METHOD AND APPARATUS FOR COUPLING STRUCTURES TO ROOFING

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ABSTRACT

An apparatus and method of coupling structures to a roof is made up of a multi-layered roofing assembly having a structure with a first portion disposed between the layers and a second portion disposed outside the layers. The structure may be embodied as a snow guard to help maintain snow on a roof, as a cable holder to help space a cable from a roof surface, or a pocket to hold staging.
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CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 10/424,402 filed Apr. 28, 2003 entitled “Method and Apparatus for Coupling Structures to Roofing” and is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to coupling structures to roofing.

BACKGROUND OF THE INVENTION

[0003] It is often desirable to secure a snow guard to a roof to prevent the snow and ice that accumulates on the roof from falling off.

[0004] Roofs are well known in the art and include, for example, metal roofs, shingle roofs, and membrane roofs. Roofs typically contain an outer layer, such as metal panels, shingles, or a rubber membrane, attached to a substrate layer, such as plywood, oriented strand board, or particle board. The substrate layer may be supported by wooden rafters or steel decking.

[0005] In a metal roof, the outer layer typically comprises a plurality of abutting metal panels, each running the length of the roof. The panels are laid side by side to cover the width of the roof, and the abutting panels are typically crimped together to form a water-resistant joint. Snow guards are typically attached to a metal roof by placing the snow guard over a portion of the water-resistant joint and securing the snow guard to the joint via set screws or other fastening means.

[0006] In a shingle roof, the outer layer typically comprises multiple rows of shingles placed in ascending fashion on the substrate layer, optionally with tar paper therebetween. Snow guards are typically attached to a shingle roof by placing the snow guards onto the outer layer of the shingles and driving screws through the snow guard into the substrate layer of the roof.

[0007] In a membrane roof, the outer layer typically comprises a rubber membrane that covers the substrate layer of the roof. Snow guards are typically attached to a membrane roof by securing a base of the snow guard to the substrate layer via screws, placing the membrane over the substrate layer and base of the snow guard, removing a portion of the membrane so that a portion of the base is exposed therethrough, and then securing an upper portion of the snow guard to the exposed portion of the base.

[0008] In areas that experience very heavy snow fall and/or ice buildup, an extreme load is often placed on the snow guard from the snow and ice which has accumulated on the roof. The load pressing against the snow guard creates a torque thereon, potentially causing the trailing edge of the snow guard to lift from the roof. When this occurs, the leading edge of the snow guard could cut into the outer layer of the roof, causing the roof to leak. Where the load on the snow guard is excessive, the snow guard could be torn from the roof.

[0009] An example of the above-mentioned is provided by U.S. Pat. No. 6,298,608, filed Feb. 1, 1999, to William F. Alley, in which there is described a snow guard assembly that contains a block having a base and a top, a snow guard attached to the block, and two rods, whereas each rod has a first and a second terminal end and a predetermined length therebetween. The first terminal end of each rod is attached to the base of the block. To secure the block to the roof, two holes are placed through the outer and substrate layers of the roof. The base of the block is placed in juxtaposition with the outer layer of the roof, with the second terminal ends of the two rods located through the holes in the roof. The length of the two rods is sufficient to allow the second terminal ends thereof to extend below the substrate layer of the roof. A first and second securement device is located on the portion of the first and second rods, respectively, protruding from the substrate layer of the roof to secure the second terminal ends of the two rods below the substrate layer of the roof, thereby securing the block to the roof. A mounting bracket is optionally located between the base of the block and the outer layer of the roof, and a lock plate is optionally located between the substrate layer of the roof and the first and second securement devices. The snow guard assembly of U.S. Pat. No. 6,298,608 is relatively expensive to manufacture, and is time consuming to install.

[0010] In addition, tall structures, such as buildings, are often protected from lightning by lightning rods mounted to, and spaced along the roofline. The lightning rods are typically coupled together by a braided cable with one end of the cable being coupled to a copper rod buried in the ground. There is a need for an apparatus and method of coupling the braided cable to a membrane roof that spaces the cable from the roof in order to reduce abrasions that adversely affect the useful life of the roof.

SUMMARY OF THE INVENTION

[0011] Briefly described, the invention is an apparatus and method for coupling structures to roofing.

[0012] The present invention can be viewed as providing a roofing assembly. The roofing assembly contains a first membrane having an opening extending from a first surface of the first membrane to a second surface of the first membrane. A second membrane is bonded to the second surface of the first membrane along a perimeter of the first membrane. The roofing assembly also has a structure having a first portion disposed between the first membrane and the second membrane, and a second portion disposed adjacent to the first surface of the first membrane.

[0013] Other apparatus, methods, features, and advantages of the present invention will be or become apparent to one with skill in the art upon examination of the following drawings and detailed description. It is intended that all such additional methods, features, and advantages be included within this description, be within the scope of the present invention, and be protected by the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] The present invention will be more fully understood from the detailed description given below and from the accompanying drawings of the embodiments of the invention, which however, should not be taken to limit the invention to any specific embodiment, but are for explana-
tion and for better understanding. Furthermore, the drawings are not necessarily to scale, emphasis instead being placed upon clearly illustrating the principles of the invention. Finally, like reference numerals in the figures designate corresponding parts throughout the several drawings.

[0015] FIG. 1 is a perspective view of a conventional roof.

[0016] FIG. 2 is a close-up view of a seam of the roof shown in FIG. 1.

[0017] FIG. 3 is a front view of a first embodiment snow guard, in accordance with the present invention.

[0018] FIG. 4 is a top view of a first embodiment snow guard assembly, in accordance with the present invention.

[0019] FIG. 5A is an exploded profile view of the first embodiment snow guard assembly being bonded to a roof, in accordance with the present invention.

[0020] FIG. 5B is an exploded profile view of a second embodiment snow guard assembly being bonded to a roof, in accordance with the present invention.

[0021] FIG. 6 is a top view of a roof illustrating an installation of the present invention.

[0022] FIG. 7A is a perspective view of a first embodiment cable holder in accordance with the present invention.

[0023] FIG. 7B is a partial perspective view of the first embodiment cable holder of FIG. 7A showing the halves of the cable holder crimped together in accordance with the present invention.

[0024] FIG. 8 is a perspective view of a second embodiment cable holder in accordance with the present invention.

[0025] FIG. 9 is an exploded profile view of a cable holder assembly being bonded to a roof in accordance with the present invention utilizing the cable holder of FIG. 7A.

[0026] FIG. 10 is a front view of a third embodiment snow guard assembly, in accordance with the present invention.

[0027] FIG. 11 is an exploded profile view of the third embodiment snow guard assembly being bonded to a roof, in accordance with the present invention.

[0028] FIG. 12 is a front view of a fourth embodiment snow guard assembly, in accordance with the present invention.

[0029] FIG. 13 is a front view of a second embodiment snow guard, in accordance with the present invention.

[0030] FIG. 13A is an exploded profile view of a fifth embodiment snow guard assembly, in accordance with the present invention.

[0031] FIG. 13B is an exploded profile view of a sixth embodiment snow guard assembly, in accordance with the present invention.

[0032] FIG. 14 is a front view of a third embodiment snow guard, in accordance with the present invention.

[0033] FIG. 15A is a top view of a fourth embodiment snow guard, in accordance with the present invention.

[0034] FIG. 15B is a front view of the fourth embodiment snow guard, in accordance with the present invention.

[0035] FIG. 15C is a side view of the fourth embodiment snow guard, in accordance with the present invention.

[0036] FIG. 16 is a front view of a seventh embodiment snow guard assembly, in accordance with the present invention.

[0037] FIG. 17 is a front view of an eighth embodiment snow guard assembly, in accordance with the present invention.

[0038] FIG. 18 is a front view of a ninth embodiment snow guard assembly, in accordance with the present invention.

[0039] FIG. 19 is a front view of a tenth embodiment snow guard assembly, in accordance with the present invention.

[0040] FIG. 20 is a side view of the tenth embodiment snow guard assembly, in accordance with the present invention.

[0041] FIG. 21 is a front view of a first embodiment staging assembly, in accordance with the present invention.

[0042] FIG. 22 is a side view of the first embodiment staging assembly, in accordance with the present invention.

[0043] FIG. 23 is a top view of the first embodiment staging assembly, in accordance with the present invention.

[0044] FIG. 24 is a front view of an eleventh embodiment snow guard assembly, in accordance with the present invention.

[0045] FIG. 25 is an exploded profile view of the eleventh embodiment snow guard assembly in accordance with the present invention.

DETAILED DESCRIPTION

[0046] The present invention is directed to a method and apparatus for coupling structures to roofing. The invention may be embodied in a multi-layer roofing assembly having a structure with a first portion disposed between the layers and a second portion disposed outside the layers, as is described below.

[0047] The following provides a description of the present method and apparatus for coupling structures to roofing via two examples. Specifically, the following describes use of the present method and apparatus for attaching snow guards to roofing and cable holders to roofing. It should be noted, however, that the present method and apparatus may be utilized to attach other structures to roofing.

[0048] FIG. 1 and FIG. 2 show a portion of a roof having a first membrane 102 and a second membrane 104 joined at a seam 108. Roof decking 112A, 112B, and 112C may be secured to the roof structure 114 using traditional means. The roof structure 114 may be made of wooden rafters or metal decking. The first membrane 102 may be secured to the roof decking 112A, 112B, and 112C using a plurality of fasteners 110, such as screws, staples or nails, along an edge 116. A portion of the second membrane 104 is then layered on top of the first membrane 102, forming an overlap. The overlap may be 2-10" in width. The first membrane 102 and the second membrane 104 may be bonded together, via use of, for example, an adhesive such as roofing cement, using
hot air welding or a butylene pressure sensitive tape or the like. The bonding forms a watertight seal.

[0049] FIG. 3 is a front view of a snow guard 200. The snow guard 200 may be formed from metallic sheet stock. Preferably, the snow guard material is galvanized steel, copper, or aluminum having a thickness in the range of 0.02" to 0.08", more preferably 0.040" and a width \( W_s \) having a range of 1" to 12", preferably 2.25". In accordance with a first exemplary embodiment of the invention, the snow guard 200 is made from 20 ounce cold rolled copper. The snow guard material may also be coated with a polymeric material, for example polyvinyl chloride (PVC). In addition, the snow guard 200 may be formed using conventional metal working tools. Further, the snow guard 200 may be generally square in shape having sides measuring 3" to 18", preferably 5.25:1. Other shapes, including rectangles and diamonds, are contemplated and considered within the invention.

[0050] The snow guard 200 may have a pocket 202 and at least one tab 204, although two tabs are preferred. The tabs 204 may extend upward at an angle \( \theta \) to the horizontal, wherein the angle \( \theta \) is preferably 15° to 75°, more preferably 30° to 60°, and most preferably 45°. The pocket 202 may be formed in the shape of an inverted, truncated cone. The pocket 202 may extend upward at an angle \( \Phi \) to the horizontal, wherein the angle \( \Phi \) may be 45° to 80°, and preferably 75°.

[0051] The snow guard 200 may be installed on shingled roofs, for example fiberglass, asphalt, and slate roofs. Upon installation of a first row of shingles, the snow guard 200 may be secured to the roof deck 112 using nails through holes 212. The holes 212 are covered by a second row of shingles. Snow guards 200 may be added to an existing shingled roof by bending a corner 210 on the tabs 204 forward or backwards. The snow guard 200 with bent corners may then be slid under a shingle and the weight of the shingle and the snow helps retain the snow guard 200 in position.

[0052] FIG. 4 shows a snow guard assembly 500 having a first membrane 302, a second membrane 400 and a snow guard 200. The first membrane 302 may be a single or multi-layer roofing membrane, preferably having a thickness of 0.048" to 0.180", and may be available from a membrane manufacturer, for example, The Firestone Tire and Rubber Co., Sarnafil, Inc., or Johns-Manville Corporation. The first membrane 302 may be any roof sheathing material, including but not limited to EPDM (ethylene-propylene diene monomer), PVC (polyvinyl chloride), or a TPO (thermoplastic olefin rubber). The first membrane 302 may have an opening 304 extending from a first surface 320 (see FIG. 5A) of the first membrane 302 to a second surface 322 (see FIG. 5A) of the first membrane 302 to allow the snow guard 200 to be inserted. The snow guard 200 may be inserted with the tabs 204 in contact with each other and then may be spread apart after insertion. An outline of the tabs 204 is shown with hidden lines in FIG. 4.

[0053] After the snow guard 200 has been inserted through the opening 304 in the first membrane 302, the first membrane 302 may then be bonded to a second membrane 400 using hot air welding or a butylene pressure sensitive tape, or the like, to form a watertight seal. The second membrane 400 may be the same or different material as the first membrane 302, preferably the same. The first membrane 302 fits within the perimeter of the second membrane 400. The first membrane 302 may be bonded to the second membrane 400 within 0.5" to 1" of the perimeter of the first membrane 302. When particular membrane materials are used, for example PVC, the entire contact area 322 of the first membrane 302 may be bonded to the second membrane 400.

[0054] FIG. 5A is an exploded profile view of a first embodiment snow guard assembly 500 being bonded to a roof membrane 600. The pocket 202 is disposed adjacent a first surface 320 of the first membrane 302 and the tabs 204 are disposed adjacent the second surface 322 of the first membrane 302. An installer may drive a mechanical fastener 602, preferably a roofing screw and plate, through the roof sheathing 600 and into the roof deck 112A, 112B, and 112C in the desired location. The installer may then bond the second membrane 400 to the roof sheathing 600 along the perimeter of the second membrane 400, preferably within 0.5" to 1" of the perimeter. The installer may use hot air welding or a butylene pressure sensitive tape, or the like, to form a watertight seal. The mechanical fastener 602 may provide a local attachment point for the roof sheathing 600 to the roof deck 112A, 112B, and 112C.

[0055] FIG. 5B is an exploded profile view of a second embodiment snow guard assembly 500 being bonded to a roof membrane 600. The snow guard assembly 500 may include a membrane 302 having an opening 304 extending from a first surface 320 of the first membrane 302 to a second surface 322 of the first membrane 302, and a snow guard 200 having a pocket 202 coupled to at least one tab 204. The pocket 202 is disposed adjacent the first surface 320 of the membrane 302 and the tab 204 is disposed adjacent the second surface 322 of the membrane 302. In this embodiment, the snow guard assembly 500 may be bonded directly to the roof membrane 600 without the need of a second, intermediate membrane.

[0056] FIG. 6 is a top view of a roof 700 illustrating an installation of the snow guard assembly 500. As shown in FIG. 6, the snow guard assemblies 500 may be secured in a predetermined and structured pattern. As an example, the assemblies 500 may be spaced on a square grid separated by a height \( H \) (1-6") and a width \( W \) (1-6"), or a diamond pattern having a height \( H \) (2-12") and a width \( W \) (2-12"). The pattern may extend a distance up the roof 700. Alternatively, the assemblies 500 may be located in a single row along a bottom edge of the roof and spaced 1-6" apart. The spacing of the snow guard assemblies 500 can be varied without departing from the present invention.

[0057] When snow falls it lands on the roof 700 and fills the pocket 202. The snow in the pocket 202 and around the pocket 202 forms a unitary structure, where the pocket 202 helps maintain the snow in one piece until it melts.

[0058] In accordance with a third embodiment of the invention, a snow guard assembly may have a snow guard 200 formed from a polymeric material and may be bonded to the first membrane 302 using ultrasonic welding.

[0059] In the unfortunate event that an excessive snowfall tears a snow guard 200 from the snow guard assembly 500, an installer may simply place a larger snow guard assembly over the prior snow guard assembly and bond it to the roof membrane.
FIG. 7A is a perspective view of a cable holder 700 that maybe coupled to roofing via use of the present method and apparatus, as described below. In accordance with a first exemplary embodiment of the cable holder 700, the cable holder 700 may be made of metallic or polymeric material. In addition, the cable holder 700 may be made of identical cable holder halves 704A and 704B that cooperate to hold a cable 702, typically a braided copper cable, a spaced distance above a membrane roof 600 (see FIG. 9). The cable holder halves 704A and 704B may have a foot portion 720, a spacer portion 722, a holding portion 724, and a coupling portion 726. The cable 702 may be held in a cable opening 706 formed when the halves 704A and 704B are coupled together. The coupling portion 726 may have openings 708 and 710 to allow the halves 704A and 704B to be coupled together using screws, bolts, rivets, eyelets, or other mechanical fasteners. The holes 708 and 710 may have the same or different cross sectional areas. As shown in FIG. 7B, the halves 704A and 704B may be coupled together by a mechanical crimp.

FIG. 8 is a perspective view of a second exemplary embodiment cable holder 800. The cable holder 800 may be used to hold a cable a spaced distance above a membrane roof 600 (see FIG. 9) and the cable holder 800 may be made of metallic or polymeric material. The cable holder 800 may be made of identical halves 804A and 804B that cooperate to hold a cable 702. The cable holder halves 804A and 804B may have a foot portion 820, a spacer portion 822, a holding portion 824, and a coupling portion 826. The cable 702 may be held in a cable opening 806 formed when the halves 804A and 804B are coupled together. The coupling portion 826 may have tabs 830 to allow the halves 804A and 804B to be coupled together by bending the tabs 830 over.

FIG. 9 is an exploded profile view of a cable holder assembly 900, which is bonded to a roof membrane 600. The cable holder assembly 900 may have a first membrane 302, a second membrane 400, and a cable holder 700. The membranes 302 and 400 may be single or multi-layer roofing membranes having characteristics and dimensions similar to that shown in FIG. 5. The first membrane 302 may have an opening 304 formed therein to allow the cable holder 700 to be inserted therein.

After the cable holder 700 has been inserted through the opening 304 in the first membrane 302, the first membrane 302 may then be bonded to the second membrane 400 using hot air welding or a butylene pressure sensitive tape, or the like, to form a watertight seal. The first membrane 302 may be bonded to the second membrane 400 within 0.5" to 1" of the perimeter of the first membrane 302. When particular membrane materials are used, for example PVC, the entire contact area of the first membrane 302 may be bonded to the second membrane 400. The second membrane 400 may be the same or different material as the first membrane, preferably the same. The first membrane 302 fits within the perimeter of the second membrane 400.

The installer may bond the cable holder assembly 900 to the roof membrane 600 along the perimeter of the second membrane 400, preferably within 0.5" to 1" of the perimeter. The installer may use hot air welding or a butylene pressure sensitive tape or the like to form a watertight seal. As shown, the cable holder assembly 900 is electrically isolated from the decking.

FIG. 10 is a front view and FIG. 11 is an exploded profile view of a third embodiment snow guard assembly 1000, in accordance with the present invention. The snow guard assembly 1000 has a first membrane 1002, a second membrane 1004, a reinforcement member 1008, and a snow guard 1006. The snow guard 1006 may be made in accordance with the snow guard 200 shown in FIG. 3. The first membrane 1002 may be any roof sheathing material, including but not limited to EPDM (ethylene-propylene diene monomer), PVC (polyvinyl chloride), or a TPO (thermoplastic olefin rubber). The first membrane 1002 may be a single or multi-layer roofing membrane, preferably having a thickness of 0.048" to 0.180," and may be available from a membrane manufacturer, for example, The Firestone Tire and Rubber Co., Sarnafil, Inc., or Johns-Manville Corporation. The first membrane 1002 may have an opening 1010 extending from a first surface 1002A to a second surface 1002B to allow the snow guard 1006 to be inserted. The reinforcement member 1008 may be made of sheet metal, for example, copper, aluminum or steel. The reinforcement member 1008 may provide localized stress relief. The reinforcement member 1008 may also have an opening 1012 alignable with the opening 1010 in first membrane 1002. Tabs 1014 of the snow guard 1006 may be inserted through the openings 1010 and 1012 in first membrane 1002 and reinforcement member 1008 respectively as described with reference to FIG. 3 and FIG. 4. An outline of the tabs 1014 is shown with hidden lines in FIG. 11.

After the snow guard 1006 has been inserted through the openings 1010 and 1012, the first membrane 1002 may be bonded to the second membrane 1004 using hot air welding or a butylene pressure sensitive tape, or the like, to form a watertight seal. The second membrane 1004 may be the same or different material as the first membrane 1002, preferably the same. The first membrane 1002 fits within the perimeter of the second membrane 1004. The first membrane 1002 may be bonded to the second membrane 1004 within 0.5" to 1" of the perimeter of the first membrane 1002. When particular membrane materials are used, for example PVC, the entire contact area of the first membrane 1002 may be bonded to the second membrane 1004. The snow guard assembly 1000 may in turn be bonded to a membrane roofing surface 700.

Alternatively, a cable holder, for example the ones shown in FIGS. 7A-9 may be substituted for the snow guard 1006 without departing from the present invention.

FIG. 12 is a front view of a fourth embodiment snow guard assembly 1100, in accordance with the present invention. This snow guard assembly 1100 may have applications on metal roofs. The snow guard assembly 1100 has a first member 1102, a second member 1104, and a snow guard 1106. The snow guard 1106 may be made in accordance with the snow guard 200 shown in FIG. 3. The first member 1102, the second member 1104 and the snow guard 1106 may be assembled as shown in FIG. 5A.

The first member 1102 and the second member 1104 may be made of sheet metal material, for example copper or aluminum, preferably having a thickness of 0.048" to 0.180." The first member 1102 may have an opening 1110 extending therethrough to allow the snow guard 1106 to be inserted. Tabs 1114 of the snow guard 1106 may be inserted through the opening 1110 in first member as described with
reference to FIG. 3 and FIG. 4. An outline of the tabs 1114 is shown with hidden lines in FIG. 12. The second member 1104 may have a plurality of openings 1108 spaced along the perimeter for securing the snow guard assembly 1110 to a metal roof surface.

[0070] After the snow guard 1106 has been inserted through the opening 1110, the first member 1102 may then be coupled to the second member 1104 by soldering, brazing, welding, or other process. The second member 1104 may be the same or different material as the first member 1102, preferably the same. The first member 1102 fits within the perimeter of the second member 1104. The first member 1102 may be bonded to the second member 1104 within 0.5" to 1" of the perimeter of the first member 1102 or the entire contact area of the first member 1102 may be bonded to the second member 1104. The openings 1108 may enable an installer to mechanically couple the snow guard assembly 1110 to a roof, for example with rivets or screws. The installer may additionally solder, braze, weld, or otherwise couple the snow guard assembly 1110 to a roof.

[0071] Alternatively, a cable holder, for example the ones shown in FIGS. 7A-9 may be substituted for the snow guard 1106 without departing from the present invention.

[0072] FIG. 13 is a front view of a second embodiment snow guard 1200 and FIG. 14 is a front view of a third embodiment snow guard 1300, both in accordance with the present invention. The snow guards 1200 and 1300 may be formed from metallic sheet stock. Preferably, the snow guard material is galvanized steel, copper, or aluminum having a thickness in the range of 0.02" to 0.08", more preferably 0.040". The snow guards 1200 and 1300 may be made from 20-ounce cold rolled copper. The snow guard material may also be coated with a polymeric material, for example polyvinyl chloride (PVC). In addition, the snow guards 1200 and 1300 may be formed using conventional metal working tools. The snow guards 1200 and 1300 may have a pocket 1202 and 1302 respectively and at least one tab 1204 and 1304 respectively, although two tabs are preferred.

[0073] FIG. 13A is an exploded profile view of a fifth embodiment snow guard assembly 1400. The snow guard assembly has a snow guard 1200, a first membrane 1402 and a second membrane 1404. The membranes 1402 and 1404 may be a single or multi-layer roofing membrane, preferably having a thickness of 0.048" to 0.180," and may be available from a membrane manufacturer, for example, The Firestone Tire and Rubber Co., Sarnafil, Inc., or Johns-Manville Corporation. The membranes 1402 and 1404 may be any roof sheathing material, including but not limited to EPDM (ethylene-propylene diene monomer), PVC (polyvinyl chloride), or a TPO (thermoplastic olefin rubber). The first membrane 1402 may have two openings 1406 extending from a first surface 1420 of the first membrane 1402 to a second surface 1422 of the first membrane 1402, and a snow guard 1200 coupled to at least one tab 1424. In this embodiment, the snow guard assembly 1500 may be bonded directly to the roof membrane 600 without the need of a second, intermediate membrane.

[0075] FIG. 15A is a top view, FIG. 15B is a front view, and FIG. 15C is a side view of a fourth embodiment snow guard 1500, in accordance with the present invention. The snow guard 1500 may be made of sheet metal material, for example copper or aluminum, preferably having a thickness of 0.048" to 0.180." The snow guard material may also be coated with a polymeric material, for example polyvinyl chloride (PVC). In addition, the snow guard 1500 may be formed using conventional metal working tools. The snow guard 1500 has an L-shaped profile as shown in FIG. 15C. The top part of the snow guard 1500 forms a shelf 1502. The shelf 1502 acts to hold the snow in place on the roof. The bottom part of the snow guard 1500 forms a tab 1504. The tab 1504 of the snow guard 1500 may be installed in a similar fashion as described with reference to FIG. 3 and FIG. 4. In this embodiment the shelf 1502 and tab 1504 are perpendicular to one another. However, the angle (shown as θ) can be any acute angle that allows the shelf to collect snow on the roof. The angle θ can be attained based on the positioning of the snow guard 1500 on the roof, the slope of the roof, and climate of the roof. The tab 1504 is inserted through an opening 1606 in the first membrane 1602 (See FIG. 16). An outline of the tabs 1504 are shown with hidden lines in FIG. 16.

[0076] FIG. 16 is a front view of a seventh embodiment snow guard assembly 1600, in accordance with the present invention. FIG. 16 shows a snow guard assembly 1600 having a first membrane 1602, a second membrane 1604 and two snow guards 1500. The first membrane 1602 may be a single or multi-layer roofing membrane, preferably having a thickness of 0.048" to 0.180," and may be available from a membrane manufacturer, for example, The Firestone Tire and Rubber Co., Sarnafil, Inc., or Johns-Manville Corporation. The first membrane 1602 may be any roof sheathing material, including but not limited to EPDM (ethylene-propylene diene monomer), PVC (polyvinyl chloride), or a TPO (thermoplastic olefin rubber). The first membrane 1602 may have two openings 1606 extending from a first surface 320 (see also FIG. 5A) of the first membrane 1602 to a second surface 322 (see also FIG. 5A) of the first membrane 1604 to allow the two snow guards 1500 to be inserted. The two openings 1606 are positioned on the snow guard assembly 1600 at an angle θ from a roofline 1608. In a preferred embodiment θ is equal to forty-five degrees; however, it is possible for θ to have any acute angle with the roofline 1608. The width (shown as W) between snow guards 1500 is narrow enough to allow the snow to collect within a pocket 1610 formed by the two snow guards 1500. In this embodiment the width is about one inch, however the width can be adjusted based on climate, slope of the roof, and size of the snow guard 1500.

[0077] FIG. 17 is a front view of an eighth embodiment snow guard assembly 1700, in accordance with the present invention. FIG. 17 shows a snow guard assembly 1700 having a first membrane 1702, a second membrane 1704 and snow guard 1500. The first membrane 1702 and second
membrane are constructed in a similar manner as discussed in previous embodied snow guard assemblies. The opening 1706 extending from a first surface 320 (see also FIG. 5A) of the first membrane 1702 to a second surface 322 (see also FIG. 5A) of the first membrane 1702 allows the snow guard 1500 to be inserted. The opening 1706 is positioned on the snow guard assembly 1700 parallel with a roofline 1708. The top part of the snow guard 1500 forms a shelf 1502. The shelf acts to hold the snow in place on the roof. The tab 1504 of the snow guard 1500 may be inserted through the opening 1706 in first membrane 1702 a previously discussed. An outline of the tabs 1504 is shown with hidden lines in FIG. 17.

[0078] FIG. 18 is a front view of a ninth embodiment snow guard assembly 1800, in accordance with the present invention. FIG. 18 shows a snow guard assembly 1800 having a first membrane 1802, a second membrane 1804 and a vertex shaped snow guard 1810. The first membrane 1802 and second membrane 1804 are constructed in a similar manner as discussed in previously embodied snow guard assemblies. However, in this embodiment the first membrane 1802 has V-shaped or vertex shaped opening 1806 extending from a first surface 320 (see also FIG. 5A) of the first membrane 1802 to a second surface 322 (see also FIG. 5A) of the first membrane 1802 to allow the vertex shaped snow guard 1810 to be inserted therein. The opening 1806 is positioned on the snow guard assembly 1800 so that an intersection 1808 of the vertex shaped opening 1806 is pointing in a downward direction parallel with the slope of the roof 1818. The vertex shaped snow guard 1810 is similar to the snow guard 1500 discussed in FIGS. 15A, 15B, and 15C; the disparity being that the triangular portion in the middle of the tab 1504 is removed. This allows the shelf 1814 to be folded at the intersection 1808 to form the vertex shaped snow guard 1810. Tabs 1812 of the vertex shaped snow guard 1810 are then positioned within opening 1806. An outline of the tabs 1812 are shown with hidden lines. The vertex shaped snow guard 1810 allows snow to collect within the pocket 1816. The angle formed by the shelf, i.e., the fold at the intersection 1808 in this embodiment is depicted at ninety degrees. However, a variety of angles can be used depending on specific details of the snow guard assembly 1800 installation, i.e., climate and slope of the roof. An opening (not shown) can also be provided at intersection 1808 to allow melting snow to drain from pocket 1816.

[0079] FIG. 19 is a front view and FIG. 20 is a profile view of a tenth embodiment snow guard assembly 1900, in accordance with the present invention. The snow guard assembly 1900 has a first membrane 1902, a second membrane 1904, a reinforcement member 1908, and a snow guard 1906. The snow guard 1906 may be formed from metallic sheet stock. Preferably, the snow guard material is galvanized steel, copper, or aluminum having a thickness in the range of 0.02” to 0.08”, more preferably 0.04”. The snow guard 1906 may be made from 20-ounce cold rolled copper. The snow guard material may also be coated with a polymeric material, for example polyvinyl chloride (PVC). In addition, the snow guard 1906 may be formed using conventional metal working tools. The snow guard 1906 has a pocket 1910. The snow guard 1906 is fastened to tab 1912. The snow guard 1906 can be fastened to tab 1912 in a variety of manners, for example but not limited to, mechanical fasteners, welds, or adhesives.

[0080] In this embodiment the tab 1912 is fastened to the first membrane 1902. The tab 1912 may be fastened to the first membrane 1902 in a variety of manners, for example but not limited to, mechanical fasteners, welds, or adhesives. The first membrane 1902 may be bonded to the second membrane 1904 using hot air welding or a butylene pressure sensitive tape, or the like, to form a watertight seal. The second membrane 1904 may be the same or different material as the first membrane 1902. The first membrane 1902 fits within the perimeter of the second membrane 1904. The first membrane 1902 may be bonded to the second membrane 1904 within 0.5” to 1” of the perimeter of the first membrane 1902. When particular membrane materials are used, for example PVC, the entire contact area of the first membrane 1902 may be bonded to the second membrane 1904. The snow guard assembly 1900 may in turn be bonded to the membrane roofing surface 600 as discussed in previous embodiments. The reinforcement member 1908 can be housed within the first membrane 1902. The reinforcement member 1908 may be made of sheet metal, for example, copper, aluminum or steel. The reinforcement member 1908 may provide localized stress relief. The reinforcement member 1908 may also be fastened to the tab 1912 to provide additional support for the snow guard 1910.

[0081] FIG. 21 is a front view of a first embodiment staging assembly 2100, in accordance with the present invention. FIG. 22 is a side view of the first embodiment of the staging assembly 2100 and FIG. 23 is a top view of the first embodiment staging assembly 2100. The staging assembly 2100 comprises a stage 2102 and two stage couplers 2104. The stage couplers 2104 are fastened to the stage 2102. Each stage coupler 2104 has an insert 2106. The inserts 2106 of the stage couplers 2104 are each inserted into the pockets 200 of two snow guard assemblies 500. Gravity retains the inserts 2106 within the pockets 200 of the snow guard assemblies 500. The weight from the stage 2102 is dispersed from the stage to the inserts 2106 and onto the snow guards 200. The snow guard 200 transfers the forces through the assembly and roofing membranes 2202 onto the roof 2204. The staging assembly 2100 can be used to provide a temporary step for use by roofing installers or maintenance professionals. The staging assembly 2100 can also be used as a temporary shelf to store supplies and equipment during installation or maintenance. Once the installation or maintenance is completed the inserts 2106 of the stage couplers 2104 can be removed from the snow guard 200 by pulling the stage couplers 2104 out of the snow guard 200.

[0082] In the specific embodiments shown in FIGS. 21, 22, and 23 the stage 2102 is a rod with a cap 2302 on the ends. The stage 2102 is fastened to the staging couplers 2104. Each staging coupler 2104 has a bracket 2206 that wraps around the stage 2102 and is fastened to an insert 2106. The inserts 2106 are shaped to the profile of the pocket of the snow guard 200. The inserts 2106 can be made of a variety of materials, for example but not limited to, metal or polymer. The inserts 2106 can also be formed from a sheet of material or from a material mold. The bracket 2206 is fastened to the insert by a mechanical faster 2208. A mechanical faster 2204 may also be used to prevent the stage 2102 from rotating within the bracket 2206. In the specific embodiment a rod is used as a stage 2102, however,
the stage may be a board or cable. Additionally, the stage 2102 can be directly fastened to the inserts without the use of brackets 2206.

[0083] FIG. 24 is a front view and FIG. 25 is an exploded profile view of an eleventh embodiment snow guard assembly 2400, in accordance with the present invention. The snow guard assembly 2400 has a first membrane 2402, a second membrane 2404, a reinforcement member 2408, a snow guard coupler 2405, and a snow guard 2506. The first membrane 2402 may have an opening 2410 extending from a first surface 2402A to a second surface 2402B to allow the snow guard coupler 2405 to be inserted. The reinforcement member 2408 may be made of variety of materials, for example, plastic, metal, or composites. The reinforcement member 2408 may provide localized stress relief. The snow guard coupler 2405 and reinforcement member 2408 may be molded as a single unit using the same material. The first membrane 2402 and second membrane 2404 are similar to and have been described in greater detail in previous embodiments.

[0084] FIG. 25 is an exploded profile view of an eleventh embodiment snow guard assembly 2400 showing the snow guard connector 2514 detached from the snow guard coupler 2405. The snow guard coupler 2405 has a slot 2412 for coupling a snow guard connector 2514. The snow guard 2506 and snow guard connector 2514 may be molded as one piece using metal, plastic, composites, or similar material. The snow guard connector 2514 slides into the slot 2412. A back portion 2416 of the snow guard coupler 2405 prevents the snow guard connector 2514 from sliding out of the slot 2412. The snow guard coupler 2405 also has two lips 2518 that hold the snow guard connector 2514 in place. The snow guard 2506 may have a cone shape or similar structure for retaining snow and ice. The weight of the snow and ice is transferred through the snow guard connector 2514 and snow guard coupler 2405 to the reinforcement member 2408. An opening 2507 is provided within the snow guard 2506 to allow for drainage of melted snow and ice. As with previously described snow guard assemblies embodiments, the reinforcement membrane 2408 and the snow guard 2506 can be molded as a single piece without the need of coupling the two components. In with the eleventh embodiment the snow guard assembly 2400 and the snow guard 2506 may be molded as a single piece without the need of the snow guard coupler 2405 and snow guard connector 2514. In this example the snow guard 2506 would not be detachable from the reinforcement member 2408.

[0085] It should be understood that, while the present invention has been described in detail herein, the invention can be embodied otherwise without departing from the principles thereof, and such other embodiments are meant to come within the scope of the present invention as defined in the following claims. For example, the first and second membranes may be bonded together using an adhesive such as roofing cement or the like.

I claim:
1. A snow guard assembly, comprising:
   a first membrane having an opening extending from a first surface of the first membrane to a second surface of the first membrane;
   a second membrane bonded to the second surface of the first membrane along a perimeter of the first membrane;
   a reinforcement member having an opening extending from a first surface of the reinforcement member to a second surface of the reinforcement member, the reinforcement member being disposed between the first membrane and the second membrane; and
   a snow guard having a pocket coupled to at least one tab, the pocket disposed adjacent the first surface of the first membrane and the tab disposed adjacent the second surface of the reinforcement member.
2. The snow guard of claim 1, wherein the first membrane and the second membrane are selected from the group consisting of EPDM (ethylene-propylene diene monomer), PVC (polyvinyl chloride), and TPO (thermoplastic olefin rubber).
3. The snow guard of claim 1, wherein the bond is watertight.
4. The snow guard of claim 1, wherein the snow guard is selected from the group consisting of copper, galvanized steel, aluminum, and a metal coated with a polymeric cover.
5. The snow guard of claim 1, wherein an edge of the tab is disposed at angle to a horizontal axis, the angle being greater than 15° and less than 75°.
6. The snow guard of claim 1, wherein the edge of the tab is disposed at angle to a horizontal axis, the angle being greater than 30° and less than 60°.
7. The snow guard of claim 1, wherein an edge of the pocket is disposed at angle to a horizontal axis, the angle being greater than 45° and less than 80°.
8. A cable holder assembly, comprising:
   a first membrane having an opening extending from a first surface of the first membrane to a second surface of the first membrane;
   a second membrane bonded to the second surface of the first membrane along a perimeter of the first membrane;
   a reinforcement member having an opening extending from a first surface of the reinforcement member to a second surface of the reinforcement member, the reinforcement member being disposed between the first membrane and the second membrane; and
   a cable holder having a foot portion, a spacer portion, a cable holding portion, and a coupling portion, wherein the foot portion is disposed between the second surface of the reinforcement member and the second membrane.
9. The snow guard assembly of claim 8, wherein the first membrane, the second membrane, the reinforcing member, and the snow guard are made from metal.
10. The snow guard assembly of claim 8, wherein the first membrane is soldered to the second membrane and the tab is soldered to the second membrane.
11. The snow guard assembly of claim 8, wherein the second membrane has one or more perimeter openings extending from a first surface of the second membrane to a second surface of the second membrane for securing the snow guard assembly to a roof surface.
12. The snow guard of the claim 8, wherein a stage coupler fastened to a stage fits within the pocket of the snow guard.
13. A snow guard assembly, comprising:
   means for a first membrane having an opening extending
   from a first surface of the first membrane means to a
   second surface of the first membrane means;
   means for a second membrane bonded to the second
   surface of the first membrane means along a perimeter
   of the first membrane means; and
   means for holding snow having coupled to at least one
   means for support, a pocket disposed adjacent the first
   surface of the first membrane means and the support
   means disposed adjacent the second surface of the first
   membrane means.
14. The snow guard of claim 13, wherein the first mem-
   brane means and the second membrane means are selected
   from the group consisting of EPDM (ethylene-propylene
   diene monomer), PVC (polyvinyl chloride), and TPO (ther-
   moplastic olefin rubber).
15. The snow guard of claim 13, wherein the bond is
   watertight.
16. The snow guard of claim 13, wherein an edge of the
   support means is disposed at angle to a horizontal axis, the
   angle being greater than 15° and less than 75°.
17. The snow guard of claim 13, wherein an edge of the
   pocket is disposed at angle to a horizontal axis, the angle
   being greater than 45° and less than 80°.
18. The snow guard assembly of claim 13, wherein the
   first membrane means, the second membrane means, and the
   snow guard means are made from metal.
19. The snow guard assembly of claim 13, wherein the
   first membrane means is soldered to the second membrane
   means and the support means is soldered to the second
   membrane means.
20. The snow guard assembly of claim 13, wherein the
   second membrane means has one or more perimeter open-
   ings extending from a first surface of the second membrane
   means to a second surface of the second membrane means
   for securing the snow guard assembly to a roof surface.
21. The snow guard of the claim 13, wherein means for
   coupling a means for staging fastened to the staging means
   fits within the pocket of the snow holding means.
22. A removable stage assembly, comprising:
   a stage spanning between two or more snow guards; and
   two or more stage couplers wherein each stage coupler
   fastens to the stage and each of the stage couplers has
   an insert portion the fits within a pocket of each of the
   snow guards.
23. A method of making a snow guard assembly, com-
   prising the steps of:
   providing a snow guard having a pocket coupled to at
   least one tab;
   providing a first membrane having an opening extending
   from a first surface of the first membrane to a second
   surface of the first membrane;
   inserting at least one tab through the opening in the first
   membrane;
   positioning at least one tab adjacent the second surface of
   the first member; and
   bonding a second membrane to the second surface of the
   first membrane along a perimeter of the first membrane.
24. The method of claim 23, further comprising the steps
   of:
   providing a reinforcement member having an opening
   extending from a first surface of the reinforcement
   member to a second surface of the reinforcement
   member, the reinforcement member being disposed
   between the first membrane and the second membrane;
   inserting at least one tab through the opening in the first
   membrane and through the opening in the reinforce-
   ment member; and
   positioning at least one tab adjacent the second surface of
   the reinforcement member.
25. The method of claim 23, wherein said step of pro-
   viding a snow guard having a pocket coupled to at least one
   tab further comprises the steps of forming sheet metal in a
   shape of the pocket and at least one tab.
26. The method of claim 23, wherein said step of pro-
   viding a snow guard having a pocket coupled to at least one
   tab further comprises the steps of molding material in a shape
   of the pocket and at least one tab.
27. The method of claim 23, further comprising the step
   of coupling the snow guard assembly to a roof with
   mechanical fasteners.
28. The method of claim 23, further comprising the step
   of coupling the snow guard assembly to a roof with an
   adhesive.
29. The method of claim 23, wherein said step of pro-
   viding a snow guard having a pocket coupled to at least one
   tab further comprises the steps of coating the snow guard with
   a weather resistant material.
30. The method of claim 23, further comprising the step
   of providing one or more openings around the perimeter of
   the second membrane for installation of mechanical fasten-
   ers.