

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International Inc.
 - .1 ASTM C 1177/C 1177M-06, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .2 ASTM D 41-05, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - .3 ASTM D 312-00(2006), Standard Specification for Asphalt Used in Roofing.
 - .4 ASTM D 6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
 - .5 ASTM D 6163-00e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.
 - .6 ASTM D 6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
 - .2 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .3 Canada Green Building Council (CaGBC)
 - .1 LEED Canada-NC-2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System for New Construction and Major Renovations.
 - .4 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Specifications Manual-1997.
 - .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.21-04, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems
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- 1.1 REFERENCES
(Cont'd)
- .6 Factory Mutual (FM Global)
 - .1 FM Approvals - Roofing Products.
 - .7 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .8 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- 1.2 ADMINISTRATIVE
REQUIREMENTS
- .1 Convene pre-installation meeting one week prior to beginning roofing Work, with roofing contractor's representative and Departmental Representative in accordance with Section 01 32 18 - Construction Progress Schedules - Bar (GANTT) Chart to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- 1.3 ACTION AND
INFORMATIONAL
SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Provide electronic copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide electronic copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements, and indicate VOC content for:
 - .1 Primers.
 - .2 Sealers.
 - .3 Provide shop drawings:
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1.3 ACTION AND
INFORMATIONAL
SUBMITTALS
(Cont'd)

- .3 Provide shop drawings: (Cont'd)
 - .1 Indicate flashing, penetration, control joints edge conditions, tapered insulation details.
 - .2 Provide layout for tapered insulation.
- .4 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
- .5 Test and Evaluation Reports: submit laboratory test reports certifying compliance of membrane with specification requirements.
- .6 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .7 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.
- .8 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.
- .9 Sustainable Design Submittals:
 - .1 LEED Submittals: in accordance with Section 01 35 21 - LEED Requirements.

1.4 STANDARDS

- .1 Perform work to:
 - .1 Canadian Roofing Contractors Association (CRCA), printed guidelines.
 - .2 Factory Mutual Fastening Standards for Roof Insulation for:
 - .1 Class 1-120.
 - .2 Fastening for perimeter and corners in as per factory mutual guidelines.
 - .3 Roof membranes shall be classified in accordance with CAN/ULC-S107, "Fire Tests of Roof Covering", Class "A" roofing.
 - .4 Manufacturer's printed instructions.
 - .5 This specification.
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- 1.5 QUALITY ASSURANCE
- .1 Installer qualifications: company or person specializing in application of modified bituminous roofing systems with 5 years documented experience approved by manufacturer.
 - .2 Sustainability Standards Certification:
 - .1 Recycled Content: provide listing of recycled content products used, including details of required percentages and recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
 - .2 Regional Materials: provide evidence that project incorporates required percentage required percentage of regional materials/products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

- 1.6 FIRE PROTECTION
- .1 Fire Extinguishers:
 - .1 Maintain one or stored pressure rechargeable type with hose and shut-off nozzle,
 - .2 ULC labelled for A, B and C class protection.
 - .3 Size 14 on roof per torch applicator, within 6 m of torch applicator.
 - .2 Maintain fire watch for 1 hour after each day's roofing operations cease, or longer if required to be certain that there are no hotspots on the roof.

- 1.7 DELIVERY, STORAGE, AND HANDLING
- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
 - .2 Storage and Handling Requirements:
 - .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling,
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1.7 DELIVERY,
STORAGE, AND
HANDLING
(Cont'd)

- .2 Storage and Handling Requirements: (Cont'd)
 - .1 Safety: (Cont'd)
storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
 - .2 Provide and maintain dry, off-ground weatherproof storage.
 - .3 Store rolls of membrane in upright position. Store membrane rolls with salvage edge up.
 - .4 Remove only in quantities required for same day use.
 - .5 Place plywood runways over completed Work to enable movement of material and other traffic.
 - .6 Store sealants at +5 degrees C minimum.
 - .7 Store insulation protected from daylight and weather and deleterious materials.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
 - .2 Fold up metal banding, flatten and place in designated area for recycling.

1.8 SITE CONDITIONS

- .1 Ambient Conditions
 - .1 Do not install roofing when temperature remains below -18 degrees C for torch application.
 - .2 Minimum temperature for solvent-based adhesive is -5 degrees C.
- .2 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.

1.9 WARRANTY

- .1 Provide a written guarantee signed and issued in the name of the Owner by the Roofing System Manufacturer stating that roofing membrane is free from manufacturing defects and that the system will stay in place and remain leak

1.9 WARRANTY
(Cont'd)

- .1 (Cont'd)
proof for a period of ten (10) years from date of Substantial Certificate of Completion, subject to the standard limitations and conditions of the manufacturer.
- .2 Provide a written guarantee, signed and issued in the name of the Owner by the Contractor, stating that the roofing application has been performed in compliance with the plans and specifications, and for two (2) years from the date of Substantial Certificate of Completion, the Contractor shall repair, at no expense to the Owner, any defects which result of a failure to comply with the plans and the specifications.
- .3 Defective work shall include, but not limited to: leaking, wind uplift, delamination of roofing materials, reduction of thermal value due to moisture in insulation, crazing and ridging.
- .4 Warranties to be non-prorated.
- .5 Warranties to be "system warranties" and to apply to all components from substrate to top surface of roofing assembly.

PART 2 - PRODUCTS

2.1 PERFORMANCE
CRITERIA

- .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.
- .2 Roofing System: to CSA A123.21 for wind uplift resistance.

2.2 THERMAL BARRIER

- .1 Glass Mat Gypsum Board: to ASTM C 1177, Type X 13 mm thick.

- 2.3 VAPOUR RETARDER .1 Air/Vapour Barrier: Self-adhering peel and stick air/vapour barrier composed of Styrene-Butadiene-Styrene(SBS) modified bitumen reinforced with high density polyethylene film, anti-slip surface, minimum thickness 1.0 mm.
- 2.4 MEMBRANE .1 Base sheet: to CGSB 37-GP-56M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non-woven, polyester reinforcement, weighting 180 g/m2.
- .1 Type 2, fully adhered.
 - .2 Class C-plain surfaced.
 - .3 Grade heavy duty service.
 - .4 Top and bottom surfaces:
 - .1 Polyethylene/polyethylene.
 - .5 Base sheet membrane properties:
 - .1 Strain energy (longitudinal/transversal): 9.0/7.0 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 17.0/12.5 N/5 cm.
 - .3 Ultimate elongation (longitudinal/transversal): 60/65 %.
 - .4 Tear resistance: 60N.
 - .5 Cold bending at -30 degrees C: no cracking.
 - .6 Static puncture resistance: >400.
 - .7 Dimensional stability: -0.3/0.3%.
- 2.5 CAP SHEET .1 Cap sheet: to CGSB 37-GP-56M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, glass, polyester reinforcement, weighting 250 g/m2.
- .1 Type 1, fully adhered.
 - .2 Class A - granule surfaced.
 - .3 Grade heavy duty service.
 - .4 Bottom surface polyethylene.
 - .5 Cap sheet membrane properties:
 - .1 Strain energy (longitudinal/transversal): 10.0/10.0 kN/m.
 - .2 Breaking strength (longitudinal/transversal): 18.0/16 kN/m.
 - .3 Ultimate elongation (longitudinal/transversal): 60/65 %.

- 2.5 CAP SHEET
(Cont'd)
- .1 Cap sheet: (Cont'd)
 - .5 Cap sheet membrane properties: (Cont'd)
 - .4 Tear resistance: 75 N.
 - .5 Cold bending at -30 degrees C: no cracking.
 - .6 Static puncture resistance: > 420 N.
 - .7 Dimensional Stability: -0.2/0.2%.
 - .8 Colour: reflective white, LEED appropriate, high solar reflectance index mix SRI = 78 and high thermal emissivity 0.90.
 - .2 Minimum total thickness of base sheet and cap sheet combined to be 5.8 mm. Cap sheet and base sheet to be of same manufacturer. Cap sheet colour as per Departmental Representative selection from manufacturer's reflective white selection.
 - .3 Install contrasting red colour cap sheet strip, 300 mm wide, along the entire perimeter of all roof, as indicated on roof plan. Contrasting colour cap sheet to be installed over reflective white cap sheet.
- 2.6 BASE SHEET
FLASHING
- .1 To CGSB 37-GP-56M, Type 2, Class C, Grade 2, non-woven polyester reinforced 180g/m², self-adhesive membrane with polyethylene top face and release film under face.
- 2.7 SEALERS
- .1 Mastic made of synthetic rubbers, plasticized with bitumen and solvents with aluminum pigments to provide greater resistance to UV.
- 2.8 PRIMERS
- .1 For self-adhesive membranes: a blend of elastomeric bitumen, volatile solvents and adhesive enhancing resins used to prime porous and non-porous substrates such as gypsum board, wood, concrete or metal to enhance the adhesion of self-adhesive membranes at temperatures above -10°C.

- 2.8 PRIMERS (Cont'd) .2 For heat welded membranes: a blend of elastomeric bitumen, volatile solvents and adhesive enhancing additives used to prime concrete or metal substrates to enhance the adhesion of torch-applied membranes.
- 2.9 FASTENERS .1 Fasteners: minimum #14 mechanical fasteners made of case-hardened carbon steel with corrosion resistance coating, complying with FM standards. 75 mm diameter round or hexagon stress plates complying with CSA B35.3 and FM 4470 approval standards, diameter and lengths as required to suit total assembly thickness. Ensure fasteners have the following deck penetration:
.1 For metal decks: minimum 19 mm and maximum 25 mm longer than assembly being secured. Fasteners to engage metal deck top flange.
- 2.10 RECOVERY BOARD .1 Recovery Board: 6 mm thick asphalt based recovery board with non-woven glass facers, as recommended by the membrane manufacturer.
.1 Install over insulation to provide torch safe surface.
- 2.11 POLYIOS-CYANURATE INSULATION .1 Polyisocyanurate Insulation:
.1 To CAN/ULC-S704, glass reinforced felt facers, square edged and containing no CFC.
.2 Insulation value thickness per cm based on values listed in the latest edition of NRC - Evaluation Listings.
.3 Thickness: as indicated.
- 2.12 SEALERS .1 Plastic cement: asphaltic or coal tar.
.2 Sealing compound: rubber asphalt type.
.3 Sealants: caulking - see Section 07 92 00 - Joint Sealing.

2.13 CARPENTRY .1 Refer to Section 06 08 99 - Rough Carpentry for Minor Works.

2.14 CANT STRIPS .1 Cut from pressure-treated wood, 38 mm thick, material, to measure 140 mm on slope.

2.15 FASTENERS .1 Covering to steel deck: No. 10 flat head, self tapping, Type A or AB, cadmium plated screws. Recommend FM Approved screw and plate assemblies.

.2 Insulation to deck: coated insulation fasteners and galvanized plates must meet FM Approval for wind uplift and corrosion resistance, as recommended by insulation manufacturer.

2.16 DOUBLE CONDUIT FLASHING .1 Refer to Section 10 99 90 - Manufactured Specialities.

PART 3 - EXECUTION

3.1 QUALITY OF WORK .1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual.

.2 Do priming in accordance with manufacturers written recommendations.

.3 The interface of the walls and roof assemblies will be fitted with durable rigid material providing connection point for continuity of air barrier.

.4 Assembly, component and material connections will be made in consideration of appropriate design loads.

3.2 EXAMINATION OF
ROOF DECKS

- .1 Verification of Conditions:
 - .1 Inspect with Departmental Representative deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.
- .2 Evaluation and Assessment:
 - .1 Prior to beginning of work ensure:
 - .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.
- .3 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION OF
IN-PLACE CONDITIONS

- .1 Cover walls, walks, slopped roofs and adjacent work where materials hoisted or used.
 - .2 Use warning signs and barriers. Maintain in good order until completion of Work.
 - .3 Clean off drips and smears of bituminous material immediately.
 - .4 Dispose of rain water off roof and away from face of building until roof drains installed and connected.
 - .5 Protect roof from traffic and damage. Comply with precautions deemed necessary by Departmental Representative.
 - .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
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- 3.4 THERMAL BARRIER .1 Mechanically fasten to steel deck Glass Mat Gypsum Board, screwed to steel deck's upper rib surfaces, spaced 400 mm on centre each way.
- .2 Place with long axis of each sheet transverse to steel deck ribs, with end joints staggered and fully supported on ribs.

- 3.5 VAPOUR RETARDER .1 Apply modified bituminous vapour retarder (CONCRETE/GYPSUM BOARD/PLYWOOD DECK) sheet.

- 3.6 (EXPOSED) CONVENTIONAL MEMBRANE ROOFING (CMR) APPLICATION .1 Insulation: mechanically fastened application:
- .1 Mechanically fasten insulation using screws and pressure distribution plates.
 - .2 Fasten insulation as per manufacturer's written recommendations.
 - .3 Number and pattern of screws per board to meet Factory Mutual requirements.
 - .4 Place boards in parallel rows with ends staggered, and in firm contact with one another.
 - .5 Cut end boards to suit.
- .2 Base sheet application:
- .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and reroll from both ends.
 - .2 Unroll and torch base sheet onto substrate taking care not to burn membrane or its reinforcement or substrate.
 - .3 Lap sheets 75 mm minimum for side and 150 mm minimum for end laps.
 - .4 Application to be free of blisters, wrinkles and fishmouths.
- .3 Cap sheet application:
- .1 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and reroll from both ends.
 - .2 Unroll and torch cap sheet onto base sheet taking care not to burn membrane or its reinforcement.

3.6 (EXPOSED)
CONVENTIONAL
MEMBRANE ROOFING
(CMR) APPLICATION
(Cont'd)

- .3 Cap sheet application:(Cont'd)
 - .3 Lap sheets 75 mm minimum for side laps and 150 mm minimum for end laps. Offset joints in cap sheet 300 mm minimum from those in base sheet.
 - .4 Application to be free of blisters, fishmouths and wrinkles.
 - .5 Do membrane application in accordance with manufacturer's recommendations.
- .4 Flashings:
 - .1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.
 - .2 Do not torch to wood. Torch base and cap sheet onto substrate in 1 metre wide strips.
 - .3 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal by mopping or torch welding.
 - .4 Lap flashing cap sheet to membrane cap sheet 250 mm minimum and torch weld.
 - .5 Provide 75 mm minimum side lap and seal.
 - .6 Properly secure flashings to their support, without sags, blisters, fishmouths or wrinkles.
 - .7 Do work in accordance with manufacturer's recommendations.
- .5 Roof penetrations:
 - .1 Install roof drain pans, vent stack covers and other roof penetration flashings and seal to membrane in accordance with manufacturer's recommendations and details.

3.7 CANTS

- .1 Install wood cants over rigid insulation.
- .2 Angle cut cants to fit tightly on back and bottom where roof to wall angle varies from 90 degrees.

3.8 FIELD QUALITY
CONTROL

- .1 Inspections:
 - .1 Inspection and testing of roofing application will be carried out by testing laboratory designated by Departmental Representative.

- 3.8 FIELD QUALITY CONTROL (Cont'd)
- .1 Inspections: (Cont'd)
 - .2 Departmental Representative will pay for tests.

- 3.9 CLEANING
- .1 Remove bituminous markings from finished surfaces.
 - .2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.
 - .3 Repair or replace defaced or disfigured finishes caused by work of this section.
 - .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal and 01 35 21 - LEED Requirements.
 - .1 Place materials defined as hazardous or toxic in designated containers.
 - .2 Clearly label location of salvaged material's storage areas and provide barriers and security devices.
 - .3 Ensure emptied containers are sealed and stored safely.
 - .4 Unused adhesive, sealant and asphalt materials must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.
 - .6 Dispose of unused sealant material at official hazardous material collections site approved by Departmental Representative.
 - .7 Dispose of unused asphalt material at official hazardous material collections site approved by Departmental Representative.
 - .8 Divert unused gypsum materials from landfill to recycling facility as reviewed by Departmental Representative.