

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 Section 01 78 00 - Closeout Submittals.
- .4 Section 06 10 00 - Rough Carpentry
- .5 Section 07 62 00 - Sheet Metal Flashing and Trim.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM C726-00a, Standard Specification for Mineral Fiber Roof Insulation Board.
  - .2 ASTM C 1177/C1177M-01, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
  - .3 ASTM D41-94(2002)e1, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
  - .4 ASTM D312-00, Asphalt Used in Roofing.
  - .5 ASTM D6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
  - .6 ASTM D6163-00e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
  - .7 ASTM D6164-00, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .2 Canadian Standards Association (CSA):
  - .1 CSA A123.23.
  - .2 CSA A123.21-14 - Standard test method for the dynamic wind uplift resistance of Membrane - Roofing Systems.
  - .3 Canadian Roofing Contractors Association (CRCA).
    - .1 CRCA Roofing Specifications Manual-1997.
  - .4 Health Canada / Workplace Hazardous Materials Information System (WHMIS).
    - .1 Material Safety Data Sheets (MSDS).
  - .5 Underwriters Laboratories' of Canada (ULC).
    - .1 CAN/ULC-S701-11, Expanded Polystyrene, Board and Pipe Covering.
    - .2 CAN/ULC-S704-03, Thermal Insulation, Polyurethane and Polyisocyanurate Boards Faced.
    - .3 CAN/ULC-S107-01, Methods of Fire Tests of Roof Coverings, Class A.

### **1.3 PERFORMANCE REQUIREMENTS**

- .1 Compatibility between components of roofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

### **1.4 GENERAL REQUIREMENTS FOR ROOFING SYSTEM**

- .1 SB modified bituminous membrane. The system used as the Standard of Acceptance for the work consists of:
  - .1 Two (2)-ply SBS modified bitumen membrane.
  - .2 Protection board
  - .3 Tapered insulation: Where indicated
  - .4 Polyisocyanurate insulation
  - .5 Vapor barrier

- .6 Support panels
- .7 Existing concrete deck

## **1.5 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit two (2) copies of the most current technical data sheets. These documents must describe the physical properties of materials and explanations about product installation, including restrictions, limitations and other manufacturer recommendations.
- .3 Indicate flashing, details.
- .4 Provide layout for tapered insulation if applicable.
- .5 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .6 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
- .7 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.
- .8 Provide shop drawing indicating fastening pattern at field, edges, corners and around roof mounted equipment.
- .9 Sub-contractor and installed certificate of approval issued by the system manufacturer.

## **1.6 QUALITY ASSURANCE**

- .1 System manufacturer to attend a minimum of three (3) site visits.
- .2 Membrane: applied by sub-contractor and installer, certified by manufacturer for application of its products.

## **1.7 FIRE PROTECTION**

- .1 All materials will be delivered and stored in their original packaging, in conformance with the requirements described in the manufacturer's technical documentation.
- .2 At all times, materials will be adequately protected and stored in a dry and properly ventilated area, away from any welding flame or spark, and sheltered from the elements and any harmful substances.
- .3 Store adhesives and solvent-based mastics at a minimum of 5 °C.
- .4 Materials delivered in rolls will be carefully stored upright; flashings will be stored to avoid wrinkling, buckling, scratches or any other possible damage.
- .5 Avoid gathering construction materials on the roof, which may affect the structural integrity by imposing loads exceeding what is admissible.

## **1.8 PROTECTION**

- .1 Prior to the start of work, conduct a site inspection to ensure its safety in order to minimize fire risks and hazards.
- .2 Respect safety measures recommended by the related local authorities and Contractor Safety Plan.
- .3 At the end of each workday, use a heat detector gun to spot any smoldering or concealed fire. Job planning must be organized to ensure workers are still on location at least two (2) hours after welding works. An inspection must be performed by an employee of the roofing contractor who specializes in this kind of job at the end of days work.
- .4 Never apply the torch directly to flammable materials.
- .5 Throughout roofing installation, maintain a clean site and have at least one ULC-approved Class A, B or C fire extinguisher, charged and in perfect operating condition, within 6 m of each torch. Respect all safety measures described in technical data sheets of sealants. Welding torches must never be placed near combustible or flammable products, nor be used where the flame is not visible or cannot be easily controlled.

## **1.9 ENVIRONMENTAL REQUIREMENTS**

- .1 Do not install roofing when temperature remains below -18°C for torch application, or to manufacturers recommendations for mop application.
- .2 Minimum temperature for solvent-based adhesive is -5°C.
- .3 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

#### 1.10 FULL SYSTEM WARRANTY

- .1 The membrane manufacturer will issue a written document in the Owner's name, valid for a twenty (20) year period, stating that it will repair any leaks in the roofing membrane to restore the roofing system to a dry and water tight condition, to the extent that manufacturing or installation defects caused such water infiltration. The warranty must cover all roofing components from the deck up to the finish cap sheet and the total cost of repair(s) during the entire warranty period. The warranty must be transferable, at no extra cost, to subsequent building owners. The warranty certificate must reflect these requirements.

#### 1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Collect and separate for disposal waste material generated by this Section.
- .2 Place in appropriate on-site bins in accordance with Waste Management Plan.
- .3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.
- .4 Place materials defined as hazardous or toxic in designated containers.

### 2 Products

#### 2.1 COMPATIBILITY

- .1 All roofing waterproofing materials shall be provided by the same manufacturer.
- .2 The roof is to be installed such that a cap sheet replacement only is required prior to the expiration of the twenty (20) year warranty in order that an additional twenty (20) year warranty will be provided.

#### 2.2 FASTENING

- .1 Fully adhered system.
- .2 Refer to roof plan for wind uplift.
- .3 System to be designed for a minimum 75 PSF wind uplift resistance.

#### 2.3 VAPOUR BARRIER SUPPORT PANEL

- .1 Gypsum-Fibre Roof Board
  - .1 Fibre-reinforced gypsum roof board 16mm-thick x longest practical length.
  - .2 Square edge.
  - .3 In conformance with: CAN/ULC S102, ASTM C1177, ASTM E136, CAN/ULC S114.1.

##### PHYSICAL PROPERTIES PER ASTM C1177

12.7mm  
 CGC-Securock  
 Glass-Mat Sheathing

\*\*\*\*\*

Weight, nominal, kg/m <sup>2</sup>	9.8 kg/m <sup>2</sup>
Linear expansion	6.25 x 10
Coefficient of thermal expansion,	15.3 x 10
Flexural strength, parallel, N	>476
R-Value, ft <sup>2</sup> x deg F x hr / BTU	0.07 (0.40)

Combustibility	Noncombustible
ASTM D3273 score	10/10
Permeance	1666
Surface burning characteristics (per ASTM E84 or CAD/ULC-S102); flame spread / smoke developed.	0/0

## 2.4 VAPOUR BARRIER

- .1 Thermal Barrier and Vapour Barrier Board (Note: Contractors option to choose this board if he feels conditions make it advantageous.)
  - .1 A high performance panel composed of SBS modified bitumen membrane with a non-woven polyester reinforcement, factory-laminated on a high density mineral fibre (rock wool) board. The surface is sanded.
  - .2 Panel is used as thermal and vapor barrier.
  - .3 Panel is installed in a bed of hot bitumen applied with a mop.
  - .4 Can be installed directly to concrete deck.
  - .5 Over the entire width of Duo Selvedge, 40 % of the surface is self-adhesive. The remaining surface of the selvedge is covered by a thermofusible plastic film to seal overlap by heat-welding with a propane torch or with an automatic hot-air welder.
  - .6 Membrane Properties:

### SPECIFICATIONS

### VAPOUR BOARD

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Total thickness (membrane & board)	18mm
Membrane reinforcement	Non-woven polyester
Insulation dimensions	0.914m x 4.88m
Selvedge width	75mm
Surface	Sanded
Underface	Mineral fibre (rock wool)
Membrane thickness	2.2mm (86.6 mil)
Weight / m <sup>2</sup>	2.6 kg/m <sup>2</sup>
Breaking strength, MD XD	17.0 / 12.5 kN/m
Ultimate elongation, MD / XD	60 / 65%
Tear strength	60 N
Static puncture resistance	400 N
Dimensional stability	-0.4 / 0.3%
Plastic flow	>115 C
Cold bending at -30 C	No cracking
Lap joint strength	Pass > 4 kN/m
Water vapour permeance	<0.21 ng / Pa*s*m <sup>2</sup>
ASTM E96 Procedure B	(<0.004 perm)

### .7 Board Properties

### PROPERTIES

### STANDARDS

### BOARD

\*\*\*\*\*

Board thickness		15.8 mm
RSI Value - for 25.4 mm at 24 C	ASTM C 518	0.70 m <sup>2</sup> /K/W
Compressive strength - at 10%	ASTM C 165	85 kPa
Compressive strength - at 25%	ASTM C 165	190 kPa
25.4 mm thickness		
Density	ASTM C612-09	200 kg/m <sup>3</sup>
Dimensional stability,	ASTM C 356	1.1%

Water absorption	ASTM C 209	1.0%
Water vapour sorption	ASTM C 1104	0.29%

## 2.5 SELF-ADHESIVE VAPOUR BARRIER

- .1 Self-adhesive membrane composed of SBS modified bitumen, with a surface screen made of high-density polyethylene laminated between two layers of polyethylene films. The self-adhesive underface is protected with a silicone plastic release film. Comply with CAN / ULC-S126.
- .2 A self-adhesive membrane composed of SBS modified bitumen and a tri-laminated woven polyethylene facer. The underface is covered with a silicone release film.
- .3 Can be installed on concrete.
- .4 Substrates must be primed. The substrate to be clean and sound, free of loose materials or contaminants, such as water and grease which may compromise the performance of the product.
- .5 Adhere to substrate by peeling off the silicone release film.
- .6 Side laps must be a minimum of 75 mm and end laps must be a minimum of 150 mm.
- .7 Once installed, pressure must be applied over the whole surface using a roller to ensure a perfect adhesion.
- .8 Minimum application temperature: - 10 °C.
- .9 Physical Properties:

PROPERTIES	SELF ADHESIVE VAPOUR BARRIER
*****	
Thickness	0.8 mm (31mm)
Dimensions	40.8 x 1.14m
Weight	0.77 kg.m2
Selvage width	75 mm
Top face	Tri-laminate woven polyethylene
Underface	Silicone release film

- .10 Product Properties:

PROPERTIES	STANDARDS	UNIT
*****		
Tensile strength, MD/XD	ASTM D5147	9.5 / 13 kN/m
Ultimate elongation, MD/XD	ASTM D5147	33 / 25%
Cold bending	ASTM D5147	-50 C
Static puncture	ASTM D5602	400 N
Tear resistance, MD/XD	ASTM D1970	423 / 458 N
Lap adhesion	ASTM D1876	1000 N/m
Water absorption	ASTM D5147	0.1% max.
Peel resistance on steel	ASTM D903	950 N/m
Water vapour permeance	ASTM E96	1.7 ng/Pa.s.m2
Air Permeability	ASTM E2178	<0.001 L/s* m2

## 2.6 VAPOUR BARRIER CONTINUITY STRIP

- .1 A base sheet membrane composed of SBS modified bitumen reinforced with a composite (glass grid and polyester) reinforcement. The surface is sanded. The self-adhesive underface is covered with a release protection film.
- .2 Must be adhered to support after removing the release protection film. Once installed, a pressure must be applied over the whole surface using a membrane roller to ensure full adhesion.

.3 Physical Properties:

SPECS / PROPERTIES	STICK ADHESIVE
*****	
Thickness	3.0mm (118 mil)
Reinforcement	Composite
Dimensions	10m x 1m
Weight	3.3 kg / m2
Selvedge width	100 mm
Surface	Sanded
Underface	Self-adh. / protection film
Strain energy	7.8 / 7.2 kN/m
Breaking Strength	15 / 13.5 kN/m
Ultimate elongation	60 / 65%
Tear resistance	125 N
Static puncture resistance	560 N
Cold bending at -30 C	No cracking

**2.7 INSULATION**

- .1 The total system from the top of the deck to top of membrane to provide R40 insulation, average. Minimum two (2) layers.
- .2 Polyisocyanurate Insulation
  - .1 A closed-cell Polyisocyanurate foam insulation board laminated on both sides with fibre reinforced felt.
  - .2 Adhered with adhesives.
  - .3 Meets the physical property requirements of ASTM C 1289, Type II, Class 1, Grade 3 (25 psi) and CAN/ULC S704 and Type III (25 psi).
  - .4 Product Properties:

PROPERTIES	STANDARDS	INSULATION BOARD
*****		
Thermal resistance 25.4 mm	CAN/ULC S704.11	1.00 (R-5.7)
Compressive Strength	ASTM D 1621	138 kPa (20 psi)
Density	ASTM D 1622	32.04 kg / m3
Dimensional Stability Linear	ASTM D 2126	< 2.0 %
Water Absorption	ASTM C 209	< 1.0%
Water Absorption	ASTM D 2842	< 3.5%
Flame Spread	ASTM E 84	40 - 60
Tensile Strength	ASTM D 1623	35 kPa
Service Temperature		-73 to 122 C

- .3 Tapered Insulation Board:
  - .1 Tapered insulation panel made of Polyisocyanurate designed to create a minimum 1% percent slope to the roof system, square edge. Meets CAN/ULC S-770-09.
  - .2 Conforming to Paragraph 2.5.2 - Polyisocyanurate Insulation.
- .4 Sump Insulation Board for Drain Location:
  - .1 Sump insulation panel made of Polyisocyanurate conforming to Paragraph 2.5.2 - Polyisocyanurate Insulation, designed to facilitate proper drainage around drain. Sump size 2440mm x 2440mm. Square edge, top and bottom face finished with a fibre reinforced felt.

## 2.8 INSULATION SUBSTRATE OVERLAY

- .1 Bituminous Board
- .1 Semi-rigid roofing support panel composed of a mineral-reinforced asphaltic core between two asphalt-saturated fiberglass liners. Length of 2440 mm long x widest practical width x 4.8mm thick x 6.9 kg / m2.
- .2 Product Properties:

PROPERTIES	STANDARDS	3/16 BOARD
*****		
Puncture resistance	ASTM E154	500 N
Water absorption	ASTM D994	0.25%
Compressive strength	ASTM C472	>1641 kPa
Shore hardness	ASTM C1278	Pass

## 2.9 ASPHALTIC SUPPORT BOARD AND BASE SHEET

- .1 Note: Contractor has the option of using this system in lieu of the insulation substrate overlay and base sheet membrane for field surface, depending on site conditions.
- .2 Board composed of SBS modified bitumen membrane with a polyester reinforcement, factory laminated on a semi-rigid asphaltic board. The board measures 910mm x 2440mm x 7mm thick. The top surface is thermofusible. The membrane side lap is part self-adhesive and part thermofusible.
- .3 Over the entire width of Duo Selvege, 60 % of the surface is self-adhesive, which protects components under the base sheet. The remaining surface of the selvedge (40 %) is covered by a thermofusible plastic film to seal overlap by heat-welding with a propane torch or with an automatic hot-air welder.
- .4 Properties:

PROPERTIES	STANDARDS	MEMBRANE
*****		
Membrane Thickness		2.2 mm (86.6 mil)
Breaking Strength, MD/XD	CAN/CGSB-37.56-M (9th)	17.0 / 12.5 kN/m
Ultimate Elongation, MD/XD	CAN/CGSB-37.56-M (9th)	60 / 65%
Tear Strength	ASTM D5601	60 N
Cold Bending	CAN/CGSB-37.56-M (9th)	
- initial		-30 C
- 90 days at 70 C		-30 C
Board Thickness		4.8 mm (3/16 mm)
Puncture Resistance	ASTM E154	500 N
Water Absorption	ASTM D994	0.25%

## 2.10 BASE SHEET MEMBRANE FOR FIELD SURFACE

- .1 Roofing membrane composed of SBS modified bitumen and a non-woven polyester reinforcement. Both sides are covered with a thermofusible plastic film. The surface must be marked with three (3) chalk lines to ensure proper roll alignment.
- .2 In conformance with: CGSB 37.56-M (9th Draft).
- .3
- | PRODUCT PROPERTIES             | UNITS |
|--------------------------------|-------|
| -----                          |       |
| Strain Energy (kN/m)           | 9     |
| Breaking Strength (kN/m)       | 17    |
| Ultimate Elongation (%)        | 60    |
| Tear Resistance (N)            | 60    |
| Static Puncture Resistance (N) | 400   |
| Dimensional Stability (%)      | -0.4  |

Plastic Flow (°C)	105 (greater than or equal)
Cold Bend at -30°C	No Cracking
Lap Joint Strength (kN/m)	Pass >4 kN/m

## 2.11 BASE SHEET MEMBRANE FOR FLASHINGS AND PARAPETS

- .1 Membrane composed of SBS modified bitumen and composite heavy duty reinforcement. The surface is covered with a thermofusible plastic film and the underface is covered with a release protection film. The surface shall be marked with three (3) chalk lines to ensure proper roll alignment.

- .2 In conformance with: CGSB 37.56-M (9th Draft).

- .3 PRODUCT PROPERTIES UNITS

-----	
Strain Energy (kN/m)	9
Breaking Strength	17
Ultimate Elongation (%)	60
Tear Resistance (N)	60
Static Puncture Resistance (N)	400
Dimensional Stability (%)	-0.4
Plastic Flow (°C)	105 (greater than or equal)
Cold Bend at -30°C	No Cracking
Lap joint strength (kN/m)	Pass >4 kN/m

## 2.12 ROOFING CAP SHEET MEMBRANE FOR FIELD, FLASHINGS AND PARAPETS

- .1 A high performance cap sheet membrane composed of SBS modified bitumen and a composite reinforcement. The surface is protected by colored granules. The underface is covered with a thermofusible plastic film.

- .2 In conformance with: CGSB 37.56-M (9th Draft).

- .3 PRODUCT PROPERTIES UNITS

-----	
Strain Energy (kN/m)	7.8
Breaking Strength (kN/m)	15
Ultimate Elongation (%)	60
Tear Resistance (N)	125
Static Puncture Resistance (N)	560
Dimensional Stability (%)	0.2
Plastic Flow (°C)	110 (greater than or equal)
Cold Bend at -30°C	No Cracking
Lap Joint Strength (kN/m)	Pass >4 kN/m

- .4 Colour choices for Roofing Cap Sheet Membrane Granules:

- .1 For field surfaces: grey.  
 .2 For walkway surfaces: brown.

## 2.13 STARTER ROLL

- .1 Waterproofing membranes composed of SBS modified bitumen, covered with granules on surface, with a 100 mm (4 in) selvedge on both sides. The underface is covered with a thermofusible plastic film.

- .2 In conformance with: CGSB 37.56-M (9th Draft).

- .3 PRODUCT PROPERTIES UNITS

-----	
Strain Energy (kN/m)	13
Breaking Strength (kN/m)	25
Ultimate Elongation (%)	66
Tear Resistance (N)	118
Static Puncture Resistance (N)	432



Dimensional Stability (%)	-0.2
Plastic Flow (°C)	110 (greater than or equal)
Cold Bend at -30°C	No Cracking
Lap Joint Strength (kN/m)	Pass >4 kN/m

## 2.14 ACCESSORIES MEMBRANE

- .1 Membrane strip made of SBS modified bitumen with a composite reinforcement. Both faces are covered with a plastic thermo fusible film. The strip ensures water-tightness in the end laps.
- .2 In conformance with: ASTM D6162.
- .3 Product Properties:

SPECIFICATIONS	UNITS
*****	
Thickness	2.5 mm (98.4 mil)
Reinforcement	Composite
Dimensions	0.33 x 12 m
Roll Weight	3.3 kg/m <sup>2</sup>
Surface	Thermofusible Plastic Film
Underface	Thermofusible Plastic Film

## 2.15 PRIMER FOR THERMOFUSIBLE MEMBRANES

- .1 Primer made from bitumen, fast-evaporating solvents and adhesive enhancing additives. Required to prime most surfaces such as concrete in order to improve the adhesion of torch-applied waterproofing membranes.
- .2 Product Properties:

PROPERTIES	UNITS
*****	
Specific Gravity at 20 C	1.00 kg / L
Colour	Black
Solids by Weight	35%
Viscosity, Brookfield at 25 C	50 cP
Drying Time	1 to 12 hours

## 2.16 PRIMER FOR SELF-ADHESIVE MEMBRANES

- .1 Primer composed of SBS synthetic rubber, adhesive resins and VOC-free solvents. Used as primer to improve the adhesion of self-adhesive membranes.
- .2 Product Properties:

PROPERTIES	UNITS
*****	
Specific Gravity at 25 C	0.94 kg / L
Colour	Red
Solids by Weight	45%
Viscosity, Brookfield at 25 C	300-600 cP
Drying Time	30 to 90 minutes

## 2.17 FLAME-STOP MEMBRANE

- .1 Self-adhesive membrane composed of SBS modified bitumen and a glass mat reinforcement, designed to prevent flames from penetrating into voids, cavities and openings before installing heat-welded membranes.
- .2 Product Properties:

PROPERTIES	STANDARD	UNITS
*****		
Thickness		1.6 mm (64 mil)
Top Face		Sanded
Underface		Silicone release sheet
Reinforcement		Glass Fleece
Strain Energy, MD/XD	CAN/CDSB-37.56-M (9th)	0.9 / 1.0 kN/m
Breaking Strength MD/XD	CAN/CDSB-37.56-M (9th)	9.4 / 8.6 kN/m
Ultimate Elongation	CAN/CGSB-37.56-M (9th)	4 / 4%
Low Temp Flexibility	CAN/CGSB-37.56-M (9th)	-35 C
Peel Resistance	ASTM D903	2800 N/m

## 2.18 WATERPROOFING MASTIC

- .1 Description: Multi-purpose mastic composed of SBS modified bitumen, fibres, mineral fillers and solvents.
- .2 Product Properties:

PROPERTIES	UNITS
*****	
Specific Gravity at 20 C (68 F)	1.12 kg / L
Colour	Black
Application Temperature Range	-10 to 35 C
Service Temperatures Range	-40 to 80 C
Solids by Weight	83%
Setting Time	Between 4 and 24 hours

## 2.19 FLASHING PRODUCTS

- .1 A waterproofing one-component polyurethane / bitumen resin. It is dedicated to roof flashings and details where it is difficult to apply waterproofing membranes. Ready to use.
- .2 Product Properties:

PROPERTIES	STANDARD	FLASHING
*****		
Physical State		Brown viscous liquid
Density at 25 C		1.07 kg / L
Solids Content		80%
Softening Point		150 C
Ultimate Elongation	ASTM D412	500%
Breaking Strength	ASTM D412	1.35 MPa
Tear Resistance	ASTM D903	102.3 N
Water Vapour Permeance	ASTM E96 (Procedure B)	<30 ng / Pa*s*m2
Peel Adhesion	ASTM C836	792 N/m
Drying Time		2 hrs
Fully Cured		3 days

## 2.20 DRAINAGE LAYER

- .1 A high strength drainage panel consisting of a polypropylene core with a factory laminated geotextile for installation over waterproof membranes to provide drainage.
- .2 1830mm wide x 15.25 meters roll, 10mm thick.
- .3 Product Properties:

PROPERTIES	STANDARDS	PANEL
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Thickness		10 mm (0.4 in)
Compressive Strength	ASTM D 1621	550 kPa (11,000 PSI)
Max In-plane Flow Rate	ASTM D 4716	223 L / min * m
Apparent Opening Size	ASTM D 4751	0.21 mm
Water Flow Rate	ASTM D 4491	5690 L / min * m2
Grab Tensile	ASTM D 4632	450 N (100 lbf)
Grab Elongation	ASTM D 4632	50%
Puncture Resistance	ASTM D 4833	300 N (65 lbf)

## 2.21 CARPENTRY

- .1 Refer to Section 06 10 00 - Rough Carpentry

## 2.22 FASTENERS

- .1 Corrosion resistance, with minimum plate diameter of 75 mm and screw length to suit insulation thickness +38 mm.
- .2 Acceptable Material:
  - .1 Buildex
  - .2 Dekfast
  - .3 Trufast

## 2.23 ROOF DRAIN AND DOME

- .1 Replace two (2) roof drain domes to match existing.
- .2 Replace two (2) roof drains as shown on drawings.

## 3 Execution

### 3.1 SURFACE EXAMINATION AND PREPARATION

- .1 Surface examination and preparation must be completed in conformance with instructions in the membrane manufacturer's technical documentation.
- .2 Before roofing work begins, the owner's representative and roofing foreman will inspect and approve deck conditions (including slopes and wood grounds) as well as flashings at parapets, roof drains, plumbing vents, ventilation outlets and other construction joints. If necessary, a non-conformity notice will be issued to the contractor so that required corrections can be carried out. The start of roofing work will be considered as acceptance of conditions for work completion.
- .3 Do not begin any portion of work before surfaces are clean, smooth, dry, and free of ice and debris. Use of calcium or salt is forbidden for ice or snow removal.
- .4 Be sure plumbing, carpentry and all other works have been duly completed.
- .5 No materials will be installed during rain or snowfall.

### 3.2 METHOD OF EXECUTION

- .1 Roofing work must be completed in a continuous fashion as surfaces are readied and as weather conditions allows it.
- .2 It's preferable to seal all joints that are not covered by a cap sheet membrane the same day. A second cap sheet cannot be installed if any moisture is present in joints.
- .3 Ensure waterproofing of roofs at all times, including protection during installation work by other trades and protection as work is completed (e.g. vents, drains, etc.).

### 3.3 SITE PROTECTION

- .1 Protect the exposed surfaces of finished work to avoid damage during roof installation and material transportation. Install walkways made of rigid boards over installed roofing materials to enable passage of people and transport of products. Assume full

responsibility for any damage.

### **3.4 INSTALLATION OF VAPOUR BARRIER SUPPORT PANELS**

- .1 Where slopes change, boards will be cleanly cut (avoid breaking boards) to acquire deck shape.
- .2 Board joints will be staggered, at half-length, and perfectly butted. Joints will be sealed with heat resistant tape in both directions to prevent any asphalt leakage in finished areas.

### **3.5 INSTALLATION OF BOARDS WITH FACTORY LAMINATED BASE SHEET**

- .1 Optional installation (Contractor's option).
- .2 Adhere base sheet board using adhesive applied in continuous strips spaced as per CSA-123-21 requirements.

### **3.6 APPLICATION OF PRIMER**

- .1 Wooden, metallic, concrete and masonry surfaces or gypsum insulation substrate will receive a coat of primer at a rate recommended by the manufacturer. All surfaces to be primed must be free of rust, dust or any residue that may hinder adherence. Primed surfaces must be covered with the roofing membrane as soon as possible (on the same day for self-adhesive membranes).

### **3.7 INSTALLATION OF BASE SHEET FLASHING**

- .1 Apply base sheet flashing only, once primer coat is dry.
- .2 Install base sheet flashing in one (1) meter widths to cover roofing substrate over 100mm overlap side laps by 75mm. Stagger side laps by at least 100mm from base sheet overlaps on roof to avoid excessive layering.
- .3 Apply base sheet flashing directly onto substrate by removing silicone paper cover sheet. Torch roof's base-sheet plastic film on installation zone. Proceed from top to bottom. Once in place, apply pressure manually in a uniform fashion to obtain homogenous adherence over entire surface. Preferably seal seams with rubber roller.
- .4 Avoid forming wrinkles, air pockets or fishmouths.

### **3.8 INSTALLATION OF SUPPORT PANEL AND VAPOUR BARRIER**

- .1 Because of the nature of this system, for this type of vapour barrier, joints can be aligned (no offset) to facilitate the installation of the reinforcing strip.
- .2 Adhere the first 60 mm of the self-adhesive side laps using a membrane roller, then heat weld the last 40 mm self-adhesive, heat-welded side laps.
- .3 Seal the end laps by welding a 330-mm wide protection strip centered on the joint

### **3.9 INSTALLATION OF INSULATION**

- .1 It is not required to fasten insulation boards, to achieve wind uplift performance, under mechanically fastened board with factory laminated base sheet membranes. However in order to prevent any insulation board movement, they can be fastened at a rate of one fastener per 4 sq/ft.
- .2 Mechanically fasten boards with screws and plates for membranes. Mechanical fasteners must be installed in the centre of the membrane side selvedge and on board surface as per CSA A123.21-10 requirements.
- .3 Surfaces must be dry and free of oil, grease, dirt and debris. The adhesive must be applied using a battery operated applicator in continuous strips of 13 to 19mm wide at time of application. Beads must be spaced CSA 123.21 requirements.

### **3.10 SUMP INSULATION PANEL INSTALLATION**

- .1 Install sump insulation panel in conformance with manufacturer's instructions and recommendations.

### **3.11 INSTALLATION OF FLAME-STOP MEMBRANE**

- .1 Adhere the membrane directly onto an approved substrate by removing the silicone release film. Flame Stop tape is designed to prevent flames from penetrating into voids, cavities and openings while installing heat-welded membranes.

### **3.12 INSTALLATION OF BASE SHEET ON THE FIELD SURFACE**

- .1 Unroll base sheet on the substrate, taking care to align the edge of the first selvage with drain centre (parallel to roof edge).
- .2 Cut off corners at end laps to be covered by the next roll.
- .3 Weld the base sheet onto prepared substrate.
- .4 Each selvage will overlap the previous one along lines provided for this purpose, and will overlap the ends by 150 mm. Space end laps by a minimum of 300 mm.
- .5 Avoid the formation of wrinkles, swellings or fishmouths.

### **3.13 INSTALLATION OF SELF-ADHESIVE BASE SHEET ON FLASHING AND PARAPETS**

- .1 Apply base sheet flashing only after primer coat is dry.
- .2 Before applying membranes, always burn the plastic film from the section to be covered if there is an overlap (inside and outside corners and field surface). For sanded base sheet membranes, apply primer for self-adhesive membranes on the area to be covered at the foot of the parapets.
- .3 Cut off corners at end laps of areas to be covered by the next roll.
- .4 Each selvage will overlap the previous one along lines provided for this purpose, and by 150 mm at the ends.
- .5 Position the pre-cut membrane. Remove 150mm of the silicone release film to hold the membrane in place at the top of the parapet.
- .6 Then, gradually peel off the remaining silicone release film, pressing down on the membrane with an aluminum applicator to ensure good adhesion. Use the aluminum applicator to ensure a perfect transition between the flashing and the field surface. Smooth the entire membrane surface with a membrane roller for full adhesion.
- .7 Install a reinforcing gusset at all inside and outside corners.
- .8 Always seal overlaps at the end of the workday.
- .9 Avoid the formation of wrinkles, swellings or fishmouths.

### **3.14 INSTALLATION OF REINFORCED GUSSETS**

- .1 Install reinforcing gussets at all inside and outside corners.
- .2 Heat-weld the gussets in place after installing base sheet membrane.

### **3.15 INSTALLATION OF THERMOFUSIBLE CAP SHEET ON FIELD SURFACE**

- .1 Begin with double-selvage starter roll. If starter roll is not used, side laps covered with granules must be de-granulated by embedding granules in torch-heated bitumen over a 75 mm width.
- .2 Starting at drain, unroll the membrane on the base sheet, taking care to align the edge of the first selvage with the edge of the roof.
- .3 Cut off corners at end laps at areas to be covered by the next roll.
- .4 Each selvage will overlap the previous one along lines provided for this purpose, and will overlap by 150 mm at the ends. Space end laps a minimum of 300 mm.
- .5 Heat-weld cap sheet membrane with a torch on the base sheet to create a bleed out of 3 to 6 mm.
- .6 During installation, be careful not to overheat the membrane or its reinforcements.
- .7 Avoid the formation of wrinkles, swellings or fishmouths.
- .8 Avoid walking over finished surfaces; use rigid protective walkways as needed.

### **3.16 INSTALLATION OF THERMOFUSIBLE CAP SHEET ON FLASHINGS AND PARAPETS**

- .1 This cap sheet must be installed in one-metre-wide strips.
- .2 Each selvedge will overlap the previous one laterally along lines provided for this purpose, and will overlap by 150 mm the field surface. Membranes for flashings must be spaced at least 100 mm with respect to the cap sheet membranes on the field surface, to avoid areas of excessive membrane thickness.
- .3 Cut off corners at end laps on areas to be covered by the next roll.
- .4 Use a chalk line to draw a straight line on the field surface, 150 mm from flashings and parapets.
- .5 Use a torch and round-nose trowel to embed the surface granules in the layer of hot bitumen, starting from the chalk line on the field surface to the bottom edge of the flashing or parapet, as well as on the granulated vertical surfaces to be overlapped.
- .6 This cap sheet will be heat-welded directly to the base sheet membrane, proceeding from bottom to top.
- .7 Avoid the formation of wrinkles, swellings or fishmouths.
- .8 During installation, be careful not to overheat the membrane and its reinforcements.

### **3.17 DRAINAGE LAYER**

- .1 Cut drainage panel into 200mm wide strips for installation under shims and sleeper assembly, under deck area.

### **3.18 INSTALLATION OF VARIOUS DETAILS**

- .1 Install waterproofing membranes at various roofing details in conformance with typical details indicated in technical documentation of the manufacturer.
- .2 Seal top of membrane flashings at stainless steel rail posts neatly.
- .3 Seal roof membrane at porcelain panel connections neatly.
- .4 Perimeter aluminum flashing, provide self adhesive strip or waterproof mastic on back side of aluminum flashing at railing points.

**End Of Section**

## **1 General**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 07 52 00 - Modified Bituminous Membrane Roofing.

### **1.2 REFERENCES**

- .1 The Aluminum Association Inc. (AA)
  - .1 Aluminum Sheet Metal Work in Building Construction-2000.
  - .2 AA DAF45-97, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM International)
  - .1 ASTM A167-99, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .2 ASTM A240/A240M-02, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
  - .3 ASTM A591/A591M-98, Standard Specification for Steel Sheet, Electrolytic Zinc-Coated, for Light Coating Mass Applications.
  - .4 ASTM A606-01, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
  - .5 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .6 ASTM A792/A792M-02, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - .7 ASTM B32-00, Standard Specification for Solder Metal.
  - .8 ASTM B370-98, Standard Specification for Copper Sheet and Strip for Building Construction.
  - .9 ASTM D523-89(1999), Standard Test Method for Specular Gloss.
  - .10 ASTM D822-01, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian Roofing Contractors Association (CRCA)
  - .1 Roofing Specifications Manual 1997.
- .4 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
  - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
  - .3 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .5 Canadian Standards Association (CSA International)
  - .1 CSA A123.3-98, Asphalt Saturated Organic Roofing Felt.
  - .2 CSA-A440-00/A440.1-00 - A440-00, Windows / Special Publication A440.1-00, User Selection Guide to CSA Standard A440-00, Windows.
  - .3 CSA B111-1974(R1998), Wire Nails, Spikes and Staples.

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Collect and separate for disposal waste material generated by this Section.
- .2 Place in appropriate on-site bins in accordance with Waste Management Plan.
- .3 A clean worksite is mandatory at all times. Failure to maintain the site in a clean, safe condition shall result in the Owner initiating a clean-up and related costs being deducted from progress claims.

## **2 Products**

## **2.1 PREFINISHED ALUMINUM SHEET**

- .1 Prefinished aluminum with factory applied polyvinylidene fluoride.
  - .1 Class F1S.
  - .2 One (1) color selected by Departmental Representative from manufacturer's standard range (white).
  - .3 Specular gloss: 30 units +/- in accordance with ASTM D523.
  - .4 Coating thickness: not less than 22 micrometers.
  - .5 Resistance to accelerated weathering for chalk rating of 8, color fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
    - .1 Outdoor exposure period 2500 hours.
    - .2 Humidity resistance exposure period 5000 hours.

## **2.2 ACCESSORIES**

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Plastic cement: to CAN/CGSB 37.5.
- .3 Underlay for metal flashing: Self adhering membrane by Section 07 52 00 - Modified Bitumen Membrane Roofing.
- .4 Sealants: to CAN/CGSB 19.13, one component.
  - .1 Acceptable Material: Tremco A Spectrum 2"
- .5 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .6 Washers: of same material as sheet metal, 1mm thick with rubber or neoprene packings.
- .7 Prefabricated flashing at pipes penetrating roofs: purpose-made, neoprene or spun aluminum to CRCA Specification FL/532, minimum 300mm above top of roof membrane.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.

## **2.3 FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details.
  - .1 Brake form to profiles indicated and required to suit parapet configurations.
  - .2 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
  - .3 Hem exposed edges on underside 12 mm. Miter and seal corners with sealant.
  - .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
  - .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

## **2.4 METAL FLASHINGS**

- .1 Form flashings, to profiles indicated of 20 ga thick aluminum.

## **3 Execution**

### **3.1 INSTALLATION**

- .1 Install sheet metal work as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
- .4 Counter flash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.
- .5 Lock end joints and caulk with sealant.

## **End Of Section**