PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials (ASTM)
- .1 ASTM C 1177/C1177M-13, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .2 ASTM E1980-11, Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

.2 Canadian Standards Association (CSA)
- .1 CSA A123.21-14, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems

.3 Canadian General Standards Board (CGSB).
- .1 CGSB 37-GP-19M, Cement, Plastic, Cutback Tar.
- .2 CAN/CGSB-37.29, Rubber- Asphalt Sealing Compound.
- .3 CAN/CGSB - 51.33 Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

.4 Canadian Roofing Contractors Association (CRCA)
- .1 CRCA Specification Manual.

.5 Cool Roof Rating Council
- .1 CRRC-1, Standard for the Initial and Aged Measurement of Solar Reflectance and Thermal Emittance.

.6 Underwriters Laboratories' of Canada (ULC)
- .1 CAN/ULC-S704, Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.2 SECTION INCLUDES

.1 Removal of EPDM roof membrane, membrane flashing, metal counter flashing, insulation, deck sheathing, and air/vapour barrier, exposing existing deck. Contractor to confirm existing conditions and report findings to the Departmental Representative.

.2 Provision of new deck sheathing, air/vapour barrier, insulation, membrane, membrane flashing and metal counter flashing.

1.3 SUBMITTALS

.1 Submit a report, issued by a certified materials testing laboratory, attesting that the specified roofing system was tested in accordance with CSA A123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems. Test results shall demonstrate that the roofing system provides a Dynamic Uplift Resistance (DUR) of -3.4 kPa for the field surface of the roof, -4.2 kPa for the edges of the roof, and -7.3 kPa for the corners of the roof.

1.4 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Provide details, inside corners, outside corners, roof penetrations and terminations, including but not limited to, roofing components, junction with expansion joints, flashings, adjacent walls, at plumbing vents, conduit penetrations, roof anchors and resilient roofing walking and lay down surface area.
- .2 Indicate attachment at roof perimeter and at parapets. Assure that methods to be employed are adequate to restrain uplift and blow off to the requirements specified herein.
- .3 Provide fastenings pattern for Dynamic Uplift Resistance rating indicated for wind uplift for each different roof assembly used. Show pattern for roof corners, perimeter and roof centre.
  - .1 Indicate fastener type, length and material.
  - .2 Indicate discs or plates, if applicable.
  - .3 Where tapered insulation is indicated, provide layout for tapered insulation.
  - .4 Submit in writing a document from the provider of the roof warranty stating:
    - .1 The applicator of the primary membranes specified in this Section is recognized by the warrantor.
    - .2 The materials and components, as assembled in system, are compatible.

1.5 STORAGE AND HANDLING

.1 Refer to Section 01 61 00 - Common Product Requirements for storage and handling requirements.

.2 Store materials off-ground in weatherproof storage.

.3 Store materials in upright position. Store membrane rolls with selvage edge up, store as per manufacturer's requirements to meet warranty.

.4 Remove only in quantities required for same day use.

.5 Place plywood runways over work to protect work and enable work flow.

.6 Store sealants at +5°C minimum.

.7 Store insulation protected from daylight, weather and deleterious materials.

1.6 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.

1.7 PROTECTION

.1 Fire Extinguishers: maintain one stored pressure rechargeable type with hose and shut-off nozzle, ULC labeled for A, B and C class protection. Size 9 kg on roof per torch applicator, within 10 m of torch applicator.

.2 Contractor to provide safety person on site at all times during the roofing process and shall remain on site two (2) hours after work has ceased or after torching has stopped. Safety person shall scan the perimeter and roof penetration details with a hand held infrared gun.

.3 Remove only as much existing roofing as can be replaced by the end of each working day.

.4 Contractor to verify existing under deck mounted electrical conduits prior to installing mechanically fastened roof assembly.

1.8 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 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 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 Warranty to be non-prorated.

1.9 COMPATIBILITY

.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.

1.10 QUALITY ASSURANCE

.1 Membrane: applied by applicator acceptable to Departmental Representative and approved by manufacturer for application of its products.

.2 Applicators: minimum 5 years proven experience.

.3 Manufacturer’s representative:
- .1 Inspect roofing system at the start of construction, midway and as required for commissioning. Additional inspections may be carried out at the discretion of the Roofing System Manufacturer.
- .2 Provide technical assistance where required to correct installation of roofing system.

.4 Refer to Section 01 33 00 – Submittal Procedures and Section 01 45 00 - Quality Control for submission procedures.

.5 Submit laboratory test reports certifying compliance of bitumens and membranes with specification requirements.

1.11 MOCK-UP

.1 If requested construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Mock up to be 10 m^2 minimum size showing typical membrane lap joint, one inside and one outside corner parapet flashing. Insulation and fastening method, air/vapour barrier lap, gypsum board and fastening method and workmanship.

.3 Allow 48 hours for inspection of mock-up by Departmental Representative before proceeding with roofing work.

.4 Accepted mock up may form part of completed work.

PART 2 - PRODUCTS

2.1 THERMAL BARRIER AND AIR/VAPOUR BARRIER

.1 Thermal Barrier: Pre-primed glass mat faced gypsum panel non-asphaltic, highly filled proprietary heat-cured coating on one side, to ASTM C1177, 12.7 mm thick.

.2 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.

2.2 INSULATION AND COVER BOARD COMPONENTS

.1 For sloped roof decks or roof structures, provide uniform thickness rigid insulation.

.2 Polyisocyanurate Insulation and Asphalt Cover Board:
  .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 Provide two layers of insulation installed with staggered joints in thickness indicated on the drawings.

.2 Asphalt Cover Board: Semi-rigid asphalt roofing substrate composed of mineral core between glass fibre mats, 1200 x 1500mm sheets, minimum thickness 6.0 mm.

.3 Roofing crickets:
.1 Precut cricket system fabricated of factory cut and hinged triangular polyisocyanurate foam core and integrally laminated to heavy non-asphaltic, fibre-reinforced felt facers, slope as indicated.

2.3 BASE SHEET

.1 Base Sheet: Base sheet: to CGSB 37.56M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, non woven, polyester reinforcement, weighing 180 g/m^2.
.1 Type 1, fully adhered.
.2 Class C - plain surfaced.
.3 Grade 2 – 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: 60 N.
.5 Cold bending at -30 degrees C : no cracking.
.6 Static puncture resistance: > 400.
.7 Dimensional Stability: -0.3 / 0.3 %.

2.4 CAP SHEET

.1 Cap sheet: to CGSB 37.56M, Styrene-Butadiene-Styrene (SBS) elastomeric polymer, prefabricated sheet, glass, polyester reinforcement, weighing 250 g/m^2.
.1 Type 1, fully adhered.
.2 Class A - granule surfaced.
.3 Grade 2 – heavy duty service.
.4 Bottom surface polyethylene.
.5 Colour for granule surface: As selected by Departmental Representative.
.6 Cap sheet membrane properties:
.1 Strain energy (longitudinal/transversal): 10.0/10.0 kN/m.
.2 Breaking strength (longitudinal/transversal): 18.0/10.0 kN/m.
.3 Ultimate elongation (longitudinal/transversal): 60/65 %.
.4 Tear resistance: 75 N.
.5 Cold bending at -30 degrees C: No cracking.
.6 Static puncture resistance: > 420.
.7 Dimensional Stability: -0.8/-0.2%.

.2 Minimum total thickness if base sheet and cap sheet combined to be 5.8 mm. Cap sheet and base sheet to be of same manufacturer.

.3 Install contrasting colour cap sheet, 300 mm wide, 2.0 m from the roof edge along the entire perimeter of all roof sections as indicated on drawings. Contrasting colour cap sheet to be installed over cap sheet. Colour to be as per Departmental Representative selection from manufacturer's standard colour range.

2.5 BASE SHEET FLASHING

.1 To CGSB 37.56M, Type 2, Class C, Grade 2, non-woven polyester reinforced 180g/m^2, self-adhesive membrane with polyethylene top face and release film under face.

2.6 SEALERS

.1 Mastic made of synthetic rubbers, plasticized with bitumen and solvents with aluminum pigments to provide greater resistance to U.V.

2.7 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 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.

2.8 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. At gymnasium locations, fastener points of all fasteners to be removed.

.2 Roofing adhesive: single-component, moisture cured, solvent free polyurethane adhesive, dispensed from a portable disposable pre-pressurized container.

2.9 ROOF DRAINS

.1 As per section 22 42 01 – Plumbing Specialties and Accessories.

.2 Sump pan: 1200 X 1200 mm galvanized steel.

PART 3 - EXECUTION

3.1 WORKMANSHIP

.1 Do roofing work in accordance with applicable, standard in Canadian roofing Contractors Association (CRCA) Roofing Specifications Manual, except where specified otherwise.

3.2 PROTECTION

.1 Cover walls 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 or hoppers installed and connected.

.5 Protect roof from traffic and damage.

.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.

.7 Install insulation promptly to avoid possibility of condensation beneath vapour retarder.

.8 Take necessary measures ensuring no penetration of the elements will occur to the building after commencement of work, including but not limited to water.

3.3 EXAMINATION ROOF DECK

.1 Examine roof decks and immediately inform of Departmental Representative in writing of defects.

.2 Prior to commencement of work ensure:
- .1 Decks are firm, straight, smooth, dry, and free of snow, ice or frost, and swept clean of dust and debris.
- .2 Curbs have been built. Coordinate height of roof curbs with Section 06 10 00 – Rough Carpentry.
- .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.

3.4 EXPOSED MEMBRANE ROOFING APPLICATION (METAL ROOF DECK)

.1 Thermal Barrier and Air/Vapour Barrier:
- .1 Place thermal barrier with long axis of each sheet transverse to steel deck ribs, with end joints staggered and fully supported on ribs.
- .2 Secure thermal barrier to metal deck using one (1) fastener per board, located at the centre of the board, fasteners to be FMRC approved.
- .3 Fit butt edge joints in firm contact with one another.
- .4 Prime all surfaces of thermal barrier to receive self-adhering modified bituminous sheet air/vapour barrier as per manufacturer's instructions.
- .5 Apply self-adhering modified bituminous sheet air/vapour barrier to thermal barrier in an overlapping shingle fashion. Stagger all vertical joints.
- .6 Align modified bituminous sheet air/vapour barrier, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all ends and side laps. Roll membrane, including seams, with counter top roller to ensure full contact.

.2 Insulation
- .1 Loosely lay layer of insulation over thermal barrier and air/vapour barrier
- .2 Place boards in parallel rows with ends staggered, and in firm contact with one another.
- .3 Cut end boards to suit.
- .4 Install tapered insulation in accordance with shop drawings.

.3 Cover Board Components (Polyisocyanurate (Polyiso)):
- .1 Cover Polyiso insulation with one layer of asphalt cover board.
- .2 Place boards in parallel rows with ends staggered and in firm contact with one another.
- .3 Cut end boards to suit.
- .4 Mechanically fasten asphalt cover board with plates and fasteners.
- .5 Fit boards tight together. Install fasteners/adhesive based on design wind uplift securement requirements, for the building site location, for insulation and cover board, in accordance with manufacturer's recommendations.

.4 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 cover board taking care not to burn membrane or its reinforcement.
- .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.

.5 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 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.

.6 Flashings:
- .1 Complete installation of flashing base sheet stripping prior to installing membrane cap sheet.
- .2 Torch, base and cap sheet onto substrate in 1 meter wide strips.
- .3 Lap flashing base sheet to membrane base sheet minimum 150 mm and seal by 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.

3.5 ROOF PENETRATIONS

.1 Install roof drain pans, vent stack covers and other roof penetration Flashings and seal to membrane in accordance with the manufacturer's recommendations and details.

.2 All roof drains to be installed by certified plumber. Coordinate installation and relocation of roof drains so that work can be inspected by Departmental Representative prior to commencement of remaining roof work.

3.6 CLEANING

.1 Perform in accordance with Section 01 74 11 – Cleaning.

.2 Check drains to ensure cleanliness and proper function, and remove debris, equipment and excess material from site.

END OF SECTION