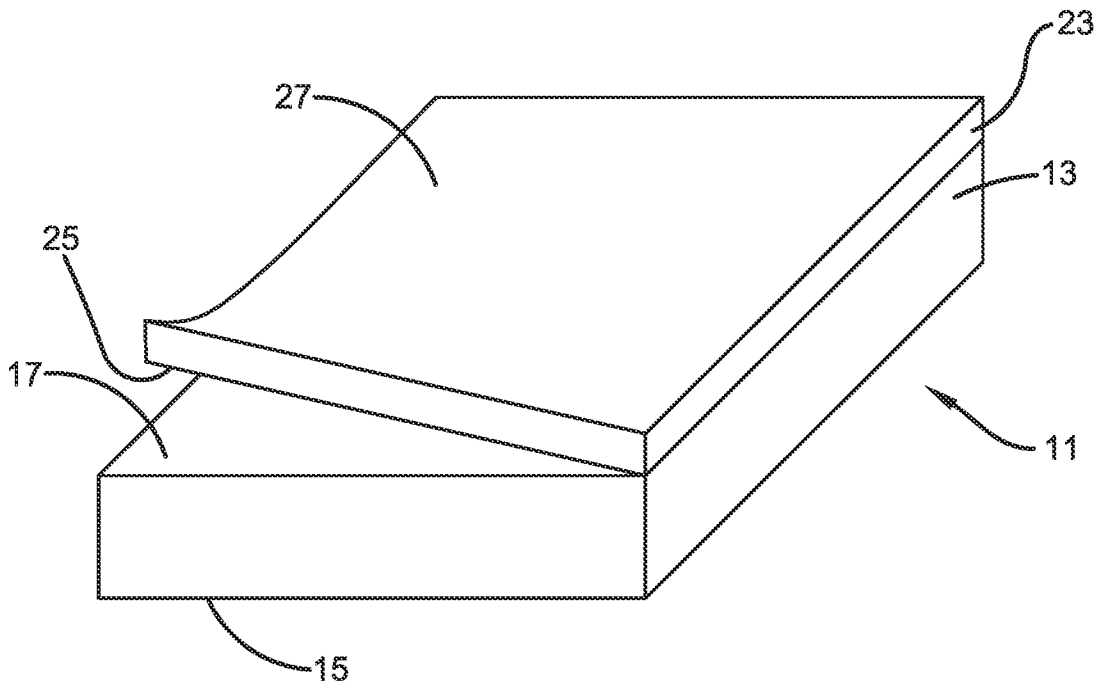


FIG. 1

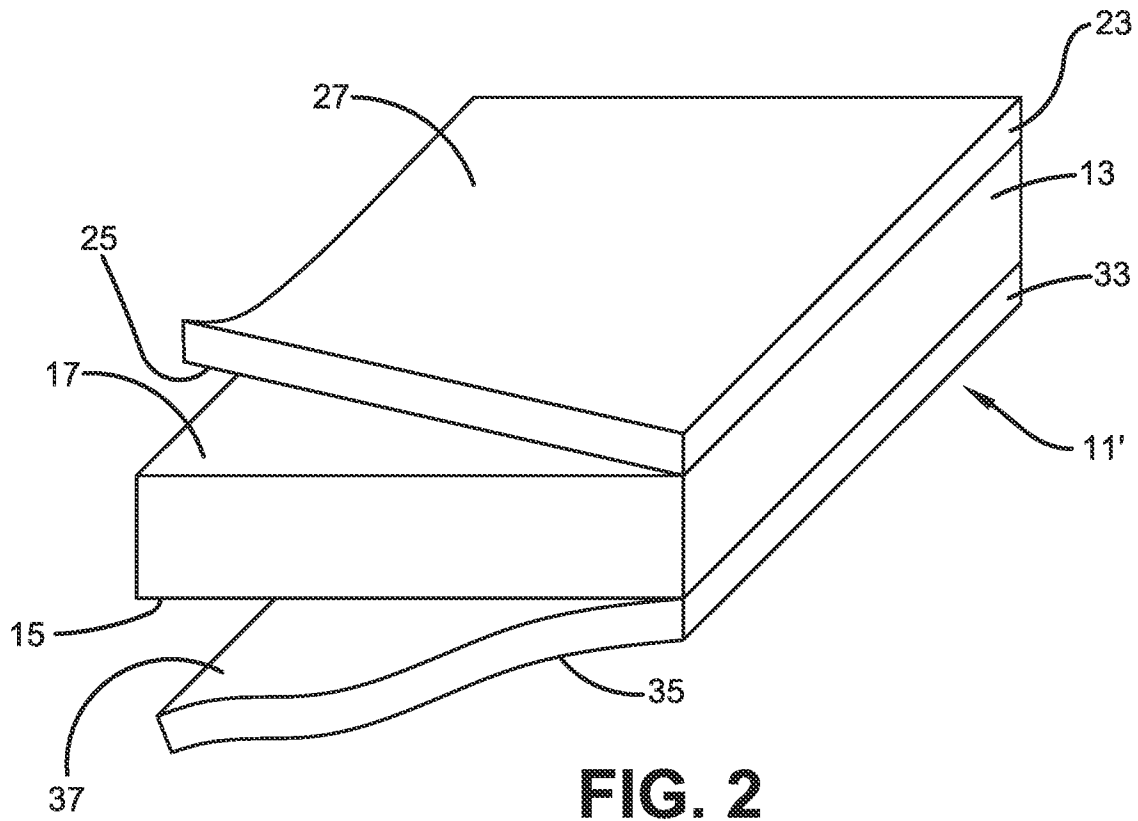


FIG. 2

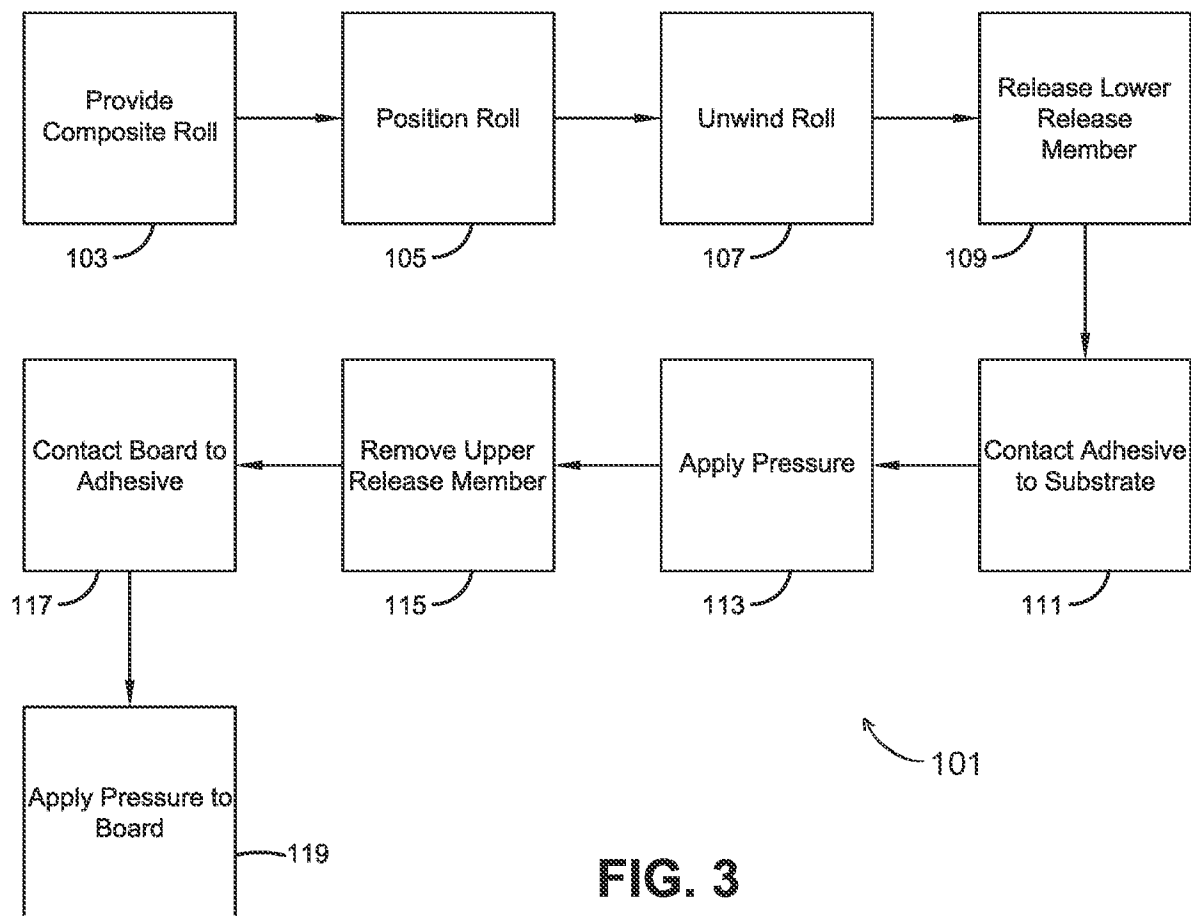


FIG. 3

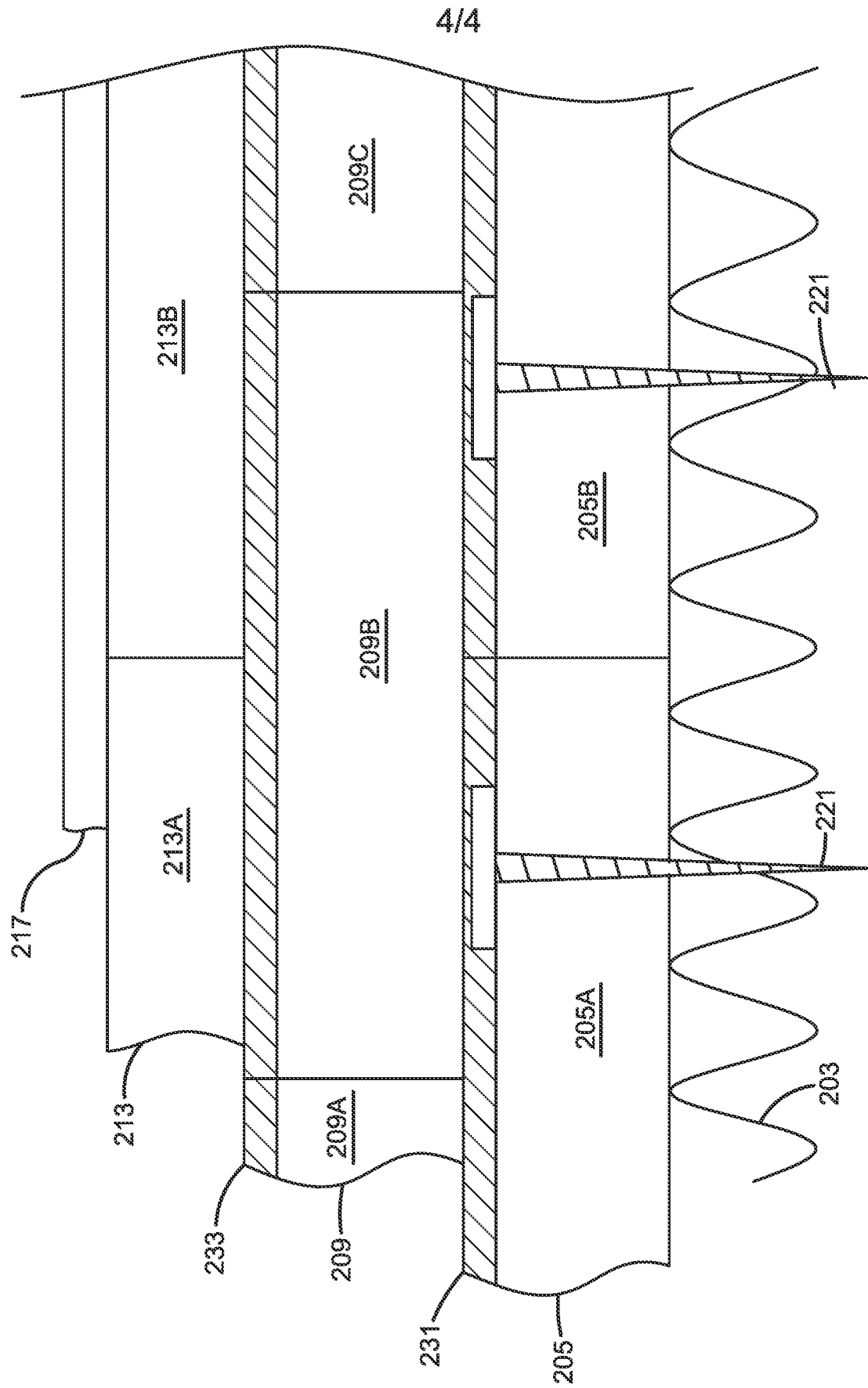


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2023/062048

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