SPEC WRITERS NOTE: This specification includes materials and installation procedures for **SlopeShield Plus®** Self-Adhered (SA) Vapor Permeable Roofing Underlayment Air Barrier Material or Water-Resistive Vapor Permeable Air Barrier Sheet Membrane. **SlopeShield Plus®** Self-Adhered sheet membrane/roofing underlayment is used on sloped roof wood substrates, mass timber flooring or plywood flooring without the need of a primer. With a water vapor permeance rating of 30 perms (1716 ng/Pa.s.m^2) as per the ASTM E96 water method, **SlopeShield Plus®** Self-Adhered prevents air leakage and allows the roof/floor assembly to breathe or 'dry-out' as necessary to meet the conditions of seasonal changes for each climate zone. This guide specification should be adapted to suit the requirements of individual projects. It is prepared in CSI Master Format and should be included as a separate section under Division 7 - Thermal and Moisture Protection.

SECTION 072743

HIGHLY PERMEABLE SELF-ADHERING AIR BARRIER MEMBRANE/ROOFING UNDERLAYMENT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the Water-Resistive Vapor Permeable Air Barrier Sheet Membrane Work of this section.

B. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the Work of this Section.

1.2 SUMMARY

A. The work of this Section includes furnishing and installation of fully self-adhered highly permeable vapor permeable air barrier membrane/roofing underlayment at locations as noted below or at locations indicated on Drawings.
   1. On sloped roof systems of 2:12 or greater that incorporate the use of metal roofing, clay or concrete roof tiles, cedar or wood shingles. In low-slope roof applications (less than a 2:12 slope), the roofing underlayment can be used over the structure for temporary moisture management during construction and for air control during occupancy.
   2. For protection of mass timber deck, flooring during construction.
   3. Temporary protection of plywood or OSB wood flooring substrates during construction.

B. The work of this Section, also includes furnishing and installation of flashing membranes to bridge gaps, for ice-dam protection and valley flashing for vented sloped roofs, for transition areas of roof/floor to openings and interface and elsewhere as indicate or required by code to provide a continuous air barrier assembly. Locations include, but are not limited to, the following:
   1. Connection of the roof/floor to wall system.

2. Openings and penetrations of roof system for skylights and mechanical equipment.
3. All other air leakage pathways between the building envelope and the roofing assembly.

C. Provide material and work of this Section required to complete mock-up panel(s). Refer to exterior elevations for extent of mock-up panels.

1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Carefully examine all of the Contract Documents for requirements which effect the work of this section.

B. Other specifications sections which directly relate to the work of this section include, but are not limited to, the following:
1. Section 072200 - Roof and Deck Insulation
2. Section 072100 - Building Insulation and Vapor Barriers
3. Section 072513 - Non-Permeable Waterproofing Roofing Underlayment
4. Section 072719 - Plastic Sheet Air Barrier
5. Section 072727.01 - Self-Adhering Water-Resistive Air Barrier Membrane System-WrapShield.
6. Section 073100 - Shingles and Shakes
7. Section 073116 - Metal Shingles
8. Section 073129 - Wood Shakes and Shingles.
9. Section 073213 - Clay Roof Tiles
10. Section 073214 - Ceramic and Porcelain Roof Tiles
11. Section 073219 - Metal Roof Tiles
12. Section 073226 - Plastic Roof Tiles
13. Section 073229 - Rubber tiles/Panels
14. Section 076100 – Sheet Metal Roofing
15. Section 079200 - Joint Sealants

1.4 REFERENCE STANDARDS

A. The American Association of Textile Chemists and Colorists (AATCC) - Test Method for Water Resistance: Hydrostatic Pressure Test.

B. American Society of Civil Engineers: ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. ASTM International (ASTM):
1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
2. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
3. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
4. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).

5. ASTM D1970/ section 7.9 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice-Dam Protection.
6. ASTM D2240 - Standard Test Method for Rubber Property - Durometer Hardness
7. ASTM D4073 - Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes.
8. ASTM D5034 - Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test).
9. ASTM D5147 - Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
10. ASTM D2523 - Standard Practice for Testing Load-Strain Properties of Roofing Membranes.
11. ASTM D5601 - Standard Test Method for Tearing Resistance of Roofing and Waterproofing Materials and Membranes.
12. ASTM D5602 - Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens.
13. ASTM D7349 - Standard Test Method for Determining the Capability of Roofing and Waterproofing Materials to Seal around Fastener.
14. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
15. ASTM E96/96M - Test Methods for Water Vapor Transmission of Materials.
16. ASTM E154 - Standard Practice for Testing Load-Strain Properties of Roofing Membranes.
17. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
18. ASTM E398 - Standard Test Method for Water Vapor Transmission Rate of Sheet Materials Using Dynamic Relative Humidity Measurement.
19. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

D. International Code Council Evaluation Service, Inc. (ICC-ES): ICC-ES AC48 - Acceptance Criteria for Roof Underlayment for Severe Climate Areas.

E. CDPH/EHLB Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers Version 1.2.

1.5 SUBMITTALS

A. Submit manufacturers' current product data sheets, details and installation instructions for the vapor permeable air barrier membrane/roofing underlayment components and accessories.

B. Submit samples of the following:
   1. Manufacturer's sample warranty.
   2. 3 each water-resistive water vapor permeable air barrier roofing underlayment, minimum 8 by 10 inches (203 by 254 mm).
   3. Accessory component:
      a. VaproTape 3"W (10.2 cm) x 50' (15 m)

b. VaproLiqui-Flash™, 1 sausage
c. VaproBond™, 1 sausage
d. 3 each VaproShim SA™ Self-Adhered, 3 mm (⅛ in.), 1 in. x 4 in. (2.5 cm x 10.1 cm)
e. 3 each VaproShim SA™ Self-Adhered, 7 mm (¼ in.), 1 in. x 4 in. (2.5 cm x 10.1 cm)
f. 3 each VaproMat™ 3 mm (⅛ in.), 8.5 in. x 11 in. (21.59 cm x 27.94 cm)
g. 3 each VaproMat™ 7 mm (¼ in.), 8.5 in. x 11 in. (21.59 cm x 27.94 cm)

4. Membrane flashing products:
   a. 3 each SlopeFlashing™ Samples, minimum, 8 by 10 inches (203 by 254 mm). 3 each RoofBlock™ HT samples, minimum 8 by 10 inches (203 by 254 mm).
5. Sealants (by others) required to provide a complete air barrier membrane system.

Delete section C if not pursuing LEED certification.

C. LEED Submittals:
   1. Integrative process [IP] has a 1 pt. potential. VaproShield encourages this through preconstruction planning, for 'building envelope attributes'.
   2. Energy and Atmosphere [EA].
      a. Minimum Energy requirement prerequisite and performance points – by providing a complete air barrier system: up to 18 pts.
      b. Commissioning (i.e. BECx): Energy load reductions, Indoor Environmental Quality, and longevity of building components which are required to satisfy the prerequisite if commissioning / verification for building envelope is chosen as a path prior to DD. Envelope Commissioning may qualify for additional 2 pts, on top of the 4 pts via building energy simulation (enhanced commissioning), or complying with the prescriptive paths in ASHRAE 90.1-2010
   3. Indoor Environmental Quality [IEQ/EQ].
      a. As part of IAQ Management plan for construction phase which protects building from moisture infiltration, SlopeShield Plus SA can help provide an additional 1 pt.
      b. Low-emitting Material Credits: up to 3 pts. SlopeShield Plus SA complies with exterior product (emission req. exempt) requirements and VOC limits per SCAQMD Rule #1168 (as published Sept. 2017).
         1) All roof or deck sealant and flashing materials to interior pass CDPH/EHLB/Standard Method V1.2 (Sect. 01350) for VOC's after 14 days cure time.
   4. Awareness and Education [AE] and/or Innovation [IN/ID].
      a. Applies to projects which offer both a case study and educational outreach program, which use the project as an example. 1 pt. available.

1.6 QUALITY ASSURANCE

A. Single Source: Obtain self-adhered water-resistive water vapor permeable air barrier membrane/roofing underlayment components and accessories from a single-source membrane system manufacturer to ensure total system compatibility and integrity.

B. Manufacturer Qualifications:
   1. Company specializing in manufacturing and supply of highly water vapor permeable water-resistive air barrier products specified in this Section with minimum [**10**] ten years' experience and successful installations in similar project applications.
   2. Provide manufacturer's experienced in-house technical and field observation personal qualified to provide technical support.

C. Applicator:
   1. Company specializing in performing Work of this Section with minimum [3] three years' experience.

D. Fire Performance Characteristics: Provide water-resistive barrier vapor permeable air barrier membrane/roofing underlayment meeting the following fire-test characteristics.
   1. Surface-Burning Characteristics: ASTM E84
      a. Flame spread index: 5 or less
      b. Smoke developed index: 45 or less

1.7 MOCK-UP

A. Construct mock-up in accordance with Section 014339 - Mock-up, or as specified under General Requirements Section 011000.

B. Provide mock-up of specified water-resistive water vapor permeable air barrier materials/roofing underlayment under provisions of Section 013323 - Shop Drawings, Product Data and Samples.

Generally, retain first subparagraph below if requiring preconstruction testing.

   1. Coordinate construction of mock-up's to permit inspection and testing of air barrier and drainage plane along with interfacing flashing and components, before external roof insulation and roof assemblies are installed.
   2. Prior to installation of specified water-resistive water vapor permeable air barrier materials/roofing underlayment or related materials on the building, construct a 100 square foot mockup of typical exterior roof or floor assembly, including connection between wall and roof, wall and floor to indicate relationship of materials with air barrier and quality of workmanship. Provide mock-up using actual air barrier membrane/roofing underlayment and associated products, for roof and/or floor materials. Provide several mock-ups if necessary to include the various conditions. Acceptable mock-ups, undamaged at time of Substantial Completion, may be incorporated into the finish work. Rebuild mock-up's which are not approved at no additional cost to the Owner.
   3. Construct mock-up in accordance with details of mock-up indicated on the Drawings.
   4. Nonpermeable Roof Underlayment: Provide RoofBlock HT at roof valley and roof edge conditions of ventilated sloped roofs susceptible to ice-dams. Use RoofBlock HT in conjunction with the SlopeShield Plus SA on ventilated roof decks.

1.8 PRE-INSTALLATION CONFERENCE

A. Provide a pre-installation conference [two] weeks prior to commencing work of this section, under provisions of Section 013119 - Project Meetings or as specified under General Requirements Section 011000. Location of conference is at building site, unless noted otherwise.

B. Ensure all contractors responsible for creating a continuous plane of water and air tightness are present.

C. Agenda includes the following:
   1. Review of approved submittals.
   2. Review of mock-ups.
   3. Coordination with sequence of installation with adjacent materials.
   4. Schedule for subsequent work covering air barrier.
   5. Procedures for quality assurance.

1.9 DELIVERY, STORAGE AND HANDLING

A. Refer to current Product Data Sheet, Installation Instructions and Safety Data Sheets (SDS) at www.vaproshield.com for proper storage and handling.

B. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

C. Store roll materials on end in original packaging. Protect rolls from direct sunlight and inclement weather until ready for use.

D. Waste Management and Disposal
   1. Separate and repurpose or recycle waste materials in accordance with Section [017419 - Construction Waste Management and Disposal], and with the Waste Reduction Work Plan.

1.10 COORDINATION

A. Ensure shingled lapping and continuity of the fully self-adhered water-resistive water vapor permeable air barrier system and vapor non permeable air barrier roofing underlayment throughout the scope of this section.
   1. Provide highly permeable air barrier membrane/roofing underlayment that includes self-adhered air barrier, transition membranes, flashing and sealants at penetrations and intersections. Provide SlopeFlashing™ and VaproLiqui-Flash™ by VaproShield, a liquid-applied water vapor permeable air barrier flashing material or VaproBond™, a water impermeable low vapor permeance barrier flashing material.
   2. At locations indicated provide unimpeded, water resistive barrier vapor permeable air barrier/roofing underlayment and flashings to the exterior.
   3. At locations indicated provide nonpermeable vapor barrier RoofBlock HT at valley and roof edge conditions susceptible to ice-dams.

4. Coordinate optimal sequencing with all related or interfaced building components and trades to facilitate best practices including: shingle fashion, drainage, water-tightness, and air barrier continuity.

1.11 WARRANTY

A. Provide manufacturer's standard material warranty in which manufacturer agrees to provide replacement material for the fully self-adhered vapor permeable air barrier roofing underlayment and/or water-resistive water vapor permeable air barrier sheets installed in accordance with manufacturer's instructions that fail due to material defects within [20] twenty years from the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 VAPOR PERMEABLE AIR BARRIER MATERIALS

A. SlopeShield Plus is a self-adhered spun-bond polyester fabric with proprietary coatings on the top and underside utilizing Vapor Permeable Polymer Composite Technology (VPPCT™). The top coating is slip resistant and UV-stable. The underside consists of a pressure sensitive adhesive protected by a siliconized release film. Combined they provide a water-resistive vapor permeable air Barrier sheet membrane or roofing underlayment
   1. Basis-of-Design Product: Subject to compliance with requirements, provide fully self-adhered highly vapor permeable air barrier sheet membrane or roofing underlayment, SlopeShield Plus Self-Adhered. Provide sheet membrane tested in accordance with ICC-ES AC 48 criteria to meet IBC and IRC requirements for weather resistive self-adhered membrane or roof underlayments for use as ice barriers having the following properties:
      a. Color: Black with allowable UV exposure for 180 days, prior to permanent roofing assembly coverage.
   2. Thickness: 0.51 mm (20 mil)
   3. Weight: ASTM D5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material. In house: 447 g/m^2 (1.46 oz/ft^2)
   4. Roll Weight with release film: 50.6 lbs (23.0 kg) (1.56 oz/ft^2)
   5. Boxed Roll Weight: 54 lbs (24.6 kg)
   6. Roll Length and Width: 59" x 102' (1.5 m x 31.1 m) and 29.5" x 102' (749 mm x 31.1 m))
   7. Roll Coverage: 59" (31.1 m): 500 ft^2 (46.6 m^2) gross, 29.5" (749 mm x 31.1 m): 275 ft^2 (23.3m^2) gross
   8. Warranty: 20 years
   9. Ultra Violet Light Exposure: 180 days (6 months) prior to covering
   10. Service Temperature: minus 40 °F (-40 °C) - 300 °F (149 °C)
   11. Installation Temperature minimum 20°F (-6°C)
   12. Composition: spun-bond polyester fabric with proprietary coatings
   13. Primer: No Primer Required
   14. Dry Breaking Force (Grab method) Percent Elongation: ASTM D5034 Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test) MD - 31%, XMD - 40%

15. Dry Breaking Force (Grab method) MD ≥40 lbf/in. XMD ≥35 lbf/in.: ASTM D5034 Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test). MD - 23.6 N/mm (135 lbf/in.) XMD - 19.8 N/mm (113 lbf/in.).
16. ASTM D5147 Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes: MD - PASS, XMD - PASS

2.2 SUPPLEMENTAL SLOPESHIELD PLUS SELF-ADHERED PROPERTIES

A. Tensile Strength (surface tension): ASTM D2523 Standard Practice for Testing Load-Strain Properties of Roofing Membranes
   1. MD - 2.8 N/mm (16 lbf/in.)
   2. XMD - 1.4 N/mm (8 lbf/in.)

B. Percent Elongation: ASTM D2523 Standard Practice for Testing Load-Strain Properties of Roofing Membranes.
   1. MD - 36 %
   2. XMD - 40 %

C. Tear Resistance (Tongue Tear): ASTM D4073 Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes
   1. MD - 427 N (96.1 lbf)
   2. XMD - 273 N (61.3 lbf)

D. Tear Resistance (Tongue Tear): ASTM D5601 Standard Test Method for Tearing Resistance of Roofing and Waterproofing Materials and Membranes
   1. MD - 70.3 N (15.8 lbf)
   2. XMD - 64.5 N (14.5 lbf)

E. Static Puncture Resistance: ASTM D5602 Standard Test Method for Static Puncture Resistance of Roofing Membrane Specimens.
   1. PASS Concrete 445 N (100 lbf)
   2. PASS Insulfoam IX 222 N (50 lbf)

F. Puncture Resistance: ASTM E154 Standard Practice for Testing Load-Strain Properties of Roofing Membranes.
   1. Puncture Strength 636 N (143 lbf)
   2. Peak Deflection 43.4 mm (1.71 in).

G. Water Vapor Transmission: ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
   1. Water Vapor Transmission Desiccant Method Procedure A - ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
      a. 23 °C (73.4 °F) 50 %RH
      b. 19.89 Perm (grain/h•ft^2•inchHg), 1138 ng/Pa•s•m^2
   2. Water Vapor Transmission Water Method Procedure B - ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials
      a. 22.8 °C (73 °F) 50 %RH
      b. 30 Perm (grain/h•ft^2•inchHg), 1716 ng/Pa•s•m^2

H. Water Vapor Transmission Dynamic Relative Humidity Measurement: ASTM E398 Standard Test Method for Water Vapor Transmission Rate of Sheet Materials Using Dynamic Relative Humidity Measurement
   1. 23 °C (73.4 °F) 0-50 %RH
   2. 30 Perm (grain/h•ft^2•inchHg), 1716 ng/Pa•s•m^2

I. Water Vapor Transmission Using Modulated Infrared Sensor: ASTM F1249 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
   1. (23 °C (73.4 °F) 0-50 %RH
   2. 9.2 Perm (grain/h•ft^2•inchHg), 526 ng/Pa•s•m^2

J. Air Resistance Testing: Air Permeance:
   1. ASTM E2178 @75 Pa Standard Test Method for Air Permeance of Building Materials
      a. 0.00437 L/s•m² @ 75 Pa (0.00086 cfm/ft^2 @ 1.57 psf)

K. Water Resistance Testing: Nail Sealability:
   2. ASTM D1970/ section 7.9 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice-Dam Protection – Pass.
      a. ASTM D7349 Standard Test Method for Determining the Capability of Roofing and Waterproofing Materials to Seal around Fasteners - Pass.

2.3 SLOPEFLASHING AND ACCESSORY COMPONENTS

A. Vapor Permeable Air Barrier Transition and Flashing Membrane
   1. Provide self-adhered air barrier transition and flashing membrane for all transitions. Provide pre-cut SlopeFlashing™ by VaproShield. SlopeFlashing™ is a zero VOC fully self-adhered water-resistive water vapor permeable roof flashing having the following properties:
      a. Same material and properties as SlopeShield SA® Self-Adhered Vapor Permeable Air Barrier/Roofing Underlayment. (See 2.1 above).
      b. Physical Dimensions: SlopeFlashing™ Black: 19 $^2/_3$ inches (50 cm) wide x 102 feet (31.1 m) long.

SPEC WRITERS NOTE: Acceptable substrates for SlopeShield Plus SA® Self-Adhered Water-Resistive Vapor Permeable Air Barrier membrane/roofing underlayment include; gypsum/fiber roof sheathing boards, rigid insulation, concrete, plywood, mass timber, (cross laminated timber (CLT), nail laminated timber (NLT) dowel laminated timber (DLT)), pre-painted steel, galvanized metal, aluminum (painted/mill finish). Best practice guidelines for the application of SlopeShield Plus SA surfaces are: a dry, sound, clean “as new” condition, and free of oil, grease, dirt, excess mortar or other surface contaminants. SlopeShield Plus SA does not require the use of adhesive-primers. Roll membrane/underlayment with two-handed roller to ensure proper adhesion to the substrate.

Penetration flashing system includes several components. VaproLiqui-Flash™ or as alternates, VaproBond™ Flashing, Vapro-SS Flashing™ or BlockFlashing™.

A. VaproLiqui-Flash™ Water Vapor Permeable Water Resistive Flashing For Rough Openings

1. Skylight, roof vents or other rough opening flashing includes VaproLiqui-Flash™ by VaproShield, a liquid-applied water vapor permeable air barrier flashing material with vapor permeance and resistance to air leakage properties compatible with the primary air barrier membrane/roofing underlayment.
   a. Pass: CDPH/EHLB/Standard Method V1.2 (Sect. 01350) VOC test.

SPEC WRITERS NOTE: Best construction practice for wood frame construction is to protect the rough openings with the two-part system of SlopeFlashing and water vapor permeable VaproLiqui-Flash™ to reduce the risk of wood deterioration.

B. Alternate Flashing Products
   1. VaproBond™ flashing: water impermeable low water vapor permeance flashing for rough openings.
      a. Include VaproBond™ flashing by VaproShield, a modified silicon sealant, at rough opening and raised curb locations.
         1) VaproBond™ Flashing: 20-ounce (592 ml) sausage.
         2) Elongation: 1,500 % when tested in accordance with ASTM D412.
   2. Vapro-SS Flashing™ water and vapor impermeable flashing for rough openings.
      a. Include Vapro-SS Flashing™ by VaproShield, a flexible 2 mil (0.05 mm) stainless steel sheet with an 8 mil (0.20 mm) butyl adhesive backing at rough opening and raised curb.
      b. Vapro-SS Flashing™: 6, 12, or 18 inches (15.2, 30.5, 45.7 cm) x 50 feet (15.24 m) long.
         1) Tensile Strength/Puncture: 100,000 psi when tested in accordance with ASTM D882 and 2,500 psi when tested in accordance with ASTM E154.
   3. BlockFlashing™ self-adhered, non-asphaltic, air, water and vapor barrier flashing for rough openings.
      a. Include BlockFlashing™ by VaproShield, a flexible 2 mil (0.26 mm) polypropylene sheet with an acrylic adhesive backing rough opening locations.
   4. RoofBlock HT™: A self-adhered vapor barrier roof valley and roof edge product associated with ventilated sloped roofs susceptible to ice-dams. RoofBlock HT is used in conjunction with the SlopeShield Plus on ventilated roof decks.

C. Enhanced drainage and ventilation can be achieved with the following accessories, provided the final roofing material chosen is designed to accept these accessories. Contact the VaproShield Technical Department for assistance in choosing the appropriate accessories for the roofing materials specified.

D. Water-resistive weather drainage and ventilation accessories by VaproShield.

E. Shim or Gasket
   1. Shim or gasket includes VaproShim SA™ Self-Adhered Neoprene/EPDM accessory used under roofing attachment components to create an unimpeded drainage vertical drainage plane for roofing, while sealing fastener penetrations.
      a. VaproShim SA™: 1”W x 4”L x ¼”D, 1”W x 4”L x ⅛”D or 3”W x 4”L x ¼”D
      b. Durometer Hardness: 80±5 Tensile Strength: 1000 psi when tested in accordance to ASTM D2240 Standard Test Method for Rubber Property - Durometer Hardness.

F. VaproMat™ lightweight, hydrophobic filter fabric with a 3 mm (⅛ in.) or 7 mm (¼ in.) polypropylene drainage matrix attached, designed to maintain a drainage cavity under roofing material, promoting rapid drying.

G. Transition Flashing
   1. Transition flashing includes VaproSilicone Transition™ Sheet by VaproShield, a flexible 80 mil (2 mm) extruded silicone sheet.
      a. VaproSilicone Transition™ Sheet: 4, 6 or 9 inches (10.2, 15, 23 cm) x 50 feet (15.24 m) long.
      b. Dynamic Movement Capability: +200 / -50 % when tested in accordance to ASTM C1523.
      c. Elongation: 400 % when tested in accordance to ASTM D412.
      d. Tensile Strength: 295 psi (2.03 MPa) when tested in accordance with ASTM D412.
      e. Tear Strength: 20 ppi (3.5 N/mm) when tested in accordance to ASTM D624.

2.4 PENETRATION SEALANT

A. Provide sealant for penetrations as recommended by manufacturer and as specified under Division 07 Section: Sealants. Appropriate sealants shall be VaproBond™ or VaproLiqui-Flash™.

2.5 ROOF/FLOOR ROLLER

A. Roof/floor roller tool: Provide two-handed roller incorporating weighted rollers of heavy-duty design die-cast type to firmly secure the membrane/underlayment adhesive to the substrate.

SPEC WRITERS NOTE: VaproShield's self-adhered membranes/roofing underlayments incorporate a pressure sensitive adhesive (PSA) that requires pressure rolling to activate the adhesion.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify that surfaces and conditions are ready to accept the work of this section. Notify [**Roofing Contractor] [Engineer] [Architect] [Construction Manager] [General Contractor**] in writing of any discrepancies. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrates.

B. All surfaces must be dry, sound, clean and free of oil, grease, dirt, excess mortar or other contaminants detrimental to the adhesion of the water-resistive air barrier membrane and flashings. Fill voids and gaps in substrate greater than 7/8 inch (22 mm) in width to provide an even surface. Tool roof or deck sheathing joints, filled with sealant materials, so that **no** sealant is spread onto the exterior surface of the sheathing. Remove any sealant products from sheathing surface prior to installation of vapor permeable air barrier membrane/roofing underlayment.

C. Minimum application temperature of fully self-adhered membrane/roofing underlayment, both permeable or non-permeable and flashing membrane to be above 20 °F (minus 6.0 °C). Frost or water on substrate is unacceptable.

D. Ensure all preparatory work is complete prior to applying primary fully self-adhered water vapor permeable air barrier sheet membrane/roofing underlayment.

E. Set flush with sheathing, any mechanical fasteners used to secure roof or deck sheathing surfaces or that penetrate sheathing surfaces. Provide fasteners secured into solid backing and covered with the upper overlapping membrane. If exposed fasteners are present on the surface of the membrane, cover and seal with VaproLiqui-Flash™ or VaproBond™.

3.2 COORDINATION OF SELF-ADHERED VAPOR PERMEABLE AIR BARRIER MEMBRANE/ROOFING UNDERLAYMENT INSTALLATION

A. Download Installation Instructions at http://vaproshield.com/public-documents/installation-instructions.

B. Installation Summary:
1. Complete detail work at; roof/floor openings, building transitions and penetrations prior to field applications allowing for shingle laps with release film temporarily left in place as needed.
2. Install self-adhered highly water vapor permeable air barrier membrane and/or roofing underlayment horizontally over the outside face of exterior sheathing board or other approved substrates.
3. Install fully self-adhered highly vapor permeable air barrier membrane or roofing underlayment over the outside face of exterior sheathing board or substrate, measure and pre-cut into manageable sized sheets to suit the application conditions.
4. Install fully self-adhered water vapor permeable air barrier sheet or highly vapor permeable air barrier roofing underlayment complete and continuous to substrate in a sequential minimal overlapping weatherboard as per slope.
    a. Slope of <1:12 requires a weatherboard shingled 3-inch (76 mm) overlap and 3-inch VaproTape to cover seam, including any vertical seams.
    b. Slope of 1:12 – 2:12 requires a weatherboard shingled 12-inch (152.4 mm) overlap including any vertical seams.
    c. Slope of >2:12 requires a weatherboard shingled 3-inch (76 mm) overlap including any vertical seams.
5. Stagger all end lap seams.
6. Roll installed membrane/roofing underlayment with a roof/floor roller to ensure positive contact and adhesion with substrate immediately.
7. Install fully self-adhered vapor impermeable barrier at roof edge, valleys, pertinent roof openings and skylights as recommended by Manufacturer.

3.3 BUILDING TRANSITION CONDITIONS

A. Tie-in to structural beams, columns, floor slabs and intermittent floors, parapet curbs, foundation walls, roofing systems and at the interface of dissimilar materials with self-adhering air barrier transition and flashing membrane.

B. Align and position fully self-adhered air barrier transition and flashing membrane, remove protective film and press firmly into place. Ensure minimum shingled over laps.

C. Ensure minimum 3 inch (76 mm) overlap at side and end laps of membrane and 6 inch (152.4 mm) at inside and outside corners, if joints occur at corner locations.

D. Roll membrane and lap seams with roller to ensure positive contact and adhesion, immediately.

3.4 MECHANICAL EQUIPMENT PENETRATIONS

A. Mechanical pipe, electrical conduit and/or duct work must be secured solid into position prior to installation of fully self-adhered water vapor permeable air barrier membrane/roofing underlayment.

B. Electrical services penetrating the roof/floor assembly and fully self-adhered water vapor permeable air barrier membrane/underlayment must be placed in appropriate conduit and secured solid into position.

C. Install manufactured flanged penetration sleeves as recommended by sleeve manufacturer.

D. For straight sided penetrations, cut and fit fully self-adhered water vapor permeable air barrier membrane/roofing underlayment to accommodate sleeve, install VaproLiqui-Flash™ or VaproBond™ to seal the air barrier membrane to ductwork or preformed flange sleeve.

E. For pipe penetrations, refer to manufacturer’s standard details.

3.5 SKYLIGHTS, ROOF VENTS, ACCESS OPENINGS AND EQUIPMENT CURBS

A. Two-part flashing system; SlopeFlashing™ and VaproLiqui-Flash™, or as alternate, VaproBond™, Vapro-SS Flashing™, BlockFlashing, or RoofBlock HT by VaproShield around roof rough openings subject to the opening size and installation of skylights, or roof access hatches.
   1. SlopeFlashing™ transition and flashing membrane installed 2 ¾ inch (70 mm) into rough roof/floor openings for equipment curbs, skylights, roof hatches, smoke /exhaust hatches and similar roof or floor openings.

B. Remove release film, align flashing membrane and apply pressure to ensure positive contact. Roll lap seams to ensure adhesion. For roof curb installation, leave the release film on the section that will overlap the field membrane. Provide lap seams in shingled fashion, to shed water.

C. Provide VaproLiqui-Flash Vapor Permeable Water Resistive Flashing For Rough Openings as follows:
   1. Provide liquid-applied rough opening flashing - VaproLiqui-Flash™ by VaproShield, a liquid-applied vapor permeable air barrier flashing material with resistance to moisture and air leakage properties compatible with the primary weather resistant air barrier membrane.

2. Apply a 12-15 wet mil (0.030-0.038 mm) coating onto the installed SlopeFlashing™, 1-inch (25.4 mm) onto the face continuing into the rough opening, covering the 2 ¾ inch (70 mm) SlopeFlashing™ and the exposed rough opening surface.

SPEC WRITERS NOTE: Rough opening flashing system includes two components. SlopeFlashing and VaproLiqui-Flash™ or as alternates, VaproBond™ Vapro-SS Flashing™. VaproBond™, Vapro-SS Flashing™ and BlockFlashing™ are optional replacements for flashing system on non-wood substrates.

D. Optional VaproBond water impermeable low vapor permeance flashing for rough openings
   1. Provide fluid applied membrane for rough opening flashing; VaproBond™ by VaproShield, a low vapor permeable, impermeable air and water barrier flashing material, replaces VaproLiqui-Flash™.
   2. Apply VaproBond™, 30-50 wet mil (0.76 - 1.27 mm) coating, 1-inch (25 mm) onto the face continuing into the rough opening, covering the 2 ¾ inch (70 mm) SlopeFlashing and the exposed rough opening surface.

E. Optional Vapro-SS Flashing water vapor Impermeable flashing for rough openings
   1. Provide self-adhered stainless-steel membrane for rough opening flashing; Vapro-SS Flashing™ by VaproShield, an impermeable air and water barrier flashing material, replaces VaproLiqui-Flash. Not recommended for wood framing.
   2. Apply SlopeFlashing™, 1-inch (25 mm) onto the face continuing into the rough opening, covering the 2 ¾ inch (70 mm) SlopeFlashing ™ and the exposed rough opening surface.

F. Optional BlockFlashing™ water vapor impermeable flashing for rough openings
   1. Provide self-adhered polypropylene membrane for rough opening flashing; BlockFlashing™ by VaproShield, an impermeable air and water barrier flashing material, replaces VaproLiqui-Flash. Not recommended for wood framing.

G. Optional Ice Barrier Protection:
   1. 2 overlapping layers of SlopeShield Plus
   2. 2 overlapping layers BlockShield SA Plus
   3. RoofBlock HT™ a self-adhered non-permeable vapor barrier roof valley and roof edge product associated with ventilated sloped roofs susceptible to ice-dams. RoofBlock HT is used in conjunction with the SlopeShield Plus on ventilated roof decks.

3.6 HORIZONTAL APPLICATIONS

A. For horizontal applications, align roofing underlayment and begin installation of water-resistive weather barrier at bottom or lowest point of roof/floor.

B. To avoid wrinkles and misalignment of subsequent applications, it is recommended to pre-mark or "Snap" a level line to work from.

C. Measure and pre-cut into manageable sized sheets to suit the application conditions.

D. Allow for excess material at bottom of roof/floor to accommodate tie-ins and connections to adjacent surfaces.

E. Align and position fully self-adhered membrane/roofing underlayment, remove release film and press firmly into place. Provide minimum 3 inch (76 mm) overlap at all side and end laps of membrane. Roll membrane and lapped seams with a roof/floor roller to ensure contact and adhesion.

F. Continue to remove release film and apply pressure to ensure positive contact onto roof/floor substrate.

G. Install subsequent sheets of fully self-adhered vapor permeable air barrier/roofing underlayment in overlapping format. Ensure sheets lay smooth and flat to surfaces. Roll membrane and lapped seams with a roof/floor roller to ensure contact and adhesion.

H. Refer to http://vaproshield.com/installation/instructions for the most current and complete installation instructions.

3.7 FIELD QUALITY CONTROL

A. Make notification when sections of work are complete to allow review prior to covering fully self-adhered vapor permeable air barrier system.

B. Owner to engage independent consultant to observe roof/floor substrate and membrane installation prior to placement of roofing system(s) or continued floor construction and provide written documentation of observations.

3.8 PROTECTION

A. Protect roof/floor areas covered with self-adhered water water-resistive vapor permeable air barrier sheet membrane or roofing underlayment from damage due to construction activities, high wind conditions, and extended exposure to inclement weather.

B. Review condition of fully self-adhered vapor permeable air barrier membrane or roofing underlayment, or non-permeable roofing underlayment prior to installation of sloped roofing materials or floor materials. Repair, or remove and replace damaged sections with new underlayment.

C. Recommended to protect exposed roof and or floor deck substrates against wet weather conditions during and after application of underlayment and construction and activity above completed fully self-adhered vapor permeable air barrier roofing underlayment installations.

D. Remove and replace highly vapor permeable air barrier membrane/roofing underlayment affected by chemical spills or surfactants.

END OF SECTION