



Bid Opportunity No. 321-2020

Provision of Roof Replacement at Winnipeg Fire Paramedic Service (WFPS) No.25
701 Day St., Winnipeg, MB



BID OPPORTUNITY FOR: Provision of Partial Roof Replacement at Winnipeg Fire Paramedic Service (WFPS) No.25
701 Day St., Winnipeg, MB

DATE: May 19, 2020

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1. ROOFING SCOPE OF WORK - Section 07 31 00

B1. GENERAL

B1.1 REQUIREMENTS

- (a) Furnish all labor, materials, tools and equipment necessary for the removal and disposal of existing steep-slope systems (**Roof- C1**), including removal of non-operational roof curbing, flashings, etc, and the design and installation of a complete step-slope roof system. Including the accessory items such as new drains, (ensure slope to positive drainage) connections, scuppers, drain inserts, copings, flashings, pitch boxes penetration seals c/w liquid sealant, at a minimum.
- (b) Base bid system to be:
 - (i) Steep-Slope: Fibreglass-Based laminate asphalt shingles c/w full water & ice shield. UL Class A fire-resistance rating. Conforms to CSA standard A123.5.
 - (ii) All installed roofing systems must meet Code and Regulatory Requirements along with recommendations of the most current edition as per the followings.
 - (iii) The roof assembly shall be in accordance with CSA A123.21-14 as it pertains to the wind uplift resistance. ULC Standards, ULC approved membranes Class C min. ASTM D 6162-4, system membrane.
 - (iv) All recommendations of the Canadian Roofing Contractors Association (CRCA)
 - (v) Slope flashings to the roof and design roof drains to promote the rapid removal of water from all roof surfaces. Slopes for roofing assembly replacement at existing flat roofs are dependent on practicable heights at perimeters and location of existing roof drains. Including back-sloping parapet coping.
 - (vi) Sheet Metal and Air Conditioning Contractor's National Association, (SMACNA)
 - (vii) CMHC Best Practice Flashing Guide
 - (viii) All requirements of the Roofing System Manufacturer's Warranty, (RSMW)
 - (ix) All applicable Province of Manitoba Building Codes
 - (x) The manufacturer's application instructions for each product used are considered part of this specification and should be followed at all times.
 - (xi) Raising, re-setting, and protection of mechanical, air conditioning equipment, ventilators, and exhaust fans may be required. Removal and re-installing of perimeter lighting and electrical if required. Provision for temporary access and protection onto the roof, such as scaffolding, portable railings, plywood and rigid insulation roof protection, etc.

B1.2 SUBMITTALS

- (a) Submit product data
- (b) Submit product data sheets for asphalt shingles. Include:
- (c) Product characteristics.
- (d) Performance criteria.
- (e) Installation instructions.
- (f) Limitations.

- (g) Colour and finish to
- (h) Indicate specially configured accessories, metal flashings, jointing methods and locations, fastening methods and locations, and installation details.
- (i) Submit WHMIS MSDS Material Safety Data Sheets. WHMIS acceptable to Health Canada for asphalt shingles.

B1.3 REFERENCE STANDARD(S)

- (a) All references shall be the current version or latest revision at the date of building permit issue:
 - (i) Canadian Roofing Contractors Association (CRCA) CRCA Roofing Specifications Manual, (current edition).
 - (ii) Canadian General Standards Board (CGSB):
 - (iii) CAN/CGSB 37.5-M89, Cutback Asphalt Plastic Cement.
 - (iv) Canadian Roofing Contractors' Association (CRCA), Roofing Specification Manual.
 - (v) Canadian Standards Association (CSA International).
 - (vi) CAN/CSA-A123.1/A123.5-98, Asphalt Shingles Made from Fibreglass Felt and Surfaced with Mineral Granules/Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - (vii) CAN/CSA-A123.3-98, Asphalt Saturated Organic Roofing Felt.
 - (viii) CAN3-A123.51-M85 (R2001), Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.
 - (ix) CSA B111-1974(R1998), Wire Nails, Spikes and Staples
 - (x) CAN3-A123.51 - Asphalt Shingle Application on Roof Slopes 1:6 and Steeper.
 - (xi) CAN/CGSB-51.32-M77 - Sheathing, Membrane, Breather Type.
 - (xii) CAN/CGSB 51.34-M86 – Vapour Barrier, Polyethylene Sheet for Use in Building Construction
 - (xiii) CAN/ULC-S107 - Methods of Fire Tests of Roof Coverings.
 - (xiv) American Society for Testing and Materials (ASTM):
 - (xv) ASTM B209M - Aluminum and Aluminum-Alloy Sheet and Plate.
 - (xvi) ASTM B370 - Copper Sheet and Strip for Building Construction.
 - (xvii) ASTM D3018/D3018M - Class A Asphalt Shingles Surfaced with Mineral Granules.
 - (xviii) ASTM D3161/ D3161M - Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method).
 - (xix) ASTM D3462/D3462M - Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - (xx) Health Canada/Workplace Hazardous Materials Information System (WHMIS) - Material Safety Data Sheets (MSDS)

B1.4 DEFINITIONS

- (a) Roofing terminology: Refer to ASTM D 1079 Standard Terminology Relating to Roofing and Waterproofing and CRCA Roofing Reference Manual for definition of terms related to roofing work in this Section.
- (b) "Roofing System" means: all materials contained within the roof assemblies installed by the Contractor, including all materials above the deck including membrane flashing up to and including 1067mm (42") above the surface of the primary membrane, and related sheet metal work.

B1.5 COMPATIBILITY

- (a) Same manufacturer shall provide all waterproofing materials.

B1.6 TECHNICAL DOCUMENTS TECHNICAL DOCUMENTS

- (a) Submit two (2) copies of the most current technical data sheets within five (5) days of contract award. These documents must describe the materials' physical properties, and explanations about product installation, including, restrictions, limitations and other manufacturer recommendations such as long-term maintenance.

B2. PERIODIC MONITORING

- (a) The City of Winnipeg will engage third party roofing monitoring (QCA). The Monitoring will provide periodic site visits and reports to The City of Winnipeg during the progress of the roofing work, in accordance with the CRCA Roofing Applications Standards, to help ensure the roofing work is provided as set out in this Contract. Upon notice from The City of Winnipeg, the Contractor shall expediently perform all steps and make changes as identified by the roofing monitor, at no cost to The City of Winnipeg. The involvement of the roofing monitor does not relieve the Contractor of the responsibility to supervise, inspect and provide the roofing work as set out in this Contract.
- (b) Allow The City of Winnipeg and its agent access to work area and materials for inspection and monitoring purposes.
- (c) If Contractor covers or permits to be covered work that has been designated for special tests, inspections or approvals before such is made, uncover such work, have inspections or test satisfactory completed and make good such work. Cost of any re-work to be borne by the Contractor.
- (d) The City of Winnipeg will order part of work to be examined if work is suspected to be not in accordance with contract documents. If, upon examination such work is found not to be in accordance with contract documents, correct such work and pay cost of examination and correction will be borne by the contractor.
- (e) If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised at no cost to The City of Winnipeg and shall be corrected within a time-frame determined by The City of Winnipeg. Contractor shall pay costs for retesting and re-inspection. Every effort will be made to expedite the testing process to minimize unnecessary delays, while not compromising the integrity of the procedures; however, the Roof Monitor will not be pressured into overlooking deficient Work or loosening acceptance criteria to satisfy scheduling or cost issues.
- (f) Engagement of inspection/testing agencies does not relax the Contractor from the responsibility to perform Work in accordance with Contract Documents. Independent Inspection/Testing Agencies will be engaged for purpose of testing portions and inspecting of Work. Cost of such services will be paid by The City of Winnipeg, except for the following: Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- (g) If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - (i) The deficiency shall be documented in the report.
 - (ii) Resolutions are made at the lowest management level possible. Other parties are brought into the discussion as needed. Interpretive authority is with QCA.
 - (iii) QCA documents the resolution process.
 - (iv) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, and provides confirmation of completion of correction to QCA. QCA reschedules the test (and any additional population to be tested) with the

affected Contractors, and the test(s) repeated until satisfactory performance is achieved.

- (v) Any required re-testing that is resulted of a deficient installation shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

- (h) Provide copies of the manufacturer's site reports to the Owner, Consultant, and roofing monitor, prior to Interim Acceptance of the Work.

B2.2 PROCEDURES

- (a) Notify appropriate agency in advance of requirement for tests, in order that attendance arrangements can be made.
- (b) Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

B2.3 REJECTED WORK

- (a) Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- (b) Make good other Contractor's work damaged by such removals or replacements promptly.
- (c) If in opinion of the Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, The City of Winnipeg will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the Contract Administrator.

B2.4 REPORTS

- (a) Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

B2.5 TESTS

- (a) Contractor shall perform periodic tests as per applicable standards utilizing third party testing company if required. Results of tests shall be provided to the Contract Administrator.
- (b) Cost of tests shall be the responsibility of the Contractor. Additional test(s) and or site visits may be required due to faulty material and or workmanship. Cost of such tests/visits shall be borne by the Contractor.

B2.6 FIELD QUALITY CONTROL

- (a) Coordinate site work and inspections with the Contract Administrator Provide minimum 72 hours' notice.
- (b) Inspection and testing of roofing membranes will be carried out by QCA Building Envelope Consultant including but not limited to membrane-substrate tensile adhesion testing conducted in general accordance with ASTM D 4541, using a Com-Ten Fastener Tester and membrane air-tightness in general accordance with ASTM E 1186.
- (c) Following project completion, The City of Winnipeg and QCA shall conduct a detailed examination in conjunction with the Roofing Contractor.
- (d) Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve contractual responsibility.

B3. QUALITY ASSURANCE/CONTROL**B3.1 MEMBRANE ADHESION TESTING**

- (a) The Consultant has the option to conduct pull tests to measure bond strength of roof underlayment barrier membrane. Results will be compared to manufacturer's recommendations to determine if corrective action is required. Including but not limited to membrane bond and field uplift resistance of assembly.
- (b) In the absence of manufacturer data, the standard of acceptance will be the average minus one standard deviation for the minimum bond strength.
- (c) Chain drag soundings may be completed on underlayment membrane. A full and intimate bond is required. The Contractor shall rectify any de-bonded areas in accordance with manufacturer's specifications.

B4. STORAGE AND DELIVERY

- (a) All materials shall be delivered and stored in their original packaging, in conformance with the requirements described in the Manufacturer's Manual. The manufacturer's name, brand, mass, specification number and lot number shall be shown on the labels
- (b) At all times, materials will be adequately protected and stored in a dry and properly ventilated area, away from any welding flame or spark and sheltered from the elements or any harmful substance.
- (c) Store adhesives and emulsion-based waterproofing mastics at a minimum 5 C (41 F). Store adhesives and solvent-based mastics at sufficient temperatures to ensure ease of application.
- (d) Materials delivered in rolls will be carefully stored upright; flashing will be stored to avoid creasing, buckling, scratches or any other possible damage.
- (e) Avoid material overloads, which may affect the structural integrity of specific roof areas.
- (f) Fuel must be stored in approved containers and placed in spill containments. Propane tanks must be properly stored and protected from any harms.

B5. PROJECT ENVIRONMENTAL CONDITIONS

- (a) Anticipate and observe environmental conditions (temperature, humidity and moisture) within limits recommended by manufacturer for optimum results. Do not install products under environment conditions outside manufacturer's limits.
- (b) Take special care when applying Waterproofing Shingle Underlayment (WSU) and shingles when ambient or wind chill temperature is below 7 degrees C. Tack WSU in place if it does not adhere immediately to the deck.

B6. WARRANTY

- (a) Manufacturer's Warranty: Furnish shingle manufacturer's warranty for the product listed below:
- (b) Lifetime limited warranty. Manufacturer shall deliver to Owner a warranty against defective materials for a period of 40 years.
- (c) Warranty Supplement: Provide manufacturer's supplemental warranty to cover labor and materials in the event of a material defect for the following period after completion of application of shingles:
 - (i) First Ten Years.
- (d) Where a manufacturer's warranty is requested by the City of Winnipeg the roofing contractor will supply all materials as required by the manufacturer and install such

materials to the acceptance of the manufacturer in order to qualify for the specified warranty.

- (e) Provide standard roofing Labour Warranty.
 - (i) Correct at Contractor's expense any defects in the Work due to workmanship occurring within a period of Five (5) years from the date of completion of the total Work.
- (f) Upon meeting the following: project completion manufacturer acceptance receipt of complete payment by both Contractor and material supplier
- (g) Receipt of Contractor's workmanship warranty.
- (h) The manufacturer/contractor shall certify compliance with the above guarantee requirements by submitting a copy of the guarantee as a submittal item indicating who will respond to warranty requests and how monitoring will be reported. The manufacturer will advise in writing how to maintain the warranty.
- (i) Manufacturer shall deliver to The City of Winnipeg a warranty against defective materials for a period of 40 years.

B7. MOCK-UP

- (a) Upon request of Contract Administrator, provide 3000mm x 3000mm (10ft x 10ft) mock-up, including ice dam protection, eave protection, underlayment, shingle installation, and associated flashings.
- (b) Mock-up will be used to judge workmanship, substrate preparation, and operation of equipment and material application.
- (c) When accepted, mockup will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of the finished Work

B8. MATERIALS

B8.1 DIMENSIONAL LUMBER

- (a) (a) This shall be pine or spruce to CAN/CSA-O141, construction grade, maximum 15% moisture content at time of installation of the dimensions as outlined under the Description of Work.

B8.2 PLYWOOD SHEATHING

- (a) (a) This shall be 1/2" construction D Grade spruce plywood.

B8.3 UNDERLAYMENT

- (a) ASTM D 226 and ASTM D 4869 synthetic polymer-based scrim reinforced underlayment designed for use on roof decks as a water-resistant layer beneath asphalt shingles, wood shingles, and shakes, metal shingles or slate.

B8.4 WATERPROOFING UNDERLAYMENT

- (a) ASTM D 1970 sheet barrier of self-adhering rubberized asphalt membrane shingle underlayment having internal reinforcement, and "split" back plastic release film; Use in "low slope" areas (below 4:12, but no less than 2:12 pitch); provide material warranty with equal in duration to that of shingles being applied.

B8.5 ICE & WATER SHIELD

- (a) Eaves Protection: ASTM D1970 sheet barrier of self-adhering rubberized asphalt membrane shingle underlayment having internal reinforcement and "split" back plastic release film; provide material warranty equal in duration to that of shingles being applied.

B8.6 ASPHALT FIBREGLASS SHINGLES

- (a) Conforming to ASTM D 3018 Type I – Self-Sealing, UL Certification of ASTM D 3462, ASTM D 3161/UL997 110-mph Wind Resistance and UL Class A Fire Resistance, glass fiber mat base, ceramically colored/UV resistant mineral surface granules across entire face of shingle; algae-resistance; two piece laminate shingle., colour match existing shingle portfolio on lower elevation(s).
- (b) Weight: 229 / 240 pounds per square (dependent on manufacturing location) (100 square feet).
- (c) Fasteners shall be 12 ga galvanized (zinc coated), with 10mm to 12mm diameter heads long enough to penetrate through plywood deck.

B8.7 ROOFING CEMENT

- (a) Asphalt Modified Roofing Cement meeting the requirements of ASTM D 4586, Type I or II or CAN/CGSB-37.5.
- (b) Lap Cement meeting the requirements of D 3019, Non-Asbestos-Fibered, Type III or CAN/CGSB-37.4.
- (c) ASTM D2822, Standard Specification for Asphalt Roof Cement. During cold weather and severe wind, hand sealing is required using flashing cement meeting ASTM D-4586. CAN/CSA-A 123.5 -M90 requires shingles applied in Canada between September 1 and April 30 is adhered with a field applied adhesive as outlined by manufacturer.

B8.8 GUTTERS

- (a) Re-use existing.
- (b) Conduct maintenance of all gutter sealants. Sealant shall be Inland Coatings RC-2200 Rubber Seam Compound or approved equal in accordance with B7.

B8.9 RUBBERIZED MASTIC

- (a) This shall be Polyroof as manufactured by Tremco Ltd. if required or approved equal in accordance with B7.
- (b) UV resistant, rubber blocks with metal C-Port Series by Clearline Technologies, B-line Supports Dura-block Rooftop Supports by Eaton, or equal.

B8.10 SPLASH PADS

- (a) Description: Precast concrete splash block
- (b) Specified product: Barkman Concrete 105604 30 "Natural or approved equal in accordance with B7.

B8.11 CAULKING

- (a) This shall be Tremco Vulkem 931 or approved equal in accordance with B7.

B8.12 ALUMINUM PAINT

- (a) Waterproofing coating applied with a brush or a roller composed of elastomeric bitumen, mineral fillers and solvents.
- (b) Specified products: Sopralastic 124 Alu by SOPREMA or approved equal in accordance with B7.

B8.13 VENT STACKS

- (a) These shall be Insulated Stack Jack Flashings (with metal cap, not neoprene seal) SJ-26A as manufactured by Thaler or approved equal in accordance with B7.

- B8.14 WATER-RESISTIVE BARRIER (WRB)**
- (a) Specified product: DuPont Tyvek Commercial Wrap or approved equal in accordance with B7.
 - (b) DuPont Self-Adhered Flashing products as per DuPont Installation Guidelines
- B8.15 METAL FLASHING**
- (a) The bays and cap flashing shall be a minimum of 24 gauge in thickness. Finishes shall closely match the painted colour of the existing flashing. This shall be chosen from the range of Stelco 8000 series of colours.
- B8.16 METAL FLASHING FABRICATION**
- (a) Form flashing to profiles indicated and to protect roofing materials from physical damage and shed water.
 - (b) Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance.
- B8.17 ACCESSORIES**
- (a) All nails, bolts, screws and other fasteners, etc. shall all be as recommended by the manufacturer of the materials for which they are to be used.
 - (b) Provide all accessories required in accordance with manufacturer's recommendations.
 - (c) Ensure compatibility between all components.

B9. EXECUTION

- B9.1** Before roofing work begins, the Consultant and Roofing Foreman will examine and approve deck conditions. If necessary, a non-conformity notice will be issued to the contractor so that required corrections can be made. The start of roofing work will mean roofing conditions are acceptable for work completion.
- B9.2** Examine substrate for compliance of conditions that affect installation and performance of roof system.
- B9.3** The Contractor shall be responsible for the removal and reinstallation of any obstructions such as, but not limited to, drains, ducts, conduits, vents, air conditioning units and components at his own expense.
- B9.4** Work must be performed during weather conditions that will not adversely affect the performance of the new Work. Surfaces must be clean and dry prior to installation.
- B9.5** Cover walls and adjacent Work where materials are hoisted or used.
- B9.6** Clean off drips and smears of roofing material.
- B9.7** Dispose of rainwater off roof and away from face of building until roof drains or hoppers are installed and connected.
- B9.8** Prevent traffic over completed roofing except where required by Work above roof level. Comply with precautions deemed necessary by Bid Opportunity. Repair damage caused by non-compliance with Bid Opportunity requirements.
- B9.9** At the end of each day's Work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- B9.10** Examine roof decks and immediately inform Contract Administrator in writing of defects.

- B9.11 Prior to commencement of Work ensure:
- (a) Decks are firm, straight, smooth, dry, and swept clean of dust and debris.
 - (b) Curbs have been built.
 - (c) Roof drainage elements have been installed at proper elevations relative to finished roof surface.
 - (d) Plywood and lumber nailer plates have been installed to walls and parapets as indicated.
- B9.12 Removal of Existing Roofing
- (a) Remove existing roofing system, curbs and cant strips as required to properly install new roofing system. Avoid damage to decks, drains, and other components on roofs.
 - (b) Provide temporary hoarding, other protection as may be required.
 - (c) Fully protect interior of building from water penetration and or construction debris from any cause.
- B9.13 Prepare remaining surfaces to accept new roofing system. To selected roofing manufacturer's specifications, recommendations and proven standards.

B10. APPLICATION

- B10.1 Ensure a roofing foreman is on Site and supervising the roofing work at all times when roofing work is undertaken. Ensure that at least one other Qualified Roofing Trades-person shall be on Site when roofing work is undertaken
- B10.2 Ensure that all Qualified Roofing Trades-persons necessary to receive the manufacturer warranties, as set out within, are appropriately trained by the manufacturer and are on Site, at all relevant times.
- B10.3 Follow manufacturer's application instructions and in accordance with local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
- B10.4 Install asphalt shingles on roof slopes in accordance with CAN3 A 123.51-M85 and as per manufacture instructions. Follow whichever method is the more stringent.
- B10.5 Install ice dam protection underlayment directly on plywood at all eaves and roof edges as well as at all penetrations, abutments, and to vertical walls as instructed. Also apply 1-ply of underlayment over the entire deck surface, except where Ice & Water protector membrane has been installed.
- B10.6 Contractor shall support the use of application details as specified by SMACNA and CRCA.

B11. PREPARATION

- B11.1 If required, rooftop equipment, electrical and gas service lines, telephone lines, etc. must be disconnected, relocated and reconnected as required in accordance with all applicable codes and regulations to accommodate the Work without disrupting operations within the facility. Prior arrangement must be made with the Contract Administrator in the event a disruption of building operations is required.
- B11.2 Remove and dispose of all metal flashings as required.

- B11.3 Remove existing roofing system to the roof deck in the area shown on the attached drawing.
- B11.4 Remove and dispose of any equipment as designated by the owner and seal any resulting openings with pre-painted 20 gauge, 1 ½" steel decking or like-kind wood decking to match.
- B11.5 Inspect and repair any deck deficiencies that would affect the installation and performance of the new roof system.
- B11.6 Fill and pack all open joints, cracks, seams, and openings in the deck.
- B11.7 Construct edge, expansion joint, projection, and all equipment curb blocking and nailers to accommodate insulation thickness. Extend all curbs to a minimum height of 203 mm (8") above the finished roof surface.
- B11.8 All blocking to be construction grade spruce wood.

B12. INSTALLATION - GENERAL

- (a) Install shingle roofing system according to all current application requirements in addition to those listed in this section.
- (b) Start the application at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

B13. ROOF DECKING

- B13.1 The Contractor shall assess the condition of the deck while doing the roof repairs. Based on the assessment, the Contractor will estimate the requirement and square footage of the deck replacement if any is required.
- B13.2 The Contractor will inform the Contract Administrator and submit the requirement with the plan and drawings designed by a registered Structural Engineer.
- B13.3 The Contract Administrator will inspect and approve, reject, reduce or increase the area of the steel deck to be replaced.
- B13.4 This work will not start until the Contract Administrator approves it.
- B13.5 Design Requirements
 - (a) The roof decking replacement plan must be designed and the drawings stamped by a Structural Engineer registered with the APEGM.
 - (b) Deflection under specified live load not to exceed 1/300 of span for roof, 1/360 of span for floor and 1/180 of span for wall.
 - (c) Design replacement sections to same as existing deck sections.
- B13.6 Fastening
 - (a) Ensure nail head standoffs measurements meet fastener manufacturer's recommendations.
- B13.7 Products
 - (a) Materials
 - Materials to match existing deck
 - (b) Deck Types
 - Deck to match existing deck.

B14. UNDERLAYMENT INSTALLATION

- (a) Underlayment are to meet the requirements of one of the following:
 - (i) ASTM D 226 / D 226M - 09
 - (ii) ASTM D 4869 / D 4869M - 05(2011)
 - (iii) CSA A123.2
 - (iv) CSA A 123.3-05 (R2010)
 - (v) CAN/CSA A 123.5-05 (R2010)
 - (vi) CAN2 51.32
- (b) Install using methods recommended by Shingle Manufacturer and in accordance with local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
- (c) Install an ice dam protection underlayment of self-adhesive membrane directly on to the plywood at all eaves and roof edges as well as at all penetrations, abutments, and to vertical walls. Add one ply of underlayment over the entire deck surface, except where Ice & Water protector membrane has been installed.

B14.2 EAVES:

- (a) Install eave protection using methods recommended by Manufacturer and in accordance with local building codes. When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
- (b) Install eaves edge metal flashing tight with fascia boards; lap joints 50 mm (2 inches) and seal with plastic cement; nail at the top of the flange.
- (c) Base flashing should be in place before shingles are applied. Cap flashings of sheet metal and base flashing of metal or mineral surfaced roofing should be used at chimneys, skylights, vents, walls and other vertical surfaces and sealed with asphalt plastic cement. Flashing shall conform to the requirements of applicable building codes and good roofing practice.
- (d) Overhang eaves with underlayment by a nominal 6 mm (1/4 inch) minimum and extending up the roof at least 600 mm (24 inches) beyond the interior wall line.
- (e) In colder climates where required by codes, and on all roofs with slopes between 2:12 and 4:12 (low slopes), install eaves protection using an Manufacturers membrane product, up the slope from eaves edge a full 900 mm (36 inches) or to at least 600 mm (24 inches) beyond the interior "warm wall". Lap ends 150 mm (6 inches) and bond.
- (f) For areas where the roof slope is 150 mm per 300 mm down to 100 mm per 300 mm (6 inches per foot down to 4 inches per foot), it is strongly recommended to cover the remainder of the deck with one ply asphalt saturated felt (or equivalent) laid parallel to the eaves, with 50 mm (2 inches) horizontal laps and 100 mm (4 inches) end laps. Apply metal drip edges on top of any underlay along rake edges and directly to the deck along eaves.

B14.3 ROOF DECK:

- (a) Install one layer of roof deck underlayment over the entire area not protected by Ice & Water protector membrane. Install sheets horizontally so water sheds.
- (b) On roofs sloped at more 4:12, lap horizontal edges at least 50 mm (2 inches) and at least 50 mm (2 inches) over eaves protection membrane.
- (c) On roofs sloped between 2:12 and 4:12, lap horizontal edges at least 480 mm (19 inches) and at least 480 mm (19 inches) over eaves protection membrane.
- (d) Lap ends at least 100 mm (4 inches). Stagger end laps of each layer at least 900 mm (36 inches).

- (e) Lap underlayment over valley protection at least 150 mm (6 inches).

B14.4 PENETRATIONS:

- (a) Vent pipes: Install a 600 mm (24 inches) square piece of Ice & Water protector membrane lapping over roof deck underlayment; seal tightly to pipe.
- (b) Vertical walls: Install Ice & Water protector membrane for eaves protection extending at least 150 mm (6 inches) up the wall and 300 mm (12 inches) on to the roof surface. Lap the Ice & Water protector membrane over the roof deck underlayment. Sheet metal flashing along the slopes of roof shall be stepped with a minimum of 75 mm (3 inches) head lap in both lower flashing and counter flashing. Where roof slopes downward from wall, flashing shall extend over shingles. Where a roof slopes upward from the wall, flashing shall extend up the slope under the shingles to a point equal in height of 400 mm (15 ¾ inches) to the flashing on masonry. Counter flashing shall be embedded approximately 25 mm (1 inch) into the wall with turn back water stop
- (c) Skylights and roof hatches: Install Ice & Water protector membrane from under the built-in counterflashing and 300 mm (12 inches) on to the roof surface, lapping over roof deck underlayment.
- (d) Chimneys: Intersection of shingle roofs and masonry walls or chimneys shall be protected using 24 gauge (or better) galvanized sheet metal to extend not less than 150 mm (6 inches) up the wall and 300 mm (12 inches) on to the roof surface. Lap the Ice & Water protector membrane over the roof deck underlayment.
- (e) Rake Edges: Install metal edge flashing over the Ice & Water protector membrane and roof deck underlayment; set tight to rake boards; lap joints at least 50 mm (2 inches) and seal with plastic cement; secure with nails.
- (f) Instructions on additional details for sealing Penetrations can be found in the ARMA's Residential Asphalt Roofing Manual and/or CRCA's Roofing and Waterproofing Manual.

B15. INSTALLATION OF SHINGLES

- (a) General:
 - (i) Install in accordance with Manufacturer's instructions and local building codes
 - (ii) When local codes and application instructions are in conflict, the more stringent requirements shall take precedence.
 - (iii) Minimize breakage of shingles in cold weather (below 4°C) by avoiding dropping bundles on edge or by "breaking bundles" over the roof ridge or other bundles. Separating shingles carefully, taking extra precautions in colder temperatures.
 - (iv) Handle shingles carefully in hot weather to avoid scuffing the surfacing or damaging the shingle edges.
 - (v) Install the asphalt shingles on roof slopes in accordance with CAN3 A 123.51-M85
 - (vi) Installation of Shingles Cover walls and adjacent work where materials hoisted or used.
- (b) Placement & Nailing:
 - (i) Use galvanized (zinc coated) roofing nails, 11 or 12 gauge, with at least 10 mm (3/8 inches) diameter heads, long enough to penetrate through plywood or 20 mm (¾ inches) into boards.
 - (ii) Use 4, 5, or 6 nails per shingle placed in the nail line per Manufacturer's instructions and local codes. Placement of nails varies based on the type of shingle specified, roof slope, and other environmental considerations. Consult the manufacturer's application instructions for the specified shingle for details.
 - (iii) Drive nails straight so that nail head is flush with, but not cutting into shingle surface. Do not overdrive or under drive the nails.

- (iv) Shingle offset varies based on the type of shingle specified. Consult the application instructions for the specified shingle for details.
- (c) Protection:
 - (i) Use warning signs and barriers. Maintain in good order until completion of work.
 - (ii) Restore any areas damaged during construction to original condition.
 - (iii) At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed work and materials. Protect areas of incomplete work.
 - (iv) Protect any areas inside the building when stoppage occurs on roof due to inclement weather.
 - (v) Do not leave any areas of roof exposed to inclement weather.

B16. CLEAN-UP

- (a) All work areas are to be kept clean, clear and free of debris at all times.
- (b) Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- (c) All tools and unused materials shall be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
- (d) Dispose of or recycle all trash and excess material in a manner conforming to current provincial regulations and local laws.
- (e) Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
- (f) Clean and restore all damaged surfaces to their original condition.

B17. METAL FLASHINGS

- B17.1 Cap flashings are to be 24 ga. galvanized sheet metal. The flashings are to conform to C.S.A.
- B17.2 The inside and outside faces are to extend down a minimum of 76 mm (3"). Fasten the cap flashing using weatherproof screws spaced not more than 610 mm (24") on centre.
- B17.3 Hem all free edges and seal all butts, joints and reglets with sealant.

B18. FIELD QUALITY CONTROL

- (a) Field inspection will be performed under provisions of Section 01 45 16.
- (b) Quality Control of the work will be provided by QCA Building Envelope Limited (QCA). If conditions are unacceptable, QCA will notify the Contractor, Project Administrator and City.
- (c) Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- (d) If defects and or non-conforming items are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of concern. Correct defect and irregularities as advised by Consultant at no cost to Owner. Contractor to pay costs for retesting and re-inspection.

END OF SECTION

2. ROOFING SCOPE OF WORK - Section 07 54 23

B19. GENERAL

B19.1 REQUIREMENTS

- (a) Furnish all labor, materials, tools and equipment necessary for the removal and disposal of existing low-slope roof (BUR) & steep-slope systems (**Roof-A1, B1**), including removal of non-operational roof curbing, flashings, etc, and the design and installation of a complete low-slope roof system capped with a fully adhered TPO single-ply system. (Firestone Ultraply TPO fully-adhered. 60-mil (1.52mm)) Including the accessory items such as new drains, (ensure slope to positive drainage) connections, scuppers, drain inserts, copings, flashings, re-paint gas-lines, rubber blocks c/w roof membrane protection traffic cap, pitch boxes penetration seals c/w liquid sealant, at a minimum.
- (b) Base bid system to be:
 - (i) Low-Slope: Firestone Ultraply TPO 60-mil (1.52mm). (Adhesive Fastened System) All installed roofing systems must meet Code and Regulatory Requirements along with recommendations of the most current edition as per the followings.
 - (ii) The roof assembly shall be in accordance with CSA A123.21-14 as it pertains to the wind uplift resistance. ULC Standards, ULC approved membranes Class C min. ASTM D 6162-4, system membrane.
 - (iii) All recommendations of the Canadian Roofing Contractors Association (CRCA) "Shall have a design slope minimum of 1.5-2% & 4% back-slope for drainage between drains and denoted perimeter areas as to create effective positive drainage.
 - (iv) Slope flashings to the roof and design roof drains to promote the rapid removal of water from all roof surfaces. Slopes for roofing assembly replacement at existing flat roofs are dependent on practicable heights at perimeters and location of existing roof drains. Including back-sloping parapet coping.
 - (v) Sheet Metal and Air Conditioning Contractor's National Association, (SMACNA)
 - (vi) CMHC Best Practice Flashing Guide
 - (vii) All requirements of the Roofing System Manufacturer's Warranty, (RSMW)
 - (viii) All applicable Province of Manitoba Building Codes
 - (ix) The manufacturer's application instructions for each product used are considered part of this specification and should be followed at all times.
 - (x) Raising, re-setting, and protection of mechanical, air conditioning equipment, ventilators, and exhaust fans may be required. Removal and re-installing of perimeter lighting and electrical if required. Provision for temporary access and protection onto the roof, such as scaffolding, portable railings, plywood and rigid insulation roof protection, etc.
 - (xi) Steep-Slope: Fibreglass-Based laminate asphalt shingles c/w full water & ice shield. UL Class A fire-resistance rating. Conforms to CSA standard A123.5.

B19.2 SUBMITTALS

- (a) Submit product data sheets for primers, insulation, SBS membranes, adhesives, and MSDS for all products, other safety and handling instructions and installation instructions.
- (b) Submit a letter issued by Roofing Manufacturer stating approved licensed applicator status and approval to issue warranty for specified system on this project.

- (c) Submit roof system(s) adhesive patterns in accordance with CSA123.21-14 including minimum resistance for the field area, edge areas and corner areas. (*Including wind uplift calculation Wind-RCI.*)
- (d) Submit shop drawings showing the slope (saddle, cricket & back-slope) package of all roofs and flow path of rainwater. Confirm structural slope adequacy.
- (e) Submit shop drawings of change of elevation up-stand details & perimeter parapet design with flashings & claddings as required.

B19.3 REFERENCE STANDARD(S)

- (a) Submit a report[s] within three (3) days of a request of the Contract Administrator, issued by a certified materials testing laboratory, attesting that the roofing system offered, was tested in accordance with CSA A 123.21-10, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane Roofing Systems. Test results shall demonstrate the roofing system provides a Dynamic Uplift Resistance (DUR) of;
 - (i) Roof-B1: -1.2kPa [-25psf] for the field of the roof, -1.6 kPa [-33 psf] for the edge of the roof, and -3.1kPa [-64psf] for the corners of the roof. End zone width 4.2 ft (1.3m).
- (b) ASTM D 4434 - Standard Specification for Poly (Vinyl Chloride) Sheet Roofing.
- (c) ASTM D-751 - Standard Test Methods for Coated Fabrics.
- (d) ASTM D-2137 - Standard Test Methods for Rubber Property-Brittleness Point of Flexible Polymers and Coated Fabrics.
- (e) ASTM E-96 - Standard Test Methods for Water Vapor Transmission of Materials.
- (f) ASTM D1204 - Standard Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature.
- (g) ASTM D-471 - Standard Test Method for Rubber Property-Effect of Liquids.
- (h) ASTM D-1149 - Standard Test Methods for Rubber Deterioration-Cracking in an Ozone Controlled Environment.
- (i) ASTM C-1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.
- (j) ASTM C-1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emittance Meters.
- (k) ASTM E 903 - Standard Test Method for Solar Absorptance, Reflectance, and Transmission of Materials Using Integrating Spheres.
- (l) ASTM D573 - Standard Test Method for Rubber - Deterioration in an Air.
- (m) Factory Mutual (FM Global) - Approval Guide.
- (n) Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal.
- (o) Mineral Wool Roof Insulation boards must meet or exceed requirements of ASTM C 726, Standard Specification for Mineral Wool Roof Insulation Board.
- (p) Extruded Polystyrene Insulation Boards must meet or exceed requirements of CAN/ULC-S701-11, Polystyrene Insulation Board and Pipe Covering.
- (q) Roofing system must meet or exceeds requirements of CAN/ULC-S107-10, Methods of Fire Tests of Roof Coverings, class [C].

- (r) ASTM C1177 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- (s) ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings
- (t) ASTM F1667-13 Driven Fasteners; Nails, Spikes & Staples
- (u) Canadian Roofing Contractors Association (CRCA) CRCA Roofing Specifications Manual, (current edition)

B19.4 DEFINITIONS

- (a) Roofing terminology: Refer to ASTM D 1079 Standard Terminology Relating to Roofing and Waterproofing and CRCA Roofing Reference Manual for definition of terms related to roofing work in this Section.
- (b) "Roofing System" means: all materials contained within the roof assemblies installed by the Contractor, including all materials above the deck including membrane flashing up to and including 1067mm (42") above the surface of the primary membrane, and related sheet metal work.

B19.5 COMPATIBILITY

- (a) Same manufacturer shall provide all waterproofing materials.

B19.6 TECHNICAL DOCUMENTS

- (a) Submit two (2) copies of the most current technical data sheets within five (5) days of contract award. These documents must describe the materials' physical properties, and explanations about product installation, including, restrictions, limitations and other manufacturer recommendations such as long-term maintenance.

B20. PERIODIC MONITORING

- (a) The City of Winnipeg will engage third party roofing monitoring (QCA). The Monitoring will provide periodic site visits and reports to The City of Winnipeg during the progress of the roofing work, in accordance with the CRCA Roofing Applications Standards, to help ensure the roofing work is provided as set out in this Contract. Upon notice from The City of Winnipeg, the Contractor shall expediently perform all steps and make changes as identified by the roofing monitor, at no cost to The City of Winnipeg. The involvement of the roofing monitor does not relieve the Contractor of the responsibility to supervise, inspect and provide the roofing work as set out in this Contract.
- (b) Allow The City of Winnipeg of Winnipeg and its agent access to work area and materials for inspection and monitoring purposes.
- (c) If Contractor covers or permits to be covered work that has been designated for special tests, inspections or approvals before such is made, uncover such work, have inspections or test satisfactory completed and make good such work. Cost of any re-work to be borne by the Contractor.
- (d) The City of Winnipeg will order part of work to be examined if work is suspected to be not in accordance with contract documents. If, upon examination such work is found not to be in accordance with contract documents, correct such work and pay cost of examination and correction.
- (e) If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised at no cost to The City of Winnipeg and shall be corrected within a time-frame determined by The City of Winnipeg. Contractor shall pay costs for retesting and re-inspection. Every effort will be made to expedite the testing process to minimize unnecessary delays, while not compromising the integrity of the procedures; however, the

Roof Monitor will not be pressured into overlooking deficient Work or loosening acceptance criteria to satisfy scheduling or cost issues.

- (f) Engagement of inspection/testing agencies does not relax the Contractor from the responsibility to perform Work in accordance with Contract Documents. Independent Inspection/Testing Agencies will be engaged for purpose of testing portions and inspecting of Work. Cost of such services will be paid by The City of Winnipeg, except for the following: Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
- (g) If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:
 - (i) The deficiency shall be documented in the report.
 - (ii) Resolutions are made at the lowest management level possible. Other parties are brought into the discussion as needed. Interpretive authority is with QCA.
 - (iii) QCA documents the resolution process.
 - (iv) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, and provides confirmation of completion of correction to QCA. QCA reschedules the test (and any additional population to be tested) with the affected Contractors, and the test(s) repeated until satisfactory performance is achieved.
 - (v) Any required re-testing that is resulted of a deficient installation shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- (h) Provide copies of the manufacturer's site reports to the Owner, Consultant, and roofing monitor, prior to Interim Acceptance of the Work.

B20.2 PROCEDURES

- (a) Notify appropriate agency in advance of requirement for tests, in order that attendance arrangements can be made.
- (b) Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

B20.3 REJECTED WORK

- (a) Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- (b) Make good other Contractor's work damaged by such removals or replacements promptly.
- (c) If in opinion of the Contract Administrator it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by the Contract Administrator.

B20.4 REPORTS

- (a) Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

B20.5 TESTS

- (a) Contractor shall perform periodic tests as per applicable standards utilizing third party testing company if required. Results of tests shall be provided to the Contract Administrator.
- (b) Cost of tests shall be the responsibility of the Contractor. Additional test(s) and or site visits may be required due to faulty material and or workmanship. Cost of such tests/visits shall be borne by the Contractor.

B20.6 FIELD QUALITY CONTROL

- (a) Coordinate site work and inspections with the Contract Administrator Provide minimum 72 hours notice.
- (b) Inspection and testing of roofing membranes will be carried out by QCA Building Envelope Consultant including but not limited to membrane-substrate tensile adhesion testing conducted in general accordance with ASTM D 4541, using a Com-Ten Fastener Tester and membrane air-tightness in general accordance with ASTM E 1186.
- (c) Following project completion, The City of Winnipeg and QCA shall conduct a detailed examination in conjunction with the Roofing Contractor.
- (d) Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve contractual responsibility.

B21. QUALITY ASSURANCE/CONTROL

B21.1 MEMBRANE ADHESION TESTING

- (a) The Consultant has the option to conduct pull tests to measure bond strength of roof air/vapour barrier membrane and roof insulation/membrane assembly. Results will be compared to manufacturer's recommendations to determine if corrective action is required and if roofing insulation and membrane(s) can continue. Including but not limited to membrane bond and field uplift resistance of assembly.
- (b) In the absence of manufacturer data, the standard of acceptance will be the average minus one standard deviation for the minimum bond strength.
- (c) Chain drag soundings may be completed on both the air/vapour barrier membrane installation and the cap sheet. A full and intimate bond is required. The Contractor shall rectify any de-bonded areas in accordance with manufacturer's specifications.

B21.2 Airtightness testing would be conducted on the air/vapour barrier; base sheet and cap sheet membrane(s). Testing may also include fasteners and penetrations. Testing would be done using an Air-Leak Detection Unit. Testing would be performed in general accordance with ASTM E 1186 "Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Retarder Systems" (method 4.2.7 *Chamber Depressurization in Conjunction With Leak Detection Liquid*). *Level of acceptance shall be zero-leaks*. The Contractor shall rectify any unsealed areas in accordance with manufacturer's specifications.

B22. STORAGE AND DELIVERY

- (a) All materials shall be delivered and stored in their original packaging, in conformance with the requirements described in the Manufacturer's Manual. The manufacturer's name, brand, mass, specification number and lot number shall be shown on the labels
- (b) At all times, materials will be adequately protected and stored in a dry and properly ventilated area, away from any welding flame or spark and sheltered from the elements or any harmful substance.
- (c) Store adhesives and emulsion-based waterproofing mastics at a minimum 5 °C (41 °F). Store adhesives and solvent-based mastics at sufficient temperatures to ensure ease of application.

- (d) Materials delivered in rolls will be carefully stored upright; flashing will be stored to avoid creasing, buckling, scratches or any other possible damage.
- (e) Avoid material overloads, which may affect the structural integrity of specific roof areas.
- (f) Fuel must be stored in approved containers and placed in spill containments. Propane tanks must be properly stored and protected from any harms.

B23. FIRE PROTECTION

- (a) Prior to the start of work, conduct a site inspection to make sure that all procedures and proposed changes are approved to minimize the risk of fires
- (b) All nails, bolts, screws and other fasteners, etc. shall all be as recommended by the manufacturer of the materials for which they are to be used.
- (c) Respect safety measures described by the local association recommendations.
- (d) At the end of each workday, use a heat detector gun and/or Infrared Thermographic camera to spot any smouldering or concealed fire. Provide firewatcher for a minimum of two hours after final torch application.
- (e) Never apply the torch directly to old and wood (combustible) surfaces.

B23.2 Throughout roofing installation, maintain a clean site and have one approved ABC fire extinguisher within 6 m (20 ft) of each roofing torch. Respect all safety measures described in technical data sheets. Torches must never be placed near combustible or flammable products. Torches should never be used where the flame is not visible or cannot be easily controlled.

B24. MATERIALS

B24.1 DIMENSIONAL LUMBER

- (a) (a) This shall be pine or spruce to CAN/CSA-O141, construction grade, maximum 15% moisture content at time of installation of the dimensions as outlined under the Description of Work.

B24.2 PLYWOOD SHEATHING

- (a) (a) This shall be 1/2" construction D Grade spruce plywood.

B24.3 ROOFING INSULATION

- (a) Tapered Insulation Panel
 - (i) Description: Tapered insulation panel made of polystyrene designed as required to create a minimum three-to-four percent (3%-4% {Double Field Slope}) back-slope to the roof system at drains and specified perimeters. Molded Expanded Polystyrene (MEPS) Board: certified for conformance with CAN/ULC S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering, Type 2, and as follows;
 - (ii) Thermal Conductivity (kSI): 0.036 W/m°C maximum.
Dimensional Stability: 0.3% max. Linear change. Certification: third party, in accordance with CGSB, ULC, or other certification programs accredited by the Standards Council of Canada.
 - (iii) Specified product: Plastifab,CO-Star or approved equal in accordance with B7.
- (b) Sump insulation panel for drain location (See above)
 - (i) Description: Sump insulation panel made of EPS Type II designed to facilitate proper drainage around drain.

- (ii) Product specified: Plastifab or Co-Star Tapered Type II EPS or approved equal in accordance with B7.

B24.4 INSULATION ADHESIVE

- (a) (a) Description: A highly elastomeric, two components, one step, all purpose, foamable adhesive that contains no solvents and sets in minutes. Adhesive shall be applied to obtain a minimum 90 mile-per-hour wind up with rating or as otherwise indicated within the description of work.
- (b) (b) Specified product: IKO Millennium Adhesive or Soprema Duotack (Cold-weather Duotack 365) or approved equal in accordance with B7.

B24.5 POURABLE SEALER

- (a) This shall be Lexcan 2 part Pourable Sealer or approved equal in accordance with B7. This shall be used to fill all pitch boxes.

B24.6 OVERLAY BOARD

- (a) Fiberglass Mat Faced Gypsum Roof Board:
- (b) Thickness: 1/4 inch.
- (c) Width: 4 feet.
- (d) Length: 8 feet.
- (e) Surfacing: Fiberglass mat with non-asphaltic coating.
- (f) In conformance with: ASTM E84 and ASTM C1177
- (g) (b) Specified Product: GP DensDeck Prime Roof Board or approved equal in accordance with B7.

B24.7 THERMOPLASTIC SINGLE-PLY ROOFING MEMBRANE

- (a) This shall be the following:
 - (i) Membrane: Single-ply Roofing Membrane (TPO)

B24.7.1 Membrane Materials

- (a) Description: Advanced heat and UV protected, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 0.060 inch (60 mil) thickness, for use as a single ply roofing membrane. UL Listed, FM Approved, CRRC rated. A full roll contains approximately 1000 sq.ft. of roofing material at 10 feet X 100 feet, weighing 322 lbs or 800 sq ft. of roofing material at 8 feet x 100 feet, weighing 256.6 lbs. A half sheet roll contains approximately 500 sq.ft. of roofing material at 5 feet X 100 feet, weighing 162 lbs or 400 sq.ft of roofing material, weighing 128.8 lbs.
- (b) Thickness: 60-mil
- (c) In conformance with: CGSB 37.56-M (9th Draft).
- (d) Specified product: UltraplyTPO (Colour: White.) fully adhered, Wood Deck by Firestone Building Products or approved equal in accordance with B7.

B24.7.2 Base Flashing Membrane for Flashings and Parapets

- (a) Provide a waterproof, fully adhered base flashing system at all penetrations, plane transitions and terminations. Advanced heat and UV protected, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane with a nominal 0.060 inch (60 mil) thickness, for use as a single ply roofing membrane.
- (b) Specified product: Base Flashing by Firestone Building Products or approved equal in accordance with B7.

B24.8 ACCESSORY MEMBRANES

- (a) Inside Corners: Pre-molded corner flashing for inside corners. 60 mil thickness. Color to match membrane.
- (b) Outside Corners: Pre-molded corner flashing for outside corners. 60 mil thickness. Color to match membrane.
- (c) TPO Curb Wrap Corners: Pre-fabricated corner flashings made from 45 mil thick reinforced membrane. 6 inch (152 mm) wide base flange and a 12 inch (305 mm) overall height. Sizes available to fit curbs up to 6 by 6 foot (1828 x 1828 mm) in size. Color to match membrane.
- (d) TPO T-Joint Covers: 60 mil thick non-reinforced TPO flashing cut into a 4.5 inch (114 mm) diameter circle used to seal step-offs at splice intersections. Color to match membrane.
- (e) TPO Universal Corners: a pre-molded flashing for use in a variety of corner details, including inside and outside corners. Available in white, gray and tan and are 60-mil thick.
- (f) Pipe Flashings: A pre-molded flashing and clamping ring used for pipe penetrations. Available for 1 to 6 inch (25 to 152 mm) diameter pipes.
- (g) Split Pipe Seals: Pre-fabricated flashing consisting of 45 mil thick reinforced membrane for pipes 1 to 6 inch (25 to 152 mm) in diameter. Split (cut) and overlapped tabs are incorporated to allow the pipe seal to be opened and wrapped around the pipe when it is not possible to pull a standard pipe flashing over a round penetration.

B24.9 CLEANERS, PRIMERS, ADHESIVES AND SEALANTS

- (a) Bonding Adhesive: Solvent-based contact adhesive that allows bonding of TPO membrane to various porous and non-porous substrates.
 - (i) Base: Synthetic Rubber.
 - (ii) Color: Yellow.
 - (iii) Solids: 20.0 percent.
 - (iv) VOC: 670 grams/liter.
- (b) Solvent based liquid, required to protect field cut edges of TPO membranes. Applied directly from a squeeze bottle, TPO Cut Edge Sealant, by Firestone Building Products. or approved equal in accordance with B7.
- (c) Solvent based primer for preparing surfaces to receive butyl based adhesive tapes, TPO Primer, by Firestone Building Products or approved equal in accordance with B7.
- (d) Solvent based seam cleaner used to clean exposed or contaminated seam prior to heat welding, EverGuard TPO Seam Cleaner, by Firestone Building Products or approved equal in accordance with B7.
- (e) One part butyl based high viscosity sealant suitable for sealing between flashing membrane and substrate surface behind exposed termination bars and for sealing between roofing membrane and drain flange. Water-Block, by Firestone Building Products or approved equal in accordance with B7.
- (f) Commercial grade roofing sealant suitable for sealing the upper lip of exposed termination bars and penetrations and around clamping rings and comes with a 20 yr ltd warranty against leaks caused by manufacturing defects. Roof Sealant, by Firestone Building Products or approved equal in accordance with B7.
- (g) One-part moisture cure, self-leveling sealant designed for use in pitch pans One-Part Pourable Sealer, by Firestone Building Products or approved equal in accordance with B7.

B24.10 FLASHING ACCESSORIES

- (a) A smooth type, unreinforced thermoplastic polyolefin based membrane for use as an alternative flashing/reinforcing material for penetrations and corners. Required whenever preformed vent boots cannot be used, available in White, 0.055 inches (55 mils) nominal thickness and sheet size: 24in x 50ft. TPO Detailing Membrane, Firestone Building Products or approved equal in accordance with B7.
- (b) An 8 inch (200mm) wide smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip for use as a cover strip over coated metal and stripping-in coated metal flanges and general repairs: 0.045 inches (45 mils) nominal thickness with 100 foot length, available in White, TPO Flashing Strip, Firestone Building Products or approved equal in accordance with B7.
- (c) Extruded aluminum termination bar with angled lip caulk receiver and lower leg bulb stiffener. Pre-punched slotted holes at 6" on center or 8" on center. 3/4 inch x 10 feet with 0.090 inch cross section, Termination Bar, Firestone Building Products or approved equal in accordance with B7.
- (d) A 6 inch (152 mm) wide, 0.045 mil reinforced TPO membrane with a 3-inch self-adhered area and a 3-inch heat-weld area. Designed for use as a cover strip over coated and non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal feet of material, TPO Cover Tape Heat-Weld, Firestone Building Products or approved equal in accordance with B7.
- (f) A 6 inch (14 cm) wide, smooth type, polyester scrim reinforced thermoplastic polyolefin membrane strip with a factory laminated butyl tape. Designed for use as a cover strip over non-coated metal edges and flanges. Each full roll contains approximately 100 Lineal Ft. of material, TPO Cover Tape, by Firestone Building Products or approved equal in accordance with B7.
- (g) 0.045 inch (45 mil) reinforced TPO membrane with pressure sensitive adhesive, to be installed on horizontal surfaces using plates and fasteners as a base attachment in fully adhered systems. Size 6 inches x 100 feet, RTA (Roof Transition Anchor) Strip, by Firestone Building Products or approved equal in accordance with B7.

B24.11 FIELD OF ROOF ACCESSORIES

- (a) Pre-manufactured expansion joint covers used to bridge expansion joint openings in a roof structure. Fabricated to accommodate all roof to wall and roof to roof applications, made of .060 inch reinforced TPO membrane, available in 5 standard sizes for expansion joint openings up to 8 inch wide. TPO Expansion Joint Covers, by Firestone Building Products or approved equal in accordance with B7.
- (b) 0.055 inch thick smooth type, unreinforced thermoplastic polyolefin membrane designed for use as a conforming membrane seal over T-joints in 60 and 80 mil membrane applications. T-Joint Patches, by Firestone Building Products or approved equal in accordance with B7.
- (c) 1/8" (3.18 mm) thick extruded and embossed TPO roll 30" x 50' (762 mm x 15.2 m), heat welds directly to roofing membrane. Unique herringbone traction surface. Gray in color, TPO Walkway Rolls, by Firestone Building Products or approved equal in accordance with B7.

B24.12 RUBBERIZED MASTIC

- (a) This shall be Polyroof as manufactured by Tremco Ltd. if required or approved equal in accordance with B7.

B24.13 ROOF DRAINS

- (a) Description: One-piece spun aluminum body, heavy-duty cast aluminum strainer dome, and clamping ring. (Control flow as required)
- (b) Specified product: OMG Hercules RetroDrain HDAL or approved equal in accordance with B7.

B24.14 PIPE & SEALER

- (a) Pipe and sealer as required by Code and as recommended by manufacturer where required for new drain pipes, to extend existing drain pipes, vent pipes, mechanical unit pipes or gas lines as necessary to suit site conditions. Provide fire-rated pipe and all associated accessories as required by Code for building area and application.

B24.15 PIPE INSULATION

- (a) Pipe insulation for mechanical unit pipes and drain pipes to be compatible with existing application and new materials specified in other sections. Drain pipe insulation to be 25mm (1") Fibreglas or equal 88 Kg/m (cubed) (52 16/cu. ft.) density pipe insulation with ASJ jacket, complete with vapour barrier. Insulate full length of all drain pipes.

B24.16 PIPE JACKETING

- (a) Drain pipe PVC jacketing system to be Smoke-Less 25/50 of ULC listed 25/50 Genotherm D007 PVC by the Sure-Fit System, 26 Greensboro Drive, Rexdale, Ontario, M9W 1E1 (416-241-0810) or approved equal in accordance with B7.

B24.17 GAS LINE, RACEWAY & SMALL EQUIPMENT SUPPORTS:

- (a) UV resistant, rubber blocks with metal C-Port Series by Clearline Technologies, B-line Supports Dura-block Rooftop Supports by Eaton, or approved equal in accordance with B7.

B24.18 SPLASH PADS

- (a) Description: Precast concrete splash block
- (b) Specified product: Barkman Concrete 105604 30 " Natural or approved equal in accordance with B7.

B24.19 DUCT INSULATION

- (a) 50mm Fibreglas RFFRK reinforced foil-faced vapour seal duct insulation PF335, 340 g. (3/4lb./ft.3) density.
- (b) Overwrap: 880 kg/m³ (55 lb./cu. ft.) density roofing felt with welded pin fasteners.
- (c) Seam and joint sealants: Duro-Dyne F2 fibreglas duct tape, Duro-Dyne S-2 duct sealer, asphalt.
- (d) Acceptable coverings: VentureClad 1577CW, white TPO covering with welded
- (a) seams, or approved equal.

B24.20 CAULKING

- (a) This shall be Tremco Vulkem 931 or approved equal in accordance with B7.

B24.21 ALUMINUM PAINT

- (a) Waterproofing coating applied with a brush or a roller composed of elastomeric bitumen, mineral fillers and solvents.
- (b) Specified products: Sopralastic 124 Alu by SOPREMA or approved equal in accordance with B7.

B24.22 VENT STACKS

- (a) These shall be Insulated Stack Jack Flashings (with metal cap, not neoprene seal) SJ-26A as manufactured by Thaler or approved equal in accordance with B7.

B24.23 STEEL CLADDING

- (a) Specified product: Vicwest AD300
- (b) Fabricated from Z275 galvanized sheet steel conforming to ASTM A653M Grade 230 or AZ150 Galvalume, sheet steel conforming to ASTM A792M Grade 230.
- (c) Fasteners: Galvanized, with exposed fasteners colour matched to cladding.
- (d) Prefinished cladding colour to be selected from the manufacturer's standard colour range by The City of Winnipeg.

B24.24 WATER-RESISTIVE BARRIER (WRB)

- (a) Specified product: DuPont Tyvek Commercial Wrap or approved equal in accordance with B7.
- (b) DuPont Self-Adhered Flashing products as per DuPont Installation Guidelines

B24.25 METAL FLASHING

- (a) The bays and cap flashing shall be a minimum of 24 gauge in thickness. Finishes shall closely match the painted colour of the existing flashing. This shall be chosen from the range of Stelco 8000 series of colours.

B24.26 ACCESSORIES

- (a) All nails, bolts, screws and other fasteners, etc. shall all be as recommended by the manufacturer of the materials for which they are to be used.
- (b) Provide all accessories required in accordance with manufacturer's recommendations.
- (c) Ensure compatibility between all components.

B24.27 MECHANICAL SUPPORT

- (a) UV resistant, 100% recycled rubber blocking with protective adhered SBS cap scrim sheet under blocking. TG or SA
- (b) Specified Product: C-Port by Clearline Technologies Inc. or approved equal in accordance with B7.

B25. EXECUTION

- B25.1 Before roofing work begins, the Consultant and Roofing Foreman will examine and approve deck conditions. If necessary, a non-conformity notice will be issued to the contractor so that required corrections can be made. The start of roofing work will mean roofing conditions are acceptable for work completion.
- B25.2 Examine substrate for compliance of conditions that affect installation and performance of roof system.
- B25.3 The Contractor shall be responsible for the removal and reinstallation of any obstructions such as, but not limited to, drains, ducts, conduits, vents, air conditioning units and components at his own expense.
- B25.4 Work must be performed during weather conditions that will not adversely affect the performance of the new Work. Surfaces must be clean and dry prior to installation.
- B25.5 Cover walls and adjacent Work where materials hoisted or used.

- B25.6 Clean off drips and smears of roofing material.
- B25.7 Dispose of rainwater off roof and away from face of building until roof drains or hoppers are installed and connected.
- B25.8 Prevent traffic over completed roofing except where required by Work above roof level. Comply with precautions deemed necessary by Bid Opportunity. Repair damage caused by non-compliance with Bid Opportunity requirements.
- B25.9 At the end of each day's Work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.
- B25.10 Examine roof decks and immediately inform Contract Administrator in writing of defects.
- B25.11 Prior to commencement of Work ensure:
- (a) Decks are firm, straight, smooth, dry, and swept clean of dust and debris.
 - (b) Curbs have been built.
 - (c) Roof drains have been installed at proper elevations relative to finished roof surface.
 - (d) Plywood and lumber nailer plates have been installed to walls and parapets as indicated.
- B25.12 Removal of Existing Roofing
- (a) Remove existing roofing system, curbs and cant strips as required to properly install new roofing system. Avoid damage to decks, drains, and other components on roofs.
 - (b) Provide temporary hoarding, other protection as may be required.
 - (c) Fully protect interior of building from water penetration and or construction debris from any cause.
- B25.13 Prepare remaining surfaces to accept new roofing system. To selected roofing manufacturer's specifications, recommendations and proven standards.

B26. APPLICATION

- B26.1 Ensure a roofing foreman is on Site and supervising the roofing work at all times when roofing work is undertaken. Ensure that at least one other Qualified Roofing Trades-person shall be on Site when roofing work is undertaken
- B26.2 Ensure that all Qualified Roofing Trades-persons necessary to receive the manufacturer warranties, as set out within, are appropriately trained by the manufacturer and are on Site, at all relevant times.

B27. PREPARATION

- B27.1 If required, rooftop equipment, electrical and gas service lines, telephone lines, etc. must be disconnected, relocated and reconnected as required in accordance with all applicable codes and regulations to accommodate the Work without disrupting operations within the facility. Prior arrangement must be made with the Contract Administrator in the event a disruption of building operations is required.
- B27.2 Remove and dispose of all metal flashings as required.
- B27.3 Remove existing roofing system to the roof deck in the area shown on the attached drawing.

- B27.4 Remove and dispose of any equipment as designated by the owner and seal any resulting openings with pre-painted 20 gauge, 1 1/2" steel decking or like-kind wood decking to match.
- B27.5 Inspect and repair any deck deficiencies that would affect the installation and performance of the new roof system.
- B27.6 Fill and pack all open joints, cracks, seams, and openings in the deck.
- B27.7 Construct edge, expansion joint, projection, and all equipment curb blocking and nailers to accommodate insulation thickness. Extend all curbs to a minimum height of 203 mm (8") above the finished roof surface.
- B27.8 All blocking to be construction grade spruce wood.
- B27.9 Substrate Preparation:
- (a) Plywood Decking
 - (i) Plywood sheathing shall be exterior grade, minimum 4 ply, and not less than 15/32 inch (12mm) thick.
 - (ii) Preservatives or fire retardants used to treat the decking shall be compatible with roofing materials.
 - (iii) The deck shall be installed over joists that are spaced 24 inches (610 mm) o.c. or less.
 - (iv) The deck shall be installed so that all four sides of each panel bear on and are secured to joist and cross blocking. "H" clips are not acceptable.
 - (v) Panels shall be installed with a 1/8 inch to 1/4 inch (3 mm to 6 mm) gap between panels and shall match vertically at joints to within 1/8 inch (3 mm).
 - (vi) Decking shall be kept dry and roofed promptly after installation.

B28. INSULATION

- B28.1 **ADHESIVE FASTENED SYSTEM:** Adhere insulation by using specified adhesive in continuous strips (minimum 3/4" wide) spaced as per wind-uplift calculations on the field surface, on the perimeter, and on corners. [CSA A123.21-14.] Corners and perimeters must be installed as per FM requirements listed in the PLPDS 1-29].
- B28.2 Replace any area of damaged or deteriorated existing insulation. Fill all voids and cracks with specified insulation material.
- B28.3 The insulation must be installed to ensure that water cannot pool in the newly replaced area.
- B28.4 Tightly butt all insulation panels in half lap fashion. Offset the pattern between layers so that no insulation joints are coincidental.
- B28.5 Adhered the layers of insulation using the specified adhesives. The application of the adhesive must be done in strict accordance to manufactures guidelines so as to obtain a minimum uplift equal to 90 mile-per-hour. Stagger the layers of insulation from one another to prevent jointing. All adhesive secured assembly components must be properly stepped-in and rolled with a weighted roller to ensure contact of mateable surfaces.
- B28.6 Leave no openings or gaps at projections or perimeters.
- B28.7 Complete vapour retarder envelope wrap by sealing ends of vapour retarder to the top on the insulation.
- B28.8 At drains and scuppers, taper insulation for 24" in all directions to ensure positive drainage.

B29. SUMP INSULATION PANEL INSTALLATION

- (a) Install sump insulation panel in conformance with manufacturer's instructions and recommendations.

B30. INSTALLATION - GENERAL

- (a) Install Firestone's TPO roofing system according to all current application requirements in addition to those listed in this section.
- (b) Start the application of membrane plies at the low point of the roof or at the drains, so that the flow of water is over or parallel to, but never against the laps.

B31. MEMBRANE INSTALLATION (FULLY-ADHERED ADHESIVE)

- (a) Provide minimum ½" plywood sheathing to all mateable surfaces as required to ensure suitable substrate to receive membrane(s).
- (b) Place membrane so that wrinkles and buckles are not formed. Any wrinkles or buckles must be removed from the sheet prior to permanent attachment. Roof membrane shall be fully adhered immediately after it is rolled out, followed by welding to adjacent sheets.
- (c) Overlap roof membrane a minimum of 3 inches (76mm) for side laps and 3 inches (76mm) for end laps.
- (d) Install membrane so that the side laps run across the roof slope lapped towards drainage points.
- (e) All exposed sheet corners shall be rounded a minimum of 1 inch.
- (f) Use full width rolls in the field and perimeter region of roof.
- (g) Use appropriate bonding adhesive for substrate surface, applied with a solvent-resistant roller, brush or squeegee.
- (i) All work surfaces should be clean, dry, and free of dirt, dust, debris, oils, loose and/or embedded gravel, un-adhered coatings, deteriorated membrane, and other contaminants that may result in a surface that is not sound or is uneven.
- (j) Apply Adhesive directly to the substrate using a ribbon pattern. Space beads as required by job specification, typically 6" or 12" (152 mm or 305 mm) o.c.
- (k) Adhesive should be approximately (22 degrees C) when being dispensed. As adhesive is applied, allow the adhesive to begin rising, then place membrane.
- (l) Roll in membrane using a 150 lb. membrane roller or equivalent
- (o) Apply bonding adhesive to the substrate surface only at 300 square feet per 5 gallons (Solvent Based) and 600 square feet per 5 gallons (Water Based). A greater quantity of bonding adhesive may be required based upon the substrate surface condition.
- (p) Prevent seam contamination by keeping the adhesive application a few inches back from the seam area.
- (q) Adhere approximately one half of the membrane sheet at a time. One half of the sheet's length shall be folded back in turn to allow for adhesive application. Lay membrane into adhesive once the bonding adhesive is tacky to the touch.
- (r) Roll membrane with a weighted roller to ensure complete bonding between adhesive and membrane.
- (s) Membrane laps shall be heat-welded together. All welds shall be continuous, without voids or partial welds. Welds shall be free of burns and scorch marks.
- (t) Weld shall be a minimum of 1 1/2 inches (39mm) in width for automatic machine welding and a minimum 2 inches (51mm) in width for hand welding.

- (u) All cut edges of reinforced membrane must be sealed with TPO Cut Edge Sealant.
- (v) Supplemental membrane attachment is required at the base of all walls and curbs, and where the angle of the substrate changes by more than five (5) degrees (1 inch in 12 inches). Roofing membrane shall be secured to the structural deck with appropriate no less than 1/2 inch from the membrane edge. Alternatively, the roofing membrane may be turned up the vertical plane a minimum of 3 inches and secured with screws and termination bar Fastener spacing is the same as is used for in-lap attachment. The termination bar must be installed within 1 1/2 to 2 inches of the plane of the roof membrane, with a minimum of 1 inch of membrane extending above the termination bar.
- (w) Supplemental membrane attachment to the structural deck is required at all penetrations unless the insulation substrate is fully adhered to the deck. Roofing membrane shall be secured to the deck with appropriate screws and plates.
- (x) Fasteners must be installed to achieve the proper embedment depth. Install fasteners without lean or tilt.
- (y) Install fasteners so that the plate or termination bar is drawn down tightly to the membrane surface. Properly installed fasteners will not allow the plate or termination bar to move (underdriving), but will not cause wrinkling of the membrane (overdriving).

B32. FLASHINGS

- (a) General:
 - (i) All penetrations shall be at least 2 feet (610 mm) from the curbs, walls, and edges to provide adequate space for proper flashing.
 - (ii) Flash all perimeter, curb, and penetration conditions with coated metal, membrane flashing, and flashing accessories as appropriate to the site condition.
 - (iii) All coated metal and membrane flashing corners shall be reinforced with preformed corners or non-reinforced membrane.
 - (iv) Hot-air weld all flashing membranes, accessories, and coated metal. A minimum 2 inch wide hand weld or minimum 1 1/2 inch automatic machine weld is required.
 - (v) Non-coated metal edge details shall be installed in accordance with current Firestone construction details and requirements.
 - (i) Twenty (20) year Firestone systems require the use of coated metal edges where applicable. Bonding adhesive and/or cover tape is not acceptable.
 - (ii) All cut edges of reinforced membrane shall be sealed with TPO Cut Edge Sealant.
- (c) Un-reinforced Membrane Flashings:
 - (i) Un-reinforced membrane is used to field-fabricate penetration or reinforcement flashings in locations where preformed corners and pipe boots cannot be properly installed.
 - (ii) Penetration flashings constructed of un-reinforced membrane are typically installed in two sections, a horizontal piece that extends onto the roofing membrane and a vertical piece that extends up the penetration. The two pieces are overlapped and hot-air welded together.
 - (iii) The un-reinforced membrane flashing shall be adhered to the penetration surface. Apply bonding adhesive at a rate resulting in 60 square feet/gallon of finished roofing material for solvent-based bonding adhesives, and at a rate of 125 square feet/gallon of finished roofing material for water-borne bonding adhesive. Apply bonding adhesive to both the underside of the membrane and the substrate surface at 120 square feet per gallon (Solvent Based) and 250 square feet per gallon (Water Based). A greater quantity of bonding adhesive may be required based upon the substrate surface condition. The bonding adhesive must be allowed to dry until tacky to the touch before flashing membrane application.

- (d) Reinforced Membrane Flashings:
- (i) The thickness of the flashing membrane shall be the same as the thickness of the roofing membrane.
 - (ii) Membrane flashing may either be installed loose or fully adhered to the substrate surface in accordance with 'Construction Detail Requirements'.
 - (iii) Where flashings are to be fully adhered, apply bonding adhesive at a rate resulting in 60 square feet/gallon of finished roofing material for solvent-based bonding adhesives, and at a rate of 125 square feet/gallon of finished roofing material for water-borne bonding adhesive. Apply bonding adhesive to both the underside of the membrane and the substrate surface at 120 square feet per gallon (Solvent Based) and 250 square feet per gallon (Water Based). A greater quantity of bonding adhesive may be required based upon the substrate surface condition. The bonding adhesive must be allowed to dry until tacky to the touch before flashing membrane application.
 - (iv) Apply the adhesive only when outside temperature is above 5 degrees C. Recommended minimum application temperature is 10 degrees C to allow for easier adhesive application.
 - (v) The membrane flashing shall be carefully positioned prior to application to avoid wrinkles and buckles.
- (e) Self-Adhered Membrane Flashings:
- (i) Install self-adhering membrane flashings according to all applicable GAF construction details.
 - (ii) Apply flashing membrane only when outside temperature is above 5 degrees C. Recommended minimum application temperature is 10 degrees C to allow for improved adhesive performance.
 - (iii) The membrane flashing shall be carefully positioned prior to removal of release film to avoid wrinkles and buckles.
 - (iv) Adhere flashing membrane to the walls by removing the release film. Broom or roll all walls. All seams shall be rolled-in with a silicone roller.
- (f) Parapet and Building Walls:
- (i) Flash walls with TPO membrane adhered to the substrate with bonding adhesive, loose applied (Less than 18 inches (457mm) in height) or with coated metal flashing nailed 4 inches (102mm) on center to pressure-treated wood nailers.
 - (ii) Secure membrane flashing at the top edge with a termination bar. Water Block shall be applied between the wall surface and membrane flashing underneath all exposed termination bars. Exposed termination bars shall be mechanically fastened 8 inches (203mm) on center; termination bars that are counter flashed shall be fastened 12 inches (305mm) on center.
 - (iii) Roof membrane must be mechanically attached along the base of walls with screws and plates (deck securement) or screws and inverted termination bar (wall securement) at the following rate:
 - (i) Mechanically Attached Systems: Per in-lap on center spacing, with a 12 inch (305mm) maximum.
 - (ii) Fully / Self Adhered Systems: 12 inches (305mm) on center
 - (iv) All coated metal wall flashings and loose applied membrane flashings must be provided with separate metal counterflashings, or metal copings.
 - (v) Metal counterflashings may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with caulking.
 - (vi) Flash wall scuppers with a coated metal insert that is mechanically attached to the wall and integrated as part of the wall flashing.

- (g) Curbs and Ducts:
- (i) Flash curbs and ducts with TPO membrane adhered to the curb substrate with bonding adhesive, loose applied (Less than 18 inches (457mm) in height) or with coated metal flashing nailed 4 inches (102mm) on center to pressure-treated wood nailers.
 - (ii) Secure membrane flashing at the top edge with a termination bar. Water Block shall be applied between the curb/duct surface and membrane flashing underneath all termination bars. Exposed termination bars shall be mechanically fastened every 8 inches (203mm) o.c.; termination bars that are counter flashed shall be fastened 12 inches (305mm) on center.
 - (iii) Roof membrane must be mechanically attached along the base of walls with screws and plates (deck securement) or screws and inverted termination bar (wall securement) at the following rate:
 - (iv) Mechanically Attached Systems: Per in-lap on center spacing, with a 12 inches (305mm) maximum
 - (v) Fully / Self Adhered Systems: 12 inches (305mm) on center
 - (vi) All coated metal curb flashings and loose applied membrane flashings must be provided with separate metal counter-flashings, or metal copings.
 - (vii) Metal counter-flashings may be optional with fully adhered flashings depending on guarantee requirements. Exposed termination bars must be sealed with caulking.

B33. MEMBRANE WALKWAY INSTALLATION

- (a) NA

B34. WATERPROOFING FOR VARIOUS DETAILS

- (a) Install waterproofing membranes in conformance with various roofing details illustrated in the manufacturer's manual instructions and recommendations.

B35. ROOF PROTECTION

- (a) Protect all partially and fully completed roofing work from other trades until completion.
- (b) Whenever possible, stage materials in such a manner that foot traffic is minimized over completed roof areas.
- (c) When it is not possible to stage materials away from locations where partial or complete installation has taken place, temporary walkways and platforms shall be installed in order to protect all completed roof areas from traffic and point loading during the application process.
- (d) Temporary tie-ins shall be installed at the end of each workday and removed prior to commencement of work the following day.

B36. PLUMBING VENTS

- B36.1 Install Thaler SJ-27 roof flashings embedded into a generous bed of adhesive ensuring that coverage extends beyond the edge of stack extension flashing.
- B36.2 Place stack extension over vent and over-trowel with adhesive extending a minimum of 4" beyond the edge of the flange.
- B36.3 Strip in entire flange edge with 6" reinforcing membrane embedded in and top-dressed with adhesive.
- B36.4 Membrane edges shall be terminated with compatible secondary seal.

B36.5 Fit and seal PVC pipe section to the plumbing vent hub and insulate in accordance with the manufacturer's instructions.

B37. FLASHING ROOF DRAINS

B37.1 Carry roofing membranes down into sump to edge of drain fitting.

B37.2 Embed flashing flange into 3 mm thickness of sealing compound on top of roofing membrane.

B38. CLEAN-UP

- (a) All work areas are to be kept clean, clear and free of debris at all times.
- (b) Do not allow trash, waste, or debris to collect on the roof. These items shall be removed from the roof on a daily basis.
- (c) All tools and unused materials shall be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.
- (d) Dispose of or recycle all trash and excess material in a manner conforming to current provincial regulations and local laws.
- (e) Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.
- (f) Clean and restore all damaged surfaces to their original condition.

B39. METAL FLASHINGS

B39.1 Cap flashings are to be 24 ga. galvanized sheet metal. The flashings are to conform to C.S.A.

B39.2 The inside and outside faces are to extend down a minimum of 76 mm (3"). Fasten the cap flashing using weatherproof screws spaced not more than 610 mm (24") on centre.

B39.3 Hem all free edges and seal all butts, joints and reglets with sealant.

B40. ROOF DECKING

B40.1 The Contractor shall assess the condition of the deck while doing the roof repairs. Based on the assessment, the Contractor will estimate the requirement and square footage of the deck replacement if any is required.

B40.2 The Contractor will inform the Contract Administrator and submit the requirement with the plan and drawings designed by a registered Structural Engineer.

B40.3 The Contract Administrator will inspect and approve, reject, reduce or increase the area of the steel deck to be replaced.

B40.4 This work will not start until the Contract Administrator approves it.

B40.5 Design Requirements

- (a) The roof decking replacement plan must be designed and the drawings stamped by a Structural Engineer registered with the APEGM.
- (b) Deflection under specified live load not to exceed 1/300 of span for roof, 1/360 of span for floor and 1/180 of span for wall.
- (c) Design replacement sections to same as existing deck sections.

B40.6 Fastening

- (a) Ensure nail head standoffs measurements meet fastener manufacturer's recommendations.

B40.7 Products

- (a) Materials
Materials to match existing deck
- (b) Deck Types
Deck to match existing deck.

B41. MISCELLANEOUS SPECIALTIES

- (i) NA

B42. FIELD QUALITY CONTROL

- (a) Field inspection will be performed under provisions of Section 01 45 16.
- (b) Quality Control of the work will be provided by QCA Building Envelope Limited (QCA). If conditions are unacceptable, QCA will notify the Contractor, Project Administrator and The City of Winnipeg.
- (c) Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- (d) If defects and or non-conforming items are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of concern. Correct defect and irregularities as advised by Consultant at no cost to Owner. Contractor to pay costs for retesting and re-inspection.

END OF SECTION

APPENDIX: MAJOR COMPONENTS

1. The major components of the Work are as follows:

1. **Roof Replacement in Section 1: ROOF-A1, B1 & C1**

EXISTING ROOF ASSEMBLY: ROOF-A1
OVERBURDEN
ASPHALT & MEMBRANE(S) APPROX. 4-PLY
STEEL DECKING

NEW ROOF ASSEMBLY: ROOF-A1
TPO 60-MIL
GLASSMAT SHEATHING MIN. ¼"
TAPERED EPS TYPE II (Min. 1.5% to achieve pos. drainage)
DECKING

EXISTING ROOF ASSEMBLY: ROOF-B1
EPDM
EXISTING DECKING

NEW ROOF ASSEMBLY: ROOF-B1
TPO 60-MIL
PLYWOOD SHEATHING 15/32 inch (12mm) thick.
TAPERED BACK-SLOPE EPS TYPE II (Min. 4% to achieve pos. drainage) b/w SCUPPERS
EXISTING DECKING

EXISTING ROOF ASSEMBLY: ROOF-C1
APSHALT SHINGLES
EXISTING DECKING

NEW ROOF ASSEMBLY: ROOF-C1
APSHALT FIBREGLASS LAMINATE SHINGLES
FULL UNDERLAYMENT
EXISTING DECKING



FIG. 1: ROOF-A1



FIG. 2: ROOF-A1 DRAIN



FIG. 3: ROOF-B1 (EPDM) & ROOF-C1 (TOWER) SHINGLES.



FIG. 4: ROOF-B1 CORE CUT.

THE END