

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 35 29.06 - Health And Safety Requirements
- .2 Section 06 10 00 - Rough Carpentry
- .3 Section 07 62 00 - Sheet Metal Flashings
- .4 Section 22 42 00 - Plumbing
- .5 Section 23 05 00 - Common Work Results for HVAC

1.2 REFERENCE STANDARDS

- .1 Perform roofing work not specifically covered by these Specifications in accordance with applicable industry standards and good roofing practices of:
 - .1 Canadian Roofing Contractors Association (CRCA),
 - .2 Canadian Modified Bitumen Manufacturer's Association's recommendations,
 - .3 Manufacturer's preprinted and published technical specifications,
 - .4 ULC Design No. S-107 criteria,
 - .5 Factory Mutual Global design criteria FM 1-28 and 1.49,
 - .6 Compliance with local fire insurance requirements,
 - .7 Compliance with local building codes.
- .2 Latest edition of all listed references; most stringent requirements to govern in conflicts.
 - .1 American Society for Testing and Materials (ASTM) International:
 - .1 C208: Cellulosic Fibre, Insulating Board.
 - .2 C578: Rigid, Cellular Polystyrene Thermal Insulation.
 - .3 C1177(M): Standard Specification for Glass Mat Gypsum Substrate.
 - .4 C1289: Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .5 C1396(M): Standard Specification for Gypsum Board.
 - .6 D41: Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - .7 D312: Asphalt Used in Roofing.
 - .8 D2822: Asphalt Roof Cement.
 - .9 D4601: Standard for Asphalt Coated Glass Fibre Base Sheet Used in Roofing.
 - .10 D6162: SBS Mod. Bit. Sheets Using Polyester & Glass Fibre Reinforcements.
 - .11 D6163: SBS Mod. Bit. Sheets Using Glass Fibre Reinforcements.
 - .12 D6164: SBS Mod. Bit. Sheets Using Polyester Reinforcements.
 - .2 Canadian Standards Association (CAN/CSA)
 - .1 A123.2: Asphalt Coated Roofing Sheets.
 - .2 A123.16: Asphalt Coated Glass Base Sheets.
 - .3 A123.21: Dynamic Wind Uplift Resistance of Roof Assemblies.
 - .4 A231.1: Precast Concrete Paving Slabs.
 - .5 O121M: Douglas Fir Plywood.
 - .6 O151M: Canadian Softwood Plywood.
 - .3 Canadian General Standards Board (CAN/CGSB)
 - .1 37.29M: Rubber-Asphalt Sealing Compound
 - .2 37-GP-9M: Primer, Asphalt, unfilled, for Asphalt Roofing and Waterproofing.
 - .3 37-GP-15M: Application of Asphalt Primer for Asphalt Roofing & Waterproofing.
 - .4 37-GP-56M: Membrane, Bituminous, Prefabricated and Reinforced for Roofing.
 - .5 51.26M: Thermal Insulation, Urethane and Isocyanurate, Boards, Faced.

- .6 51.33M: Vapour Barrier Sheet, Excluding Polyethylene, for use in Construction.
- .4 Underwriters Laboratories of Canada (CAN/ULC)
 - .1 Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 S704: Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Fixed.
 - .3 S706: Wood Fibre Thermal Insulation for Buildings
- .5 Canadian Roofing Contractors Association (CRCA): Roofing and Waterproofing Manual.

1.3 WIND DESIGN REQUIREMENTS

- .1 Based on CSA A123.21 requirements for Wind Uplift, the following minimum wind loads must be met:

Roof Area	Wind Load
End Zone Width, Z	10 ft (3 m)
Corner, (C)	-58 psf (-2.8 kPa)
Edge, (S)	-30 psf (-1.4 kPa)
Field, (F)	-23 psf (-1.1 kPa)

1.4 SUBMITTALS

- .1 Refer to Section 01 33 00.

1.5 QUALITY ASSURANCE

- .1 Compatibility between components of roofing system and wall system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in new system will meet this requirement.
- .2 Perform Work in accordance with Contracts Documents and Manufacturer's written instructions.
- .3 Make no deviation from Project Specifications or approved shop drawings without prior written approval by Departmental Representative and, if applicable, Manufacturer.
- .4 Arrange for a Technical Representative of Manufacturer to review installed roof system wherever a System Warranty requirement has been specified.
- .5 Upon completion of new installation, provide certification that all work has been done in accordance with Contract Documents and to Manufacturer's requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Site storage is limited. Where applicable, location of storage and related facilities to be coordinated with Departmental Representative.
- .2 All materials to be delivered and stored in their original packaging bearing manufacturers label, grade and product weight, including all other related standards, specifications, and like.
- .3 All materials to be adequately protected from inclement weather conditions and stored in a dry, well ventilated and weather protected location. Use only dry materials and apply only during weather that will not introduce moisture into roofing system.
- .4 Only materials to be installed on same day to be removed from protected location to work site.

- .5 Modified bitumen rolls to be kept clear of all flames and sparks when not being applied to roof.
- .6 All materials in a rolled configuration to be stored on end, elevated off ground, and on a pallet or skid to protect bottom surface from foreign debris and moisture.
- .7 Restrict stockpiling of material in one location on roof to prevent exceeding specified deck live load capacity. Avoid point loading that may compromise structural integrity of roof.
- .8 Handle and store products in a manner to prevent damage and deterioration.
- .9 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Do not apply roofing materials to damp, wet, or frozen deck or substrates.
- .2 Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
- .3 Only install as much new roofing as can be made weather-tight each day, including all flashing and detail work. All seams to be sealed or heat welded before leaving job site that work day.
- .4 All work to be scheduled and executed without exposing interior building areas to effects of inclement weather. Existing building and its contents to be protected against all risks.
- .5 All new and temporary construction, including equipment and accessories, to be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
- .6 Uninterrupted water-stops to be installed at end of each day's work and to be completely removed before proceeding with next day's work. Water-stops to not emit dangerous or unsafe fumes and to not remain in contact with finished roof as installation progresses. Contaminated membrane to be replaced at no cost to Departmental Representative.
- .7 Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, provide all necessary protection and barriers to segregate work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over felt or plywood over insulation board to be provided for all new and existing roof areas that receive rooftop traffic during construction.
- .8 Prior to and during application, all dirt, debris and dust to be removed from surfaces by vacuuming, sweeping, blowing with compressed air, and/or similar methods.
- .9 Follow all safety regulations as required by OHS (Occupational Health and Safety) and any other applicable authority having jurisdiction.
- .10 All roofing, insulation, flashings and metal work removed during construction to be immediately taken off site to a legal dumping area authorized to receive such materials. Hazardous materials, such as materials containing asbestos, are to be removed and disposed of in strict accordance with applicable Local, Provincial, and National requirements.
- .11 All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) to be immediately removed from site by Contractor and properly transported to a legal dumping area authorized to receive such material.
- .12 Take precautions that storage and/or application of materials and/or equipment does not overload roof deck or building structure.
- .13 Flammable adhesives and deck primers to not be stored and not be used in vicinity of open flames, sparks and excessive heat.

- .14 All rooftop contamination that is anticipated or that is occurring to be reported to manufacturer to determine corrective steps to be taken.
- .15 Verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Contractor to report any such blockages in writing to Departmental Representative for corrective action prior to installation of roof system.
- .16 Immediately stop work if any unusual or concealed condition is discovered and immediately notify Departmental Representative of such condition in writing in order to obtain additional instruction.
- .17 Site cleanup, including both interior and exterior building areas that have been affected by construction, to be completed to satisfaction of Departmental Representative.
- .18 All landscaped areas damaged by construction activities to be repaired at no cost to Departmental Representative.
- .19 Take precautions when using adhesives at or near rooftop vents or air intakes. Avoid adhesive odours from entering building. Coordinate operation of vents and air intakes in such a manner as to avoid intake of adhesive odour while ventilating building. Keep lids on unused cans at all times.
- .20 Protective wear to be worn when using solvents or adhesives or as required by job conditions.

1.8 PREPARATORY WORK

- .1 Review roof levels and advise Departmental Representative of any deviation from specified tolerances.
- .2 Review roof drain locations and number. Advise Departmental Representative of any deviation or alteration from specifications.
- .3 Sweep roof deck free of dust or dirt and remove all debris prior to any installation work.

1.9 SAFETY AND PROTECTION

- .1 Solvents, Adhesives and Membranes:
 - .1 Store only enough solvents and adhesives on roof for same day use. Do not leave adhesives on roof over night. Manufacturer supplied adhesives should be stored in their over night containers. Minimum temperature for solvent based adhesives and primers is -5°C (23°F). Refer to Manufacturer's written instructions.
 - .2 Do not install roof membrane when temperature remains below 5°C (41°F) for self-adhered installations. Apply materials in accordance with manufacturer's recommendations and in accordance with Canadian Modified Bitumen Manufacturer's Association.
 - .3 Protect walls from damage where hoisting is required.
 - .4 Protect roofs from damage due to traffic and materials handling until completion.
- .2 Fire Safety:
 - .1 Contractor must keep charged and ready fire extinguishers on site at all times, including on roof and at access points to building interior, and wherever solvent based products are stored and accessed.
 - .1 Provide a fire watch to meet all requirements of Section 5.11.2.5 (Fire watch) of the Ontario Fire Code (latest edition).
- .3 Health and Safety:

- .1 Contractor to comply with all safety requirements as per latest current printed edition of the Provincial Occupational Health and Safety Act

1.10 EXTENDED WARRANTY

- .1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12 months warranty period is extended to 60months.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 All membrane materials are to meet manufacturer's respective material compatibility requirements to achieve required System Warranty.
- .2 Components to be used that are other than those supplied or manufactured by membrane manufacturer may be submitted for review and acceptance by membrane manufacturer.
- .3 Membrane Manufacturer's acceptance of any other product is only for a determination of compatibility with products and not for inclusion in manufacturer's warranty.
- .4 Specifications, installation instructions, limitations, and/or restrictions of respective manufacturers must be reviewed by Departmental Representative for acceptability for intended use with membrane manufacturer's products.

2.2 MEMBRANE PRIMER

- .1 General Purpose: Asphalt Primer to ASTM D41 Type II.
 - .1 Solvent Based Primer: Composed of volatile solvents, synthetic polymers, and/or adhesive enhancing resins to prepare surfaces for membrane application.
- .2 High-tack for Self-adhered Membranes:
 - .1 Solvent Based Primer: Composed of volatile solvents, synthetic polymers, and/or adhesive enhancing resins to prepare surfaces for self-adhered membranes.
- .3 For Torch Applied Membranes:
 - .1 Solvent Based Primer: Composed of SBS modified bitumen, volatile solvents, synthetic polymers, and/or adhesive enhancing resins to prepare surfaces for torch applied membranes.

2.3 ROOFING BOARD ADHESIVE

- .1 Polyurethane Adhesive for Deck, Insulation, and Cover Boards:
 - .1 Ribbons of one or two component polyurethane foamable adhesive.

2.4 VAPOUR RETARDER

- .1 Vapour Retarder Field Membrane:
 - .1 Torch grade modified bitumen, minimum 2.6mm thick, with minimum 180 g/m² non-woven polyester scrim, random glass fibre mat, or composite reinforcement, impregnated and coated with SBS modified bitumen, and conforming to CGSB 37-GP-56M. Top surface lightly sanded and torch grade bitumen bottom surface covered with thermofusible polyolefin film.
- .2 Vapour Retarder Flashings:

- .1 Self-adhered grade modified bitumen; minimum 2.2mm thick, with minimum 95g/m² non-woven polyester scrim, random glass fibre mat, or composite reinforcement, impregnated and coated with SBS modified bitumen, and conforming to CGSB 37-GP-56M. Top surface covered with thermofusible polyolefin film and self-adhesive bitumen bottom surface covered with polyolefin or silicone release film.

2.5 BASE INSULATION

- .1 Base Insulation Type: Closed-cell polyisocyanurate foam rigid insulation boards to ASTM C1289 Type II, Class 1, 2, or 3, Grade 2, manufactured with HCFC-free blowing agent (Pentane) bonded to inorganic coated glass facers on top and bottom surfaces during manufacturing process:
 - .1 Approved and listed for use with Noncombustible and FM Class 1 rated insulated roof assemblies to FM Standard 4450 on Insulated Steel Deck Roofs and FM Standard 4470 on Roof Covers for durability, wind uplift, and fire resistance.
 - .2 Meet physical property requirements of ASTM C1289 and CAN/ULC S704.
 - .3 Compressive strength: Min. 138 kPa (20 psi) to ASTM C1621, Grade 2.
 - .4 Dimensional stability change of less than 2% conforming to ASTM D2126.
 - .5 Conformity to CAN/ULC S704 and Can/ULC S770 for Long Term Thermal Resistance (LTTR) in polyisocyanurate insulation.
- .2 Base Insulation Panel Size:
 - .1 Flat Panels: 1.22m x 1.22m max. size.
- .3 Base Insulation Thickness:
 - .1 On Roof All Roof Areas:
 - .1 Continuous flat layer of polyisocyanurate insulation boards 100mm in thickness, with butt lapped joints.

2.6 TAPERED INSULATION

- .1 Tapered Insulation Type: Closed-cell polyisocyanurate foam rigid insulation boards to ASTM C1289 Type II, Class 1, 2, or 3, Grade 2, manufactured with HCFC-free blowing agent (Pentane) bonded to inorganic coated glass facers on top and bottom surfaces during manufacturing process:
 - .1 Approved and listed for use with Noncombustible and FM Class 1 rated insulated roof assemblies to FM Standard 4450 on Insulated Steel Deck Roofs and FM Standard 4470 on Roof Covers for durability, wind uplift, and fire resistance.
 - .2 Meet physical property requirements of ASTM C 289 and CAN/ULC S704.
 - .3 Compressive strength: Min. 138 kPa (20 psi) to ASTM C1621, Grade 2.
 - .4 Dimensional stability change of less than 2% conforming to ASTM D2126.
 - .5 Conformity to CAN/ULC S704 and Can/ULC S770 for Long Term Thermal Resistance (LTTR) in polyisocyanurate insulation.
- .2 Overlay Insulation Thickness: Tapered to suit layout indicated on roof plan drawing:
 - .1 On All Roof Areas: Taper insulation at a slope of 2% or 6mm vertically per 305mm (linear foot) horizontally, as noted on roof plan drawing.

- .3 Tapered Drainage Sumps: Tapered closed-cell polyisocyanurate foam rigid insulation boards with to inorganic coated glass facers.
 - .1 At Roof Drains: Delete section of overlay insulation to accommodate tapered sump:
 - .1 On Roof Area 101, 103 & 201: Sump size to be 2.44m x 2.44m and tapered from 100mm at outer edge down 2% to 75mm in thickness at center.
 - .2 On Roof Area 102 & 105: Sump size to be 1.2m x 1.2m and tapered from 100mm at outer edge down 2% to 75mm in thickness at center.
- .4 Tapered Insulation Crickets:
 - .1 Closed-cell polyisocyanurate foam rigid insulation boards to ASTM C1289 Type II, Class 1, 2, or 3, Grade 2, manufactured with HCFC-free blowing agent (Pentane) bonded to inorganic coated glass facers on top and bottom surfaces during manufacturing process.
 - .2 Insulation Crickets: Where indicated on roof plan drawing. Custom cut on site.
 - .1 Taper insulation crickets at 4% down to a minimum thickness of 0mm.
 - .3 All tapered insulation to be factory cut and mitred. Submit all shop drawings to Departmental Representative for review prior to prefabrication.

2.7 COVER BOARD

- .1 Asphaltic Cover Board: Dimensionally stable, laminated board, max size 1.2m x 1.5m:
 - .1 Multi-ply, semi-rigid asphaltic roofing recovery board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners.

2.8 MODIFIED BITUMEN MEMBRANE: TORCH BASE & TORCH CAP

- .1 Two (2) ply modified bitumen membrane system for specified System Warranty.
- .2 Base Sheet Field, Base Sheet Flashing and Reinforcing Membrane:
 - .1 Torch grade modified bitumen; minimum 2.6mm thick, with minimum 180 g/m² non-woven polyester scrim, random glass fibre mat or composite reinforcement, impregnated and coated with SBS modified bitumen, and conforming to CGSB 37-GP-56M. Torch grade bitumen top and bottom surface covered with thermofusible polyolefin film.
- .3 Cap Sheet Field & Cap Sheet Flashing Membrane:
 - .1 Torch grade modified bitumen; minimum thickness 3.3mm, with minimum 250 g/m² non-woven polyester scrim, random glass fibre mat, or composite reinforcement, impregnated and coated with SBS modified bitumen, and conforming to CGSB 37-GP-56M. Top surface to have No. 11 ceramic granules and torch grade bitumen bottom surface covered with thermofusible polyolefin film. Colour of granules to be chosen by Departmental Representative from Contractor supplied samples of standard colours.
- .4 Protective Membrane (Walkways & Under Pavers, Supports and Sleepers):
 - .1 Torch grade modified bitumen; minimum thickness 5.0mm, with minimum 250 g/m² non-woven polyester scrim, random glass fibre mat, or composite reinforcement, impregnated and coated with SBS modified bitumen, and conforming to CGSB 37-GP-56M. Top surface to have No. 11 ceramic granules and torch grade bitumen bottom surface covered with thermofusible polyolefin film. Colour of granules to be chosen by Departmental Representative from Contractor supplied samples of standard colours.

2.9 LIQUID APPLIED BITUMEN RESIN FLASHINGS

- .1 Flexible, reinforced, monolithic waterproof flashing membrane constructed on site using at least two coats of polyurethane and bitumen blended resin or modified polymer based resin, complete with polyester or fleece mesh reinforcement.
- .2 Primer & Catalyst: As recommended by manufacturer for substrate applied against.
- .3 Reinforcement: Polyester scrim or fleece mesh as recommended by manufacturer.
- .4 Accessories & Tools: As recommended by manufacturer.

2.10 MISCELLANEOUS INSULATION

- .1 Batt Insulation: Non-combustible, water resistant, vapour permeable, semi rigid mineral wool batt insulation made from slag and basalt rock, conforming to CAN/ULC S702-09 with a density of 45 kg/m³ (2.8 lb/ft³).

2.11 ROOFING ACCESSORIES

- .1 Membrane Tools: Use tools, hand rollers, weighted rollers, squeegees, etc. as recommended by membrane Manufacturer for installation of their product to ensure compatibility and avoid damaging of pressure sensitive membranes.
- .2 Roofing accessories to be manufactured from spun aluminum or copper as required, and complete with removable caps where applicable. Unless otherwise designated by Departmental Representative, pitch pockets are strictly prohibited. All units are to have foamed in place closed cell urethane foam insulation sprayed into unit at plant under controlled conditions. Flanges to be primed with rubberized asphalt compatible primer.
- .3 Sealing Compound: Rubberized Sealing Compound to CAN/CGSB-37.29, rubber asphalt type
- .4 Firestop Sealant: One component, neutral cure silicone sealant meeting ASTM E84 and CAN4-S115M, designed for firestop applications at joints and through-wall penetrations.
- .5 Membrane Protection Pads: to be a rubber mat manufactured from recycled material, used for protecting membranes from excessive foot traffic, falling of ice or other objects. The topside of the mat to be embossed with a hexagon-shaped design. Underside to have longitudinal groves spaced at 25mm to allow water drainage. The groves to be 4mm wide by 3.5mm deep.
- .6 Fireguard Tape: to be a self-adhesive fire stop membrane composed of glass fleece reinforcement and SBS Modified Bitumen. Roll to be min. 150mm wide.
- .7 Torchable Cant Strip: to be a rigid mineral wool fibre cant manufactured from basalt rock and steel slag having a melting point of 1195°C, with top face saturated with bitumen and coated with a thermofusible plastic film cover, and cut at a 45° angle.
- .8 Self-adhering Waterproof Membrane: to be comprised of modified asphalt with a consistent layer of adhesive applied to one side.
 - .1 All membrane to be installed with manufacture's recommended primer.
- .9 Guy Wire Support: to be a steel base plate welded to a steel pipe, a hot dip galvanized forged steel eye bolt welded to a galvanized cap, a 1.6mm aluminum sleeve with sufficient space to insulate.

2.12 ALUMINIUM ROOF ACCESS LADDER

- .1 Supply and install new aluminum, wall-mounted, fixed roof access ladder where indicated on roof plan. Exact location to be determined on site with Departmental Representative.

- .2 Ladder design to be in accordance with the OBC 2012 and covering:
 - .1 OBC Supplementary Standard SB-8: Design, Construction and Installation of Anchorage Systems for Fixed Access Ladders, September 14, 2012.
 - .2 Engineering Datasheet 2-04 by Ontario Ministry of Labour, July 2014.
- .3 Ladders to incorporate use of horizontal treads instead of round rungs. Fixed aluminum ladders to incorporate use of aluminum treads.
 - .1 Treads to be a maximum of 57mm (2.25") in width and have anti-slip surfacing.
 - .2 Handrails to extend above and over perimeter parapet detail.
- .4 Provide engineered shop drawings to Departmental Representative for review prior to fabrication and installation.
 - .1 Shop drawings to be specific to this project and include all attachment requirements and securement details for installation into specified roof deck type.
- .5 Protect roof membrane with provision of rubber mat walkway pads and fully adhered sacrificial cap sheet membrane at both top and bottom of each ladder installation. New layout as indicated on roof plan drawing(s).

2.13 ROOF GUARD RAILS (PARAPET MOUNTED)

- .1 At locations identified on roof plan, supply and install fixed roof safety railing systems along exterior perimeter wall for fall arrest protection during use of roof areas.
- .2 Railing system to use new wall-mounted rail posts, support brackets, and appropriate mechanical securement for existing wall construction type. Posts to be fabricated from min. 38mm (1.5") in diameter galvanized steel or aluminum tube or HSS.
- .3 Provide posts for railing at a maximum spacing of 2.44m (8'-0") on centre or as recommended by railing manufacturer.
- .4 Provide engineered shop drawings to Departmental Representative for review prior to fabrication and installation.
 - .1 Guard design to be in accordance with the OBC 2012 and covering:
 - .1 OSHA Standard 29 CFR 1910.23,
 - .2 OSHA Standard 29 CFR 1926.501, 29 CFR 1926.502,
 - .3 Canadian National Building Code 4.1.10.1(1)(e), 4.1.10.1(2), 4.1.10.1(4),
 - .4 Ontario Building Code Section 4.1.10.1(1)(b), 4.1.10.1(2), 4.1.10.1(4).
 - .2 Shop drawings to be specific to this project and include all attachment requirements and securement details for installation into specified substrate.

2.14 SHEET METAL FLASHINGS AND TRIM

- .1 As per Section 07 62 00.

2.15 PLUMING

- .1 As per Section 22 42 00.

2.16 MECHANICAL / ELECTRICAL

- .1 As per Section 23 05 00.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- .1 Procedures for application of materials should be in accordance with Manufacturer's printed instructions and recommendations.
 - .1 Advise Departmental Representative of adjustments to specified roofing procedures recommended by Manufacturer or due to site conditions.
 - .2 Written approval by Departmental Representative is required to make any adjustments to specified procedures.
- .2 All work to be carried out in accordance with drawings, and specifications provided.
 - .1 All supplied drawings and details constitute acceptable installations. Any deviance from these details must first be approved by Departmental Representative prior to installation.
- .3 While work is in progress, all steps must be taken to safeguard building from damage due to weather, fire, and structural overloading.
- .4 Examine underside of roof deck when installing mechanical fasteners, where possible, to avoid accidental damage to existing services.
- .5 Apply each part of roofing system when surfaces are free of moisture for successful application.
- .6 Do priming for asphalt roofing in accordance with CAN/CGSB 37-GP-15M and as recommended by membrane manufacturer.
 - .1 Adhesives or sealants and liquid primers will not be applied until surfaces are dry.

3.2 EXAMINATION OF SITE CONDITIONS

- .1 Examine existing site conditions and substrates upon which work of this section is dependent. Report to Departmental Representative in writing any defects or discrepancies. Commencement of work implies acceptance of existing conditions and assumption of full responsibility for finished condition of work.
- .2 Defective work resulting from application to unsatisfactory conditions will be considered responsibility of those performing work of this section.

3.3 PROTECTION

- .1 Adjacent Buildings and Tenants:
 - .1 Take care to not damage any adjacent or closely located buildings and all related grounds in vicinity of Work during roofing operations.
 - .2 Protect against infiltration of dust, debris, and other such contaminants and occurrences.
 - .3 Locate garbage chutes to minimize exposure to adjacent building, its grounds, and its occupants.
 - .4 Protect walls by means of tarpaulins where garbage chutes and hoisting equipment are located and operated.

- .5 Cover dumpsters and bins to prevent debris from blowing away.
- .6 Do not use spray installation methods on days with significant wind.
- .7 Damage to adjacent buildings, grounds, and vehicles to be rectified by Contractor at no additional cost.
- .2 Adjacent Roof Areas and Completed Work:
 - .1 Take care not to damage any previously performed work or existing roofs.
 - .2 If work area is accessed across existing roof areas, provide protection to existing roof system. Use continuous Protection Walkways consisting of 19mm plywood sheathing over 38mm extruded polystyrene insulation.
 - .3 Protect newly installed roof work from traffic and damage using Protection Walkways where warranted by traffic requirements.
 - .4 Comply with any precautions deemed necessary by Departmental Representative.
- .3 Material Storage:
 - .1 Deliver all materials to site in undamaged condition with original manufacturer's label intact and clearly visible for easy verification of specified materials.
 - .2 Provide security fencing at all times for equipment and materials stored at ground level.
 - .3 Protect rolls from flattening by storing on ends on skids.
 - .4 Whenever possible, store roof materials off roof at designated, protected storage area.
- .4 Structural Integrity of Roof:
 - .1 Use only equipment that will not adversely affect, damage, or alter roof deck.
 - .2 Do not create point loads that may adversely affect performance of existing deck when storing materials on roof.
- .5 Inclement Weather:
 - .1 For health and safety reasoning all shutdowns due to inclement weather must be approved by all Departmental Representatives.
 - .2 Any shutdowns by the Contractor due to inclement weather will be on their own terms and not reimbursable.
- .6 Roof Safety, Access, and Egress:
 - .1 Use warning signs and barriers. Maintain in good order until completion of work.
 - .2 Access to roof to remain unobstructed.
 - .3 Keep doorways and fire routes clean and clear of any obstacles.
 - .4 Protect and safeguard all man-size or larger openings in roof deck with warning flags and suitable temporary barriers or railings.
- .7 Damage and Defective Work:
 - .1 Avoid use on roof of any petroleum based and other chemical products that are corrosive and/or damaging to membrane. Provide protection to membrane from any accidental spills or

drips. Any damage to roof system caused by non-compatible products to be cut out and replaced at no cost to Departmental Representative.

- .2 Investigate and examine any damage caused by execution of Work for this contract, and repair or replace with new materials to match original finish. Restoration and repair work to be reviewed and approved by Departmental Representative.
- .3 Defective Work resulting from application of material on unsatisfactory surface or substrate to be rectified by Contractor at no additional cost.
- .4 Defective Work resulting from improper installation of materials to be rectified by Contractor at no additional cost.

3.4 SURFACE PREPARATION

.1 Preparation:

- .1 Examine all roof decks and existing site conditions to ensure that they are in satisfactory condition for commencement of work in this section.
- .2 Divide work into logical sections and only tear-off as much existing roof as can be made watertight in same working day to prevent damage to building interior.
- .3 Prior to removal of any roof components, all existing openings (drains, vents, air intakes, etc.) to be covered or plugged to prevent any debris or contaminate from entering building below. All such coverings are to be removed at end of each working day and reinstalled prior to next day's start up.
- .4 Disconnect and reconnect Electrical Services and Mechanical Equipment as required.
 - .1 Rooftop equipment requiring disconnection and reconnection to be responsibility of Contractor unless otherwise specified elsewhere in contract documents or in consultation with Departmental Representative.

.2 Existing Roof Removal:

- .1 On All Roof Areas: Remove all existing roof system components down to expose existing roof deck in preparation for installation of new roof system.
- .2 At areas designated for roof removal and replacement, remove existing projection and perimeter metal flashings, ballast, gravel, roof membrane and flashings, insulation, vapour retarder and flashings, and old appurtenances. Dispose removed items to an appropriate site for building material waste.
- .3 All unused and abandoned pitch pockets, vents, curbs, sleepers, projections, etc. are to be removed from designated areas and disposed of.
 - .1 Obtain verification and authorization from Departmental Representative before removing and disposing of any suspected unused or abandoned projections.
 - .2 Install new roof decking as required to close off any deck openings prior before proceeding with new roof system installation.
 - .3 Where existing insulation is exposed, examine insulation for any damage and deterioration required to be cut out and repaired with new compatible materials.

.3 Substrate Review:

- .1 Exposed roof deck surfaces to be reviewed by Contractor with Departmental Representative. Ensure to review entire roof area to satisfy any warranty requirements of Manufacturer of new roof membrane system.
 - .1 Notify Departmental Representative of review at least forty-eight (48) hours prior to site review.
- .2 Report any anomalies found that may impact soundness and structural integrity of roof system to Departmental Representative and Departmental Representative immediately. Areas with damaged decking must be replaced or repaired before any further work may take place on that particular section.
- .3 Ensure roof decks are firm, straight, smooth, dry, free of snow, ice, frost, oils, or other contaminants. Decking must be properly cleaned of any dust and debris prior to proceeding with new installation. Test whether specified adhesion to deck will be obtained where required.
- .4 Prior to application of vapour retarder, examine deck and ensure any defect of level or construction is correct before proceeding with work.
- .5 Verify that roof drains have been installed at proper elevations relative to finished roof surface to allow for sufficient drainage of roof surface.
- .6 Review securement of existing projections and equipment (electrical conduit, gas lines, etc.). If inadequate securement is found, inform Departmental Representative and halt work around that area until situation is rectified.
- .7 Review securement of existing plywood sheathing, wood blocking, and cant strips. Do not install new roofing unless such items are adequately secured to withstand stresses imposed by thermal movement of new roofing components.

3.5 CARPENTRY

- .1 On All Roof Areas: Refer to drawings for carpentry requirements. Install wood blocking, plywood, and cant strips to accommodate required slopes, insulation, membranes, and finish sheet metal and trim. Carpentry alterations to be performed to accepted trade practices.
- .2 Add new wood blocking as necessary to maintain minimum heights at perimeters and roof curbs, as indicated on detail drawings.
- .3 Replace any damaged or deteriorated wood at perimeters and projections with new construction grade spruce wood blocking or exterior grade plywood, good one side, to match existing. Determination of suitability to reuse or replace existing wood to be by Observer.
 - .1 Ensure existing wood blocking remaining at perimeters and curbs is securely fastened to existing substrate before installing new wood blocking and plywood.
- .4 Install wood blocking as required to ensure that all roof curbs and sleepers supporting HVAC and mechanical equipment are level.
- .5 Wood to wood, wood to metal, wood to masonry or concrete to be secured at 305mm (12") on center with alternating fasteners staggered.
 - .1 Avoid protruding fastener heads. Where possible, all fasteners to be flush with or slightly sunk below surface of wood blocking being secured.
- .6 All wood blocking and plywood to be considered part of roof, and to be made watertight by end of each work day to eliminate moisture infiltration into roof system.

- .7 Limit amount of in-flute insulation installation to an area that will be made watertight by end of work day. Do not leave in-flute deck insulation exposed to elements.

3.6 VAPOUR RETARDER

- .1 On All Roof Areas: Install a one (1) ply modified bitumen vapour retarder with self-adhered vapour retarder flashings as per manufacturer's written instructions. Installation to be free of blisters, wrinkles and fish-mouths.
 - .1 Install vapour retarder flashings at perimeters, curbs, sleepers, and penetrations prior to installation of field membrane across roof. Self-adhered vapour retarder flashings must be used at perimeters or projections where torching may be an issue.
 - .2 Vapour retarder must be installed on same day as primer application.
 - .3 Do not install when it is raining or snowing, on wet/humid surfaces, or when inclement weather is expected shortly.
 - .4 Deck substrate must be clean, dry, and free of dirt, dust, grease, or other contaminants.
- .2 Primer Installation:
 - .1 Prime surface of concrete deck, perimeters, curbs, sleepers, and penetrations to receive membrane and flashings where required by manufacturer.
 - .2 Apply primer to clean and dry surfaces with a paint brush, roller or sprayer at temperatures 0°C and above.
 - .3 Apply primer at a coverage rate between of 0.1 to 0.5 L/m² as recommended by membrane manufacturer for surface type.
 - .4 Ensure all substrates are fully covered with primer with no areas bare and avoid pooling.
 - .5 Allow primer to dry and flash-off prior to installation of new membrane and flashings.
- .3 Membrane Flashing Installation:
 - .1 Install membrane flashing onto substrate in strips one membrane roll wide (1m) and extend over perimeters as shown on detail drawings
 - .2 Field measure and cut flashing membrane to length required for flashing at each detail and roll up for installation.
 - .3 Once aligned in position, peel back a portion of release sheet and press membrane onto substrate for initial adherence. Hold membrane flashing tight and peel back release sheet by pulling diagonally.
 - .4 Overlap each preceding flashing sheet by min. 76mm on side laps and align bottom edge to a chalk reference line along base sheet membrane. Lap membrane flashing onto field membrane a minimum 102mm.
 - .5 Use a weighted roller to press membrane down onto substrate including laps. Finish by aligning edge of roller with lower end of side laps and rolling up membrane.
 - .1 Do not cut membrane to remove trapped air bubbles. Squeeze out air bubbles by pushing roller to edge of laps.
- .4 Tape Seams:

- .1 Tape any remaining seams in roof deck and deck overlay board with modified bitumen membrane strips to prevent flame from entering through roof deck.
- .2 Apply appropriate primer to top surface of deck overlay board where required for self-adhered membrane strips.
- .3 Install continuous strips of 152mm wide self-adhered modified bitumen base sheet membrane over seams and joints.
- .4 Overlap end joints of membrane strips by minimum of 76mm.
- .5 Field Membrane Installation:
 - .1 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and re-roll from both ends.
 - .2 Unroll and install base sheet carefully in straight and parallel rows.
 - .3 When torching, limit direct contact of flame with prepared substrates. Ensure that majority of flame remains on roll of membrane. Avoid over torching membrane.
 - .4 Overlap each preceding row of membrane sheet by min. 76mm on side laps and by a min. 152mm at end laps. Stagger end laps of adjacent rows by at least 305mm.
 - .5 Carry vapour retarder up all vertical surfaces at parapets and projections a minimum of 152mm to allow for encapsulating of new insulation with roof membrane as indicated on detail drawings.
 - .6 INSTALL MEMBRANE GUSSET REINFORCEMENT AT ALL INSIDE AND OUTSIDE CORNERS ON TOP OF BASE SHEET MEMBRANE. DEPARTMENTAL REPRESENTATIVE TO REVIEW GUSSET INSTALLATION BEFORE PROCEEDING.
- .6 All side and end laps of base sheet and base sheet flashing to be hot air welded to satisfaction of Departmental Representative.

3.7 BASE INSULATION

- .1 On All Roof Areas: Install a layer of base insulation boards over prepared vapour retarder in accordance with insulation manufacturer's instructions.
- .2 Where applicable, install tapered base insulation according to layout on reviewed shop drawings and roof plan drawing(s). Report any discrepancies to Departmental Representative before proceeding.
- .3 Do not install more insulation board than can be covered with membrane by end of work day or before onset of inclement weather.
- .4 Do not install warped, curled, damaged, or wet insulation boards.
- .5 Install base insulation boards in parallel rows and butt tightly together with joints staggered by one half board length.
 - .1 Where multiple layers of insulation are required, stagger all board joints at least 305mm between rows.
- .6 Adhere base insulation to substrate using continuous beads of polyurethane foamable roofing adhesive. Follow manufacturer's installation instructions.
 - .1 Install continuous ribbons of polyurethane adhesive in parallel lines to meet wind uplift requirements.

- .2 Adhesive ribbons to be no less than 13mm to 19mm in width at time of application.
- .3 Do not allow rising foam adhesive to skin-over. Place insulation panels immediately into wet adhesive.
- .4 Once insulation has been placed, immediately roll boards into adhesive using a heavy steel roller, to ensure positive adhesion to substrate across full panel. Repeat as required until insulation is firmly attached.
- .7 Custom cut insulation boards as required at perimeters and projections to suit. Field cuts to be neat and provide tight fit around penetrations, projections, and at perimeters.
- .8 For uneven surfaces, trimming or slitting of boards may be necessary. Fill all gaps larger than 3mm with insulation slivers or continuous spray polyurethane foam insulation to ensure thermal barrier continuity.

3.8 TAPERED INSULATION

- .1 On All Roof Areas: Install a continuous layer of overlay insulation boards over base insulation in accordance with insulation manufacturer's instructions.
- .2 Where applicable, install flat or tapered overlay insulation according to layout on reviewed shop drawings and roof plan drawing(s). Report any discrepancies to Departmental Representative before proceeding.
- .3 Do not install more insulation board than can be covered with membrane by end of work day or before onset of inclement weather.
- .4 Do not install warped, curled, damaged, or wet insulation boards.
- .5 Install overlay insulation boards in parallel rows and butt tightly together with joints staggered by one half board length.
 - .1 Where multiple layers of insulation are required, stagger all board joints at least 305mm between rows.
- .6 On All Roof Areas: Adhere overlay insulation to substrate using continuous beads of polyurethane foamable roofing adhesive. Follow manufacturer's installation instructions.
 - .1 Install continuous ribbons of polyurethane adhesive in parallel lines to meet wind uplift requirements.
 - .2 Adhesive ribbons to be no less than 13mm to 19mm in width at time of application.
 - .3 Do not allow rising foam adhesive to skin-over. Place insulation panels immediately into wet adhesive.
 - .4 Once insulation has been placed, immediately roll boards into adhesive using a heavy steel roller, to ensure positive adhesion to substrate across full panel. Repeat as required until insulation is firmly attached.
- .7 Custom cut insulation boards as required at perimeters and projections to suit. Field cuts to be neat and provide tight fit around penetrations, projections, and at perimeters.
- .8 For uneven surfaces, trimming or slitting of boards may be necessary. Fill all gaps larger than 3mm (1/8") with insulation slivers or continuous spray polyurethane foam insulation to ensure thermal barrier continuity.
- .9 On Roof Areas 101, 103 & 201: At all existing roof drain locations, delete a section of overlay insulation in a 2.4m x 2.4m area centered around each drain.

- .1 At each drain location, install a new 2.4m x 2.4m prefabricated, tapered insulation drain sump over prepared substrate.
- .10 On Roof Areas 102 & 105: At all existing roof drain locations, delete a section of overlay insulation in a 1.2m x 1.2m area centered around each drain.
 - .1 At each drain location, install a new 1.2m x 1.2m prefabricated, tapered insulation drain sump over prepared substrate.
- .11 Install tapered insulation crickets over top of overlay insulation in ribbons of polyurethane adhesive.
 - .1 Provide crickets where shown on roof plan, tapered insulation shop drawings, and at all penetrations wider or longer than 305mm blocking direction of drainage.
 - .2 Install continuous ribbons of polyurethane adhesive in parallel lines to meet wind uplift requirements.
 - .3 Adhesive ribbons to be no less than 13mm to 19mm in width at time of application.
 - .4 Do not allow rising foam adhesive to skin-over. Place insulation panels immediately into wet adhesive.
 - .5 Once insulation has been placed, immediately roll boards into adhesive using a heavy steel roller, to ensure positive adhesion to substrate across full panel. Repeat as required until insulation is firmly attached.

3.9 COVER BOARD

- .1 On All Roof Areas: Install a layer of cover board panels in ribbons of polyurethane foamable roofing adhesive over rigid insulation as per manufacturer's written instructions and to meet wind uplift requirements.
- .2 Do not use wet or damaged cover board panels. Panels must be dry for proper installation.
- .3 Determine and mark, as required, areas to receive new cover board installation to avoid over application of quick adhesive.
- .4 Custom cut cover board panels at perimeters and projections to suit. Install cover boards tightly together with no gaps between insulation boards larger than 3mm.
 - .1 Cut boards as required to fit snug at all perimeters, walls, and roof projections.
 - .2 Cut straight lines using proper tools and snap chalk lines.
 - .3 Cut boards cleanly where slope changes direction. Do not break boards by stepping on them to acquire changes in deck slope.
- .5 Install cover board panels in parallel rows and butt tightly together with end joints staggered by a half width of panel. Stagger panel end joints with joints of rigid insulation below by min. 152mm.
 - .1 Install continuous ribbons of polyurethane adhesive in parallel lines to meet wind uplift requirements.
 - .1 Adhesive ribbons to be no less than 13mm to 19mm in width at time of application.
 - .2 Do not allow rising foam adhesive to skin over. Place roof board panels immediately into wet adhesive.

- .3 Once boards have been placed, immediately roll boards into adhesive using a heavy steel roller, to ensure positive adhesion to substrate across full panel. Repeat as required until board is firmly attached.
- .6 Where cover board is field primed, allow sufficient time for applied primers to dry and flash-off. Roof board surface must be thoroughly dry before installation of membrane.

3.10 MODIFIED BITUMEN MEMBRANE APPLICATION

- .1 On All Roof Areas: Install a two (2) ply, SBS modified bitumen membrane system overtop of prepared substrate. Base sheet field membrane and base sheet flashings to be torch applied. Cap sheet field membrane and cap sheet flashings to be torch applied.
- .2 All membrane materials are to be supplied by same manufacturer in order to meet material compatibility requirements necessary to achieve required System Warranty.
- .3 All membrane installations to conform to membrane manufacturer's printed literature, recommendations, guidelines, and instructions.
- .4 All membrane and flashing applications to be free of sags, blisters, wrinkles, and fish-mouths.
- .5 General Requirements for Application:
 - .1 Tools, Rollers, & Squeegees: Use membrane manufacture's recommended tools and accessories. Keep tools clean during performance of work and frequently replace application roller tips and squeegee heads with new when clogged.
 - .2 Surface Review: Apply over wood, metal, gypsum board and concrete decks which are clean, smooth, and free of snow, ice, moisture, and debris. Concrete decks must have all holes filled with quick drying cement and rough patches removed.
 - .3 Application of Primer: Priming is required for all substrates prior to installation. Avoid pooling primer and allow to completely dry before membrane installation. Drying time will vary according to absorptive qualities of material and ambient weather conditions.
 - .4 First Roll Starting Point: Base sheet to begin at drain level with side lap aligned to centre of drain. Run rolls perpendicular to slope. Cap sheet to be installed over base sheet covering base sheet overlap. Center of cap sheet to align up with centre of drain.
 - .5 Relaxing of Roll Membrane: ALL ROLL MEMBRANES ARE TO BE FULLY UNROLLED AND ALLOWED TO RELAX FOR A MIN. OF 15 MINUTES PRIOR TO INSTALLATION. Wait longer in cooler temperatures. Trace zig-zag pattern with torch as recommended by manufacturer over membranes that are covered with thermal-fusible film.
 - .6 Alignment of Rolls: Completely unroll first roll and align with edge of roof. Reroll membrane from both ends to centre and apply as per specifications.
 - .7 Staggering of Sheets: End laps between base and cap sheets to be offset a min. of 610mm. Side laps between base and cap sheets to be offset a min. of 305mm centered alignment preferred. Laps in same membrane layer to be min. 76mm wide for side laps and min. 305mm wide for end laps. When salvage side laps of base and cap sheets are unequal, adjust cap roll width occasionally to maintain alignment.
 - .8 Procedure to Seal Voids: Where voids are created by overlapping rolls of membrane, cut off corner of salvage edge where covered by next roll of material.
 - .9 Salvage Edge Protection: Granules along edge of membrane to be primed prior to application of adhesive to provide good adhesion of laps.

- .10 Membrane Flashings: Base flashings to extend min. 102mm onto field of roof from base of cant strip or vertical surface. Cap flashings to overlap base sheet flashings and extend min. 102mm beyond base flashings. Use wider overlap widths where required by manufacturer for warranty requirements.
- .11 Bleed-Out at Seams: When torch applying membrane, provide consistent, continuous bleed-out along all seams, no less 3mm and no greater than 6mm in width.
- .12 All Seams: Check all seams in all sheets with a round nosed trowel while work is in progress. Repair found deficiencies immediately and before continuing roof installation.
- .13 Base Sheet Seams: Butter all seams and laps. Provide additional bitumen at point of 90° upturns in base sheet flashings. Recheck self-adhered membrane seams left exposed within forty-eight (48) hours of installation to repair any revealed seam deficiencies with clean, heated trowel.
- .14 Cap Sheet Seams: At all end laps and membrane flashing overlaps, degranulate area (embed granules) of surface to be bonded by embedding ceramic granules into bitumen of membrane using clean, heated trowel to push in. Measure and use straight chalk lines to mark outline of areas requiring degranulation. Achieve a uniform black surface of bitumen across 100% of embedment areas to be overlapped.
- .15 Reinforcement: Required at all corners, vents, drains, HVAC units, and gravel stops.
- .16 Primer Application: Sanded membrane left exposed overnight or longer to be primed before continuing membrane installation to ensure good adhesion.
- .17 Torch Application: During windy periods, slow application rate down to ensure good bond with proper level of heat. Stop and periodically check for proper adhesion.
- .6 Correction Requirements for Defects and Deficiencies:
 - .1 Delamination: Membrane may not be fully bonded to substrate due to:
 - .1 Moisture present on substrate,
 - .2 Dirt, dust, or other contaminate on substrate acting as a parting agent,
 - .3 Inadequate application of primer or adhesive.
 - .2 Misalignment: Alignment of row to starting line is lost due to swerving during application or to roll not being unrolled, aligned, and rerolled straight prior to application.
 - .1 Misaligned roll to be cut at point where swerve begins and restarted.
 - .2 Ensure membrane rolls are allowed to relax. Use heat in a zig-zag pattern to relax thermo-fusible films and membrane reinforcement.
 - .3 Ensure pressure is applied evenly across roll during application to avoid drifting.
 - .3 Wrinkles: Undulations located on surface of membrane after it has been applied:
 - .1 Cross-Sheet Undulations: Waves in membrane due to installation in a stop and go fashion.
 - .2 Continuous Ridging of Membrane: Formed by movement of substrate underneath membrane. Ensure substrate is secure before continuing.
 - .4 Blisters: Pocket of air trapped under membrane where full adhesion was not achieved or trapped moisture released from substrate:
 - .1 Remove and repair significant blisters.
 - .2 Cut blister and adhere any loose membrane.

- .3 Apply patch membrane over repair area, extend a min. 152mm on all sides.
- .5 Membrane Patches: Cap sheet membrane patches to be installed from seam to seam. Minimum size of membrane patch to be 915 x 915 mm.
- .7 Primer Installation:
 - .1 Prime surface of existing concrete deck, deck overlay board, perimeters, curbs, sleepers, and/or penetrations to receive membrane and flashings where required by manufacturer.
 - .2 Apply primer to clean and dry surfaces with a paint brush, roller or sprayer at temperatures 0°C and above.
 - .3 Apply primer at a coverage rate between of 0.1 to 0.5 L/m² as recommended by membrane manufacturer for surface type.
 - .4 Ensure all substrates are fully covered with primer with no areas bare and avoid pooling.
 - .5 Allow primer to dry and flash-off prior to installation of new membrane and flashings.
- .8 Base Sheet Field Membrane, Torch Applied Installation
 - .1 Field measure and cut membrane to length of run required and roll up for installation.
 - .2 Starting at low point of roof, perpendicular to slope, unroll base sheet, align and re-roll from both ends.
 - .3 Unroll and install base sheet carefully in straight and parallel rows.
 - .4 Base sheet to be torched across flat of roof, overtop of cover board.
 - .5 Lap sheets 76mm for side laps and a minimum 152mm for end laps. Extend the base sheet up verticals 51mm above the top of the cant and nail above the top of the cant at 203mm on centre. Cut off corners at end laps to be covered by next roll.
 - .6 All side and end laps of base sheet to be heat welded as required with hot air gun or torch to satisfaction of Observer.
- .9 Base Sheet Flashing, Torch Installation:
 - .1 Install membrane flashing onto substrate in strips one membrane roll wide (1m) and extend over perimeters as shown on detail drawings
 - .2 Field measure and cut flashing membrane to length required for flashing at each detail and roll up for installation.
 - .3 Apply the base sheet flashing with 75mm side laps. Extend the base sheet flashing 102mm from the base of the cant onto the roof surface, and extend up the verticals 102mm above the top of the base sheet, or as indicated on the detail drawings. Cut off corners at leading end to be covered by next sheet.
 - .4 Torch base sheet flashing to base sheet. Firmly press membrane into substrate to ensure proper bond.
 - .5 MEMBRANE GUSSET REINFORCEMENT TO BE INSTALLED ON TOP OF BASE SHEET MEMBRANE AT ALL INSIDE AND OUTSIDE CORNERS. SIZE TO BE 76x152mm WITH "V" CUT BOTTOM. DEPARTMENTAL REPRESENTATIVE TO REVIEW GUSSET INSTALLATION BEFORE INSTALLATION OF CAP SHEET MEMBRANE.

- .6 All side and end laps of base sheet flashing to be heat welded as required with hot air gun or torch to satisfaction of Observer.
- .10 Cap Sheet Field Membrane, Torch Installation:
 - .1 Complete installation of base sheet flashing prior to installing membrane cap sheet and cap sheet flashings.
 - .2 Field measure and cut membrane to length of run required and roll up for installation.
 - .3 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and re-roll from both ends.
 - .4 Unroll and install cap sheet carefully in straight and parallel rows keeping majority of flame on membrane roll.
 - .5 Cap sheet to be torched across flat of roof, overtop of base sheet, and terminated at perimeters and vertical surfaces ensuring a good bond.
 - .6 Lap sheets 76mm for side laps and a minimum 152mm for end laps. Offset joints in cap sheet 305mm minimum from those of base sheet.
 - .7 All side and end laps of cap sheet to be heat welded with hot air gun to satisfaction of Departmental Representative.
- .11 Cap Sheet Flashing, Torch Installation:
 - .1 Cap sheet membrane flashing to be torched up and over perimeter details.
 - .2 Install membrane flashing onto substrate in strips one membrane roll wide (1m) and extend up perimeters as shown on detail drawings
 - .3 Field measure and cut flashing membrane to length required for flashing at each detail and roll up for installation.
 - .4 Set cap sheet to offset base sheet flashing joints by 50% and extend a minimum of 203mm onto roof. All end lap joints to be a minimum 76mm
 - .5 Align bottom edge to a chalk reference line along cap sheet membrane.
 - .6 Install cap sheet flashing onto field membrane a minimum 203mm at base of perimeter detail. Run flashing up vertical and across perimeter detail to outside edge.
 - .7 Overlap each preceding cap sheet flashing sheet by min. 76mm on side laps. Offset joints in cap sheet flashing 305mm minimum from those of base sheet flashing.
 - .8 Properly secure flashings to their support, without sags, blisters, fish-mouths or wrinkles with terminations as indicated on drawings and details.
 - .9 All side and end laps of cap sheet flashing to be heat welded with hot air gun to satisfaction of Observer.

3.11 LIQUID APPLIED BITUMEN RESIN FLASHINGS

- .1 Where specifically indicated in detail drawings and at any junctions where conventional installation of membrane flashings are not feasible, install new polyurethane and bitumen blended resin or modified polymer based resin, complete with polyester or fleece mesh reinforcement.
- .2 Installation of liquid applied flashing system to follow in STRICT ACCORDANCE with manufacturer's written instructions.

- .3 Ensure substrates are free from gross irregularities, loose, unsound or foreign material such as dirt, ice, snow, water, grease, oil, bituminous products, release agents, laitance, paint, loose particles/friable matter, rust or any other material that would be detrimental to adhesion of catalyzed primer and/or resin to substrate.

3.12 ROOF PENETRATIONS & ACCESSORIES

- .1 On All Roof Areas: Install vent stack flashings, support flashings, and other roof penetration flashings, and seal with roof membrane in accordance with Manufacturer's instructions and as indicated on detail drawings.
 - .1 Prime all metal flanges with modified bitumen compatible primer, and allow any solvents to flash-off and dry completely prior to installation.
 - .2 Set metal flange in bed of manufacturer recommended and system compatible roofing cement applied over base sheet membrane, ensuring a positive bond.
 - .3 Install an additional ply of base sheet membrane flashing over metal flange prior to installing cap sheet membrane. Additional ply of base membrane to extend a minimum of 204mm past all edges of metal flange.
 - .4 Install cap sheet ply over base flashing ensuring a full bond to base ply membrane.
 - .5 Apply continuous bead of manufacturer's recommended and system compatible sealant around penetration at point where membrane terminates.

3.13 PROTECTION MEMBRANE PADS:

- .1 Where indicated on roof plan provide protection pads for walkway protection following manufacturers installation instructions.

3.14 ROOF DRAINS

- .1 General Practice:
 - .1 Ensure existing roof drains, rain gutters, and down pipes are clear of debris and are free flowing prior to installation of new roof system.
 - .1 Any blockages are to be reported prior to start of Work. Once Work has begun, Contractor assumes responsibility for free flowing drains and clearing blockages at no additional cost to Departmental Representative.
 - .2 All roof drain and drain line work as per Section 22 42 00.
 - .3 Where required for new roof drains and interior plumbing, Contractor to provide interior plumbing and hook-up to existing storm water drainage system and co-ordinate installation of same with Departmental Representative.
 - .2 Prior to installation of new roof, ensure that all drains are located at a height where new roof system is able to clear majority of roof top water caused by rainfall within a seventy-two (72) hour period.
 - .3 Once work has begun, no roof area to be left overnight without adequate provision for drainage.
 - .4 Install drains in accordance with detail drawings and as per manufacturer's written instructions and guidelines.
- .2 Roof Drain Installation:

- .1 On All Roof Areas: At all existing roof drain locations, install new roof drains as per section 22 42 00.
 - .1 At all existing roof drains employing control flow weir devices, it is mandatory to reinstate existing devices or provide new control flow devices with equivalent flow rates inside new roof drains.
- .2 Set metal flange of drain body into continuous bed of manufacturer recommended and system compatible roofing cement applied over base sheet membrane.
- .3 Install target patch of membrane reinforcement over metal drain flange. Use a square of 1m x 1m base sheet membrane and install over drain at a 45° angle to direction of base sheet rolls.
- .4 Install cap sheet over base sheet membrane with drain in center of roll and without seams in drain area.
 - .1 All end laps of cap sheet to be min. 915mm away from drain.
 - .2 Where seams of cap sheet do not align properly with drain location, install cap sheet over drain area first and picture-frame cap sheet into remainder of roof.
- .5 Place Clamping Ring over raised bolt studs. Install stainless steel self locking nuts to tighten Clamping Ring against membrane flashings until secure.
- .6 Install ballast guard strainer dome and secure with cotterless pin or wing nut screw.

3.15 TEMPORARY WATER CUT-OFFS

- .1 All membrane flashings to be installed concurrently with roof membrane in order to keep roof system watertight during performance of work.
- .2 Temporary waterproof seals to be placed on daily work as required. All temporary water-stops to be constructed to provide a one hundred (100) percent watertight seal.
- .3 New roofing membrane to be carried into water-stop. Water-stop to be sealed to roof deck and/or substrate to prevent water travel and infiltration under new or existing roofing.
- .4 Edge of roof membrane to be sealed in a continuous heavy application of sealant. Temporary seals to be removed and cleaned up before proceeding with remaining work.
- .5 When work resumes, cut out and dispose of all contaminated membrane. All sealant, contaminated membrane, insulation fillers, etc. to be removed from work area and properly disposed of offsite. Reuse of these materials in new work is strictly prohibited.
- .6 If inclement weather occurs while a temporary water-stop is in place, Contractor to provide all necessary labour required to monitor situation and maintain watertight condition.
- .7 If any water is allowed to penetrate under newly completed roofing, then affected area to be cut out, removed, and replaced with new materials at Contractor's own expense.

3.16 METAL FLASHINGS

- .1 On All Roof Areas: After installation of roof membrane and membrane flashings, new perimeter metal and metal flashings to be installed as detailed in Section 07 62 00 and as indicated on drawings.

3.17 CLEAN-UP

- .1 On All Roof Areas: Clean up and remove from job site on a daily basis, all rubbish and surplus materials resulting from this work.

- .2 Drag a magnetic bar across work area and grounds to ensure removal of all discarded fasteners and sharp metal debris.