SPEC WRITERS NOTE: This specification includes materials and parameters. Examine all Drawings and all Sections of the Specifications for requirements and provisions affecting the work of this Section.

Procedures for use of **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, flat or sloped mass timber flooring/roofing (CLT Panels) 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 sheet membrane 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 1 - General Requirements.

SECTION 015010

PERMEABLE AIR - WATER BARRIER PROTECTION FOR MASS TIMBER CONSTRUCTION

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Work of this Section includes requirements for developing a Mass Timber Protection Program, describing the Contractor's temporary facilities, controls and enclosures required to protect mass timber components from wetting and facilitate drying during construction until the permanent building enclosure, and heating and ventilating systems are complete.

1. For protection of Mass Timber flooring and roofing during construction.
2. Temporary protection of wood or OSB wood flooring and roofing substrates during construction.
3. Methods for mitigating the mass timber end grains' exposure to water should be considered, based on the project site and scheduling restraints. A combination of approaches may be necessary, such as applying a water repellent or coating to panel edges or sealing panel joints and penetrations through panels with tape sealant or draping protection membrane over the edge. This will vary from project to project.
    a. The work of this Section, also includes furnishing and installation of flashing membranes to bridge gaps, for transition areas of floor-to-wall interface and elsewhere as indicated or required by code to provide a continuous air barrier assembly at the floor-or-roof.
4. Locations include, but are not limited to, the following:
    a. Connection of the floors or roof to the wall system.

b. and penetrations of floor and roof system for mechanical equipment, elevator shafts, mechanical shafts and roof skylights.

c. All other air leakage pathways between the floor assembly and building envelope.

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

1.3 RELATED REQUIREMENTS:

A. Section 011000 - Summary; for work restrictions and limitations on material applications.

B. Section 150000 - Temporary Facilities and Controls; for temporary facilities during construction.

C. Section 061323 - [Heavy Timber] [Timber Frame] Construction

D. Section 061700 - Shop Fabricated Structural Wood

E. Section 061726 - Nail-Laminated Timber

F. Section 061729 - Dowel-Laminated Timber

G, Section 061753 - Shop Fabricated Wood Trusses

H. Section 061800 - Glued-Laminated Construction

I. Section 070811 - Construction Quality Program for Building Enclosures: Coordinate installation of water-resistive vapor permeable, air barrier floor and roof underlayment membrane specified in this Section concurrently with installation of permanent building enclosure components specified for the Project.

1.4 DEFINITIONS

A. Mass Timber: Structural wood construction comprised of cross-sectional area timbers having minimum dimension of 3.8-inch (96 mm) and that are solid wood, laminated wood or composite wood panels and components used as the primary building structural framework and supporting systems. Mass timber products are thick, compressed layers of wood, creating strong, structural load-bearing elements that can be constructed into panelized components. They are typically formed through lamination, fasteners, or adhesives.

B. Cross-Laminated Timber (CLT): CLT is a series of plies of dimensional lumber perpendicularly oriented, glued, and pressed together to create structural panels that are similar to plywood, but on a larger scale. CLT panels consist of an odd number of layers (usually three to seven} and may be sanded and prefinished before shipping.

1.5 CODES AND REGULATIONS

A. State and local code requirements.

1. Fire Regulations: Comply with state and local requirements to maintain ASTM-E84 rating on all components of the system.

2. Safety Regulations: Comply with requirements of all applicable Federal, State and local safety rules and regulations. Contractor shall be solely responsible for jobsite safety.
3. Barricades and Barriers: As required by governing authorities having jurisdiction, provide substantial barriers, guardrails and enclosures around Work areas.

1.6 PROTECTION OF EXISTING CONDITIONS

A. Protection of Adjacent Facilities: Contractor shall restrict Work to limits indicated on the Drawings and as specified in Section 011000 - Summary of the Work: Protect existing, adjacent facilities from damage, including soiling and debris accumulation, dust and airborne contamination caused by construction activities.

1.7 SUBMITTALS

A. Provide manufacturers product data for all materials required for the protection of mass timber flooring or roofing during construction or temporary protection of wood or OSB wood flooring substrates during construction.

B. Submit samples of the following:

1. Manufacturer's sample warranty.
2. 3 each water-resistive vapor permeable air barrier sheet, minimum 8 by 10 inches (203 by 254 mm).
3. Accessory component:
    a. VaproLiqui-Flash™, 1 sausage
    b. VaproBond™, 1 sausage
    c. 3 each VaproShim SA™ Self-Adhered 3 mm (⅛ in.), 1 in. x 4 in. (2.5 cm x 10.1 cm)
    d. 3 each VaproShim SA™ Self-Adhered 7 mm (¼ in.), 1 in. x 4 in. (2.5 cm x 10.1 cm)
    e. 3 each VaproShim SA™ Self-Adhered 3 mm (⅛ in.), 3 in. x 4 in. (7.6 cm x 10.2 cm)
4. Membrane flashing products:
    a. 3 each SlopeFlashing™ Samples, 12 in. x 12 in. (30.5 cm x 30.5 cm)
5. Sealants (included by others) required to provide a complete air barrier membrane system.

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).

c. 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.

1.8 QUALITY ASSURANCE

A. Single Source: Obtain self-adhered water-resistive vapor permeable air barrier sheet membrane 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 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 [10] ten years' experience.

D. Fire Performance Characteristics: Provide water-resistive barrier 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

1.9 REFERENCE STANDARDS

A. Canadian Standards Association (CSA Group):

1. CSA S478:19, Durability in Buildings

B. Underwriters Laboratories of Canada (ULC):

1. ULC S146-19, Standard Method of Test for the Evaluation of Encapsulation Materials and Assemblies of Materials for the Protection of Structural Timber Element.

1.10 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 vapor permeable air barrier materials under provisions of Section 013323 - Shop Drawings, Product Data and Samples.

1. Coordinate construction of mockups to permit inspection and testing of air barrier along with interfacing flashing and components.

2. Prior to installation of specified water-resistive vapor permeable air barrier materials on the mass timber or related flooring/roof, construct a 100 square foot mockup of typical existing mass timber-floor/roof assembly, including connection between wall and roof, wall and floor to indicate relationship of materials with air barrier and quality of workmanship. Provide mockup using actual air barrier membrane for floor/roof construction. Provide several mockups if necessary to include the various conditions. Acceptable mock-ups, undamaged at time of Substantial Completion, may be incorporated into the finish work. Rebuild mockups which are not approved at no additional cost to the Owner.

3. Construct mockup in accordance with details of mockup indicated on the Drawings when applicable.

1.11 PRE-INSTALLATION CONFERENCE

A. Provide a pre-installation conference [two] <Insert> weeks prior to commencing work of this section, under provisions of Section 013119 - Project Meetings or as specified under General Requirements Section 011000.

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.

1.12 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. Refer to air barrier manufacturers guidelines for disposal of air barrier components.

1.13 COORDINATION

A. Ensure shingled lapping and continuity of the fully self-adhered water-resistive water vapor permeable air barrier system throughout the scope of this section.

1. Provide highly permeable air barrier membrane that includes self-adhered air barrier, transition membranes, flashing and sealants at penetrations and intersections. Provide SlopeShield Plus SA™ Self-Adhered flashing which includes VaproLiqui-Flash™ by VaproShield, a liquid-applied water vapor permeable air barrier flashing material or VaproBond™ a single component 100% silicone sealant used to bind layers of VaproShield membranes to each other or typical construction material surfaces.
2. At floor and roof mass timber locations indicated, provide unimpeded, water resistive barrier underlayment and flashings to the exterior.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide SlopeShield Plus 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 is a fully self-adhered adhesive protected by a siliconized release film. Combined they provide a Water-Resistive Highly Vapor Permeable Self-Adhered Air Barrier Material.

B. Basis-of-Design Product: Subject to compliance with requirements, provide fully self-adhered highly permeable air barrier sheet membrane SlopeShield Plus Self-Adhered Water-Resistive

Vapor Permeable Air Barrier Sheet as manufactured by VaproShield, a zero VOC fully self-adhered vapor permeable air barrier sheet membrane consisting of multiple layers of spun-bonded polypropylene with vapor-permeable adhesive. Provide sheet membrane tested in accordance with ICC-ES AC 38 criteria to meet IBC and IRC requirements for weather resistive barriers having the following properties:

1. Color: Black.
2. Thickness: ASTM D5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material 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: 50.6 lbs. (23.0 kg) (1.56 oz/ft^2)
5. Boxed Roll Weight: 54 lbs. (24.6 kg)
6. Roll Length & Width: 1.5 m x 31.1 m (59” x 102’)
7. Roll Coverage: 500 ft^2 (46.6 m^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) - 250°F (121°C)
11. Installation Temperature: minimum 20°F (-6°C)
12. Composition: spun-bond polyester fabric with proprietary coatings
13. Primer: No Primer Required

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

D. Percent Elongation: ASTM D2523 Standard Practice for Testing Load-Strain Properties of Roofing Membranes. MD – 36 %, XMD – 40 %.

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

F. 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%.

G. Dry Breaking Force (Grab method) MD ≥40 XMD ≥35: 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.).

H. ASTM D5147 Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes. MD – PASS, XMD - PASS.

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

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

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

L. Water Vapor Transmission:

1. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials. Water Method Procedure B. 22.8°C (73°F) 50%RH, 30 Perm (grain/h•ft^2•inchHg), 1716 ng/Pa•s•m^2.

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

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

SPEC WRITERS NOTE: Acceptable substrates for SlopeShield SA® Self-Adhered Water-Resistive Vapor Permeable Air Barrier Sheet include; plywood, and mass timber. Best practice guidelines for the application of SlopeShield SA® Self-Adhered is on clean, dry surfaces of mass timber or sheathing surfaces without the use of adhesive-primers. Applications of SlopeShield SA® Self-Adhered on mass timber or sheathing surfaces clean of oil, dust, bulk water or other contaminants including primers, should be followed by two handed roller pressure to insure good adhesion, immediately after installation of material. Rough opening flashing system includes several components. VaproLiqui-Flash™ or as alternates, VaproBond™ Flashing or Vapro-SS Flashing™.

M. Adhesion Testing

1. Peel Adhesion: ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds:

   a. Concrete 438 N/m (2.5 pli)

   b. Plywood 876 N/m (5.0 pli)

2. Lap Adhesion: ASTM D1876 Standard Test Method for Peel Resistance of Adhesives (T-Peel Test): 437 N/m (2.5 pli).

3. Delamination (Tear-drop): FM 4470, C.2 Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction. Appendix H Test Procedure for Small Scale QC and Physical Properties of Roof System Assemblies:

   a. Concrete - 24 N (5.4 lbf)

   b. Plywood - 28 N (6.4 lbf)

   c. Galvanized Steel - 59 N (13.2 lbf)

   d. ACFoam II - 24 N (5.3 lbf)

e. ACFoam III - 32 N (7.3 lbf)

f. Styrofoam™ High Load 60 – 41 N (9.3 lbf)

g. Dens Deck Prime Roof board – 24 N (5.5 lbf)

h. Securock® Gypsum-FiberRoof Board – 35 N (7.8 lbf)

4. Tensile Adhesion: Testing Application Standard (TAS) No. 114-95, Test Procedures for Roof System Assemblies, in the High Velocity Hurricane Zone Jurisdiction:

a. INSTA STICK™ - 2848 N (640.3 lbf)

b. OlyBond500™ - 2580 N (580 lbf)

c. Millennium One Step™ - 3821 N (858.9 lbf)

d. Millennium PG-1 Pump Grade - 4355 N (979 lbf)

e. CR-20 - 3354 N (754 lbf)

N. Air Resistance Testing: Air Permeance:

1. ASTM E2178 @75 Pa Standard Test Method for Air Permeance of Building Materials: 0.00437 l/(s x m²) @ 75 Pa (0.00086 cfm/ft^2 @ 1.57 psf)

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

P. Fire Testing:

1. Flame Spread Smoke Developed: ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials: Flame Spread 5, Smoke Developed 45.

2. Cone Calorimeter Testing Data: ASTM E1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter:

a. Time to ignition: 23 sec

b. Flame Duration: 51 sec

c. Ave. Effective Heat of Combustion: 0.0066 MJ/kg (6.6 kJ/kg)

d. Ave. HRR at 60 sec: 89 kW/m^2

e. Ave. HRR at 180 sec: 14 kW/m^2

f. Peak HRR: 156 kW/m^2

g. Time of Peak: 49 sec

h. Total HRR/A: 7 4 MJ/m^2

Q. Water-Resistive Vapor Permeable Transition and Flashing Membrane

1. Provide self-adhered air barrier transition and flashing membrane for all transitions. Provide pre-cut SlopeFlashing™ Self-Adhered flashing by VaproShield. SlopeFlashing™ Self-Adhered flashing is a zero VOC fully self-adhered water-resistive vapor permeable sheet membrane having the following properties:

a. Same material and properties as SlopeFlashing™ Self-Adhered Water-Resistive Vapor Permeable Air Barrier Sheet, factory slit to flashing sizes. (See 2.1.B.1 above).

b. Physical Dimensions: SlopeFlashing SA™ Self-Adhered flashing: 19 ⅔ inches (31.1 cm) wide x 102 feet (31.1 m) long.

2.2 ROOF/FLOOR ROLLER

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

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

PART 3 - EXECUTION

3.1 INSTALATION, GENERAL

A. Existing Conditions: Existing conditions must be review prior to installation. Ensure that all adjacent mass timber walls, floors, roofing are properly installed, structurally sound and ready to accept temporary air barrier products/system. Prior to any Work, the contractor is responsible to perform, with the Owner or Owner's agent, a preconstruction checklist or ICRA, as directed by the Owner.

B. Mass Timber Flooring/Roof Protection: Protect mass timber flooring/roofing against water intrusion damage during construction period. Protection methods indicated are recommended by air barrier manufacturer and the Architectural/Engineering disciplines.

C. Apply temporary modular containment floor/roof barrier in strict accordance with manufacturer written instructions.

D. Protection of Installed Work General:

1. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage to Air Barrier installed products.

2. Protective Coverings: Provide protective coverings at mass timber floor/roof locations as necessary to prevent damage from moisture and construction activities.

E. Removal of Temporary Barriers and Enclosures

1. Removal of Temporary Barriers and Enclosures: The intended Air and Water permeable membrane is intended to remain in place. Removal is impossible due to product

adherence. Construction area must be cleaned to the level of the adjacent occupied areas.

F. Cleaning and Repairs: Clean and repair damage, caused by installation or use of temporary barriers and enclosures.

G. Manufacturer's Installation Guidelines: VaproShield Air Barrier installation parameters.

END OF SECTION