SPECIFICATIONS and DRAWINGS

Project:	Roof and Skylight Replacement At PNE HASTINGS ROOM 2901 East Hastings Street Vancouver, BC, V5K 5J1
	Prepared For
Prepared for:	CITY OF VANCOUVER 320 – 507 West Broadway Vancouver, BC, V5Z 0B4
Attention:	Jason Jotie
W.O. Number: IRC Number:	VR19-062SP IRC-21686

IRC Building Sciences Group

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Roof and Skylight Replacement at:

PNE HASTINGS ROOM 2901 East Hastings Street Vancouver, BC, V5K 5J1





END OF SECTION - 00 02 00

PART 1 - GENERAL

1.1 DESCRIPTION

- .1 Roofing Contractor to provide all labour, equipment, and materials necessary to perform to completion Work:
 - .1 Roof and Skylight Replacement on designated roof areas of: PNE Hastings Room, located at 2901 East Hastings Street, Vancouver, BC, V5K 5J1.

1.2 PROJECT SCHEDULE

- .1 Contractor to mobilize his forces and trades to commence work on site as soon as possible after Award of Contract, weather permitting.
- .2 Substantial Completion of Work to be completed by a specified date; to be announced later in consultation with Contractor.

1.3 BID PRICING

- .1 Bid Pricing: Provide a breakdown of Stipulated Lump Sum Price as itemized and indicated within City of Vancouver Invitation to Tender Form:
 - .1 Roof Areas 3.1, 3.2 and 3.3: Price to remove existing pea gravel, built up roofing membranes, fibreboard insulation, kraft vapour retarder down to existing wood or plywood decks, and install new replacement 2 ply modified bitumen membrane system in accordance with Section 07 52 00 SBS Modified Bituminous Membrane Roofing.
- .2 Separate Pricing: Provide Separate Prices as itemized and indicated within City of Vancouver Invitation to Tender Form:
 - .1 Roof Area 2.1: Price to remove existing pea gravel, built up roofing membranes, fibreboard insulation, kraft vapour retarder down to existing wood deck, and install new replacement 2 ply modified bitumen membrane system in accordance with Section 07 52 00 SBS Modified Bituminous Membrane Roofing. Price to include the following:
 - .1 Installation of new 13mm (1/2") plywood sheathing.
 - .2 Delete 2 unused curbs and install new wood decking to restore the wood deck substrate in order to receive new roof membrane assembly.
 - .3 Temporarily lift or disconnect the gas lines in order to accommodate the work and reinstall the gas lines on new C-Ports.
 - .2 Roof Area 2.1: Price to supply and install new aluminum windows, includes all associated work specified herein.
 - .3 Roof Areas 2.1: Price to supply and install new engineered ladders to access Roof Areas 3.1 and 4.1.
 - .4 Price to repoint and repair the top of the existing block wall at the entire roof perimeters prior to installing new wood parapet curb. Install new concrete blocks to replace any damaged or deteriorated blocks. Price is to be per lineal foot.
- .3 Unit Pricing: Items to be performed as required and endorsed by Consultant and Owner where exposed during performance of Work or where directed on site by Consultant, and added to Contract Price.

- .1 Wood Block Replacement: Price to add to Contract to supply and install new matching wood blocking as required to replace any damaged and/or deteriorated existing wood blocking, per board foot. Replacement of wood blocking to be endorsed by QA Observer.
- .2 Vertical Sheathing Replacement: Price to add to Contract to supply and install new matching sheathing as required to replace any damaged and/or deteriorated existing sheathing, per square foot. Replacement of sheathing to be endorsed by QA Observer.
- .3 Wood Deck Replacement: Price to add to Contract to supply and install new matching wood decking as required to replace any damaged and/or deteriorated existing wood decking, per square foot. Replacement of wood decking to be endorsed by QA Observer.
- .4 Plywood Deck Replacement: Price to add to Contract to supply and install new matching plywood decking as required to replace any damaged and/or deteriorated existing plywood decking, per square foot. Replacement of plywood decking to be endorsed by QA Observer.

1.4 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.5 CONTRACTOR USE OF PREMISES

- .1 Contractor to limit use of premises for Work, for storage and access.
- .2 Coordinate use of premises under direction of Owner and Consultant.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.6 GENERAL SITE REQUIREMENTS

- .1 Perform Work between hours of 07:00 to 18:00 hours, Monday through Friday. Consult with Client/Building Owner for special access times.
- .2 Temporary Barriers, enclosures and signage will be highly enforced given use of property.
- .3 Contractor to ensure safety and proper execution of public routing; ensuring temporary access to fire exits if and when they are affected as part of Work.
- .4 Obtain sidewalk and roadway occupation permits as required by local municipality.
- .5 Determine nature and extent of all site services above and below grade prior to commencement of Work.
- .6 Coordination of trades will be responsibility of Contractor to ensure work is completed as soon as possible. Provide weather protection and heating as required to perform Work if required and as specified.
- .7 Supply, set-up, maintain and remove scaffolding, man-lift platforms and/or swing-stages during performance of Work as required to access work areas. If scaffolding is to be used, Contractor to provide complete shop drawings bearing seal of a Professional Engineer, licensed to practice in Place of Work. Work to include review and approval of installed scaffolding by Designer. Allowance should be made for access to all elevations of building.

- .8 No public access to Work area to be allowed. Ensure access to fire exits are maintained and hoarded through Work area. Pedestrian access along sidewalks must be maintained as per Owner's requirements. No areas of access to or around building are to be restricted without approval of Owner.
- .9 Sanitary Facilities
 - .1 Provide on-site washroom facilities on ground level only, secured in a locked compound. The Contractor will not have access to the building washrooms.
 - .2 Maintain facilities in clean condition.
 - .3 Workers will not be permitted to use any other sanitary facilities, intended for the use of public or building personnel.
- .10 Install temporary protection at all locations of Work, as required to ensure safe, clean, orderly removal and disposal work, and to provide protection for all interior and exterior building components, vehicles, pedestrians and occupants.
- .11 Provide temporary support to existing structural and cladding components during performance of work if required.
- .12 Install temporary protection for all materials and building components, which have been exposed during demolition/removals as specified.
- .13 Dispose of all materials unable or unsuitable for recycling at landfill site authorized by authorities having jurisdiction.
- .14 Pay for any additional testing and observations required by Observer for correction of Work, without additional cost to Owner, when initial tests and observations reveal work failing to meet contract requirements and when construction extends beyond the schedule submitted by the contractor.

1.7 **PROTECTION OF ROOFS**

- .1 <u>Cover and protect interior surfaces and finishes by installing polyethylene sheets or tarps in order</u> to protect against debris falling thru the wood deck during roof removal and replacement.
- .2 Protect all roof areas within area of Work and where equipment or materials are stored. Do not store equipment or materials directly on roof surface.
- .3 Protect existing roof systems to remain against damage from traffic generated by new Work.
- .4 Protection of existing and newly installed roof membranes to use sheets of 25mm (1") expanded polystyrene insulation cover with 13mm (0.5") plywood.

1.8 SCOPE OF WORK: LOW SLOPE MEMBRANE ROOFING

- .1 On Roof Areas 3.1, 3.2, and 3.3: Remove existing system components, projection and perimeter flashings, and old appurtenances down to the existing wood deck on Roofs 2.1 and 3.1 and down to the existing plywood deck on Roofs 3.2 and 3.3 in preparation for installation of a new 2 ply SBS waterproofing membrane system in accordance with Section 07 52 00.
 - .1 Remove existing built-up roofing membranes down to existing wood and plywood decks and dispose of removed components, projection and perimeter flashings, and old appurtenances to an appropriate site.

- .2 Review entire existing wood and plywood decks with Consultant to identify damaged areas requiring repair or replacement. Consultant to be notified 48 hours prior to wood deck examination.
 - .1 Install new compatible wood deck and plywood deck materials where required to repair and restore existing decks.
 - .2 On Roof Area 3.1 Temporarily lift or disconnect the service lines in order to accommodate the work and reinstall within new conduits and onto new C-Ports.
 - .3 On Roof Area 3.2 The existing plywood sheathing is to be in an acceptable and clean condition prior to the installation of the vapour retarder, in order to meet the manufacturer's installation guidelines and to meet industry acceptable good roofing practices.
 - .4 On Roof Areas 3.2 and 3.3 See Roof Plan R1 for skylights to converted to exhaust fans and vent stacks to be deleted and roofed over.
 - .5 On Roof Areas 3.2 and 3.3 Remove and dispose of existing curb mounted skylights and install new acrylic domed curb mounted skylights at existing locations and to fit existing structures.
 - .6 On Roof Areas 3.2 and 3.3 Remove the existing electrical lines from the curbs and re-route to the exterior. Coordinate the removal and any d/c with the Owner.
- .3 On Roof Areas 3.1 and (2.1 Separate Price 1): Install new 1 layer of 13mm (1/2") plywood roof sheathing.
- .4 On Roof Areas 3.1, 3.2, 3.3 and (2.1 Separate Price 1): Install new 1 ply self adhered vapour retarder, adhered.
- .5 Install new 2% slope glass faced polyisocyanurate insulation with 4% cricket overlay, as shown on Roof Plan R1, adhered.
 - .1 Contractor to submit tapered insulation shop drawings for approval prior to installation.
- .6 Install new minimum R20 glass faced polyisocyaurate insulation in 2 layers, adhered.
- .7 Install 1 layer of high density polyisocyanurate insulation support panel factory-laminated to a SBS base sheet, adhered.
- .8 Install 1 ply modified bitumen cap sheet field and flashing membranes, torch applied.
- .9 Install new prefinished metal flashings, hook strips, and trims at all perimeter and projection locations where indicated on drawings and detailed in related technical sections.

1.9 SCOPE OF WORK: ALUMINUM WINDOWS (SEPARATE PRICE 2)

- .1 The work shall include all necessary demolition/removal, carpentry, sub-sill waterproof membranes, WRB tie-ins, replacement of windows, associated testing, hardware and sealants, metal flashings, interior and exterior repairs/ modifications, etc. The work shall include all labour, material, equipment and services necessary for the completion of the work as indicated on the drawings and as specified herein and per Section 08 51 13.
- .2 Supply and installation of new aluminum windows. *All interior owner-installed improvements are to be removed.*

- .3 All windows are to be Insulating Glazed Units (IGU) fenestrations with minimum double glazing, low-e, argon fill, and thermally-broken aluminum frame.
- .4 Energy Performance: Overall window performance must meet the BC Energy Efficiency Act. Contractor to provide written confirmation.
- .5 An air seal consistent with the rainscreen principle shall be continuously installed at the glass line perimeter and connected to the structure as an integral part of the design to provide a complete impervious air and vapour barrier.
- .6 Water Resistance: No water to penetrate the windows assembly or be retained within any frame member, when tested in accordance with ASTM 1E1105 at air pressure difference of 220 Pa or tested in accordance with AAMA 501.2 without the pressure caps and exterior seals in place. There is to be no "water infiltration" as defined by CSA A440.
- .7 Produce and submit engineer-stamped shop drawings prior to start of project. Submit corresponding engineering schedules as part of the requirements of this job.
- .8 Submit colour samples, product data sheets for the new fenestrations, flashings, sealant and related accessories. Colours to be selected by the Owner. Obtain approval prior to any procurement and/or installation.
- .9 Mock up: install the first complete assembly (mock-up) of one window, complete with tie-ins to adjacent wall cladding materials and assemblies to demonstrate the required sequence of installation, for review and approval by the consultant. Contractor is to arrange and coordinate this review with the consultant.
- .10 Field testing: Contractor will coordinate and arrange for a third-party testing agency. Testing will be paid for by the Owner. The consultant will randomly choose the windows for field testing during installation stage. The field testing will be in accordance with ASTM E1105 "standard test method for field determination of water penetration of installed exterior windows and skylights by uniform or cyclic static air pressure difference. The test procedure shall correspond to the method of test used to qualify the product for water penetration resistance under AAMA/WDMA/CSA 101/I.S.2/A440. The contractor will pay for any re-testing required as a result of failure.
- .11 Interior finishes: remove interior finishes at the rough openings as required to facilitate the work including but not limited to blinds, electrical/plumbing/security fixtures, etc. To allow for installation of new fenestrations. Reinstate, repair, paint all interior wall and related fixtures at areas affected by the work to match existing.
- .12 Window trims: supply and install new window trims and related accessories such as metal flashings & trims, blocking, strapping, etc., to conform to architectural details.
- .13 Window replacement is to be coordinated with other building envelope remediation, ie. Roof Replacement. The contractor is responsible to coordinate all related details and scheduling in order to properly execute the required scope of work.

1.10 SCOPE OF WORK: REMOVAL OF HAZARDOUS MATERIALS

.1 Contractor to refer to City of Vancouver documents for a list of known hazardous items for this project.

1.11 MISCELLANEOUS

.1 It shall be the responsibility of the Contractor to verify that all existing conditions and roof system components are accurately reported in these specifications.

- .2 All details specified by this Scope of Work constitute acceptable installations. Any deviation from these specifications must first be approved by the Consultant prior to any installation.
- .3 All reasonable precautionary measures will be undertaken. It shall be the responsibility of the Contractor to ensure minimal dust and debris contamination of the interior and exterior of the work site.
- .4 At the end of each day's work drag a magnetic bar across all work areas to remove all fasteners from the grounds. All loose debris shall be removed from the designated roof areas and disposed of accordingly.
- .5 It shall be the responsibility of the Contractor to arrange and pay for the disconnect and reconnect of all ventilation, mechanical and A/C units as required to execute the Work.
- .6 If the removal of any exhaust vents or equipment results with an opening in the deck that cannot be permanently sealed that day, the Contractor shall be responsible for providing overnight security to the building by a company approved by the Consultant.
- .7 It shall be the responsibility of the Contractor to ensure that no attachments (wiring, lighting, etc.) are attached to the underside of any deck that is to be removed. The contractor shall notify a representative of the Owner, who will then disconnect any such services, if necessary.
- .8 Security fencing shall be provided at all times for equipment and materials at stored at ground level. No materials or equipment shall be left unsecured on the ground. The materials and equipment compound shall be locked when access is not required.
- .9 Cover all roof materials properly with suitable tarps to prevent exposure to moisture and sunlight. Manufacturer's packaging does not constitute adequate tarping and protection. All roof materials are to be elevated on appropriate dunnage.
- .10 Existing grounds shall be restored to original condition upon completion of project by the Contractor to the satisfaction of the Consultant.

1.12 CLEANING

.1 Perform daily and final clean-up of Work area and surrounding areas of site.

1.13 WARRANTY

- .1 Contractor's Workmanship Warranty:
 - .1 Provide Owner with Contractor's two (2) year Warranty for Workmanship and Materials on Contractor's letterhead.
- .2 Manufacturer's System Warranty:
 - .1 Provide a written Ten (10) Year Membrane Manufacturer's No Dollar Limit System Warranty from the date of Approved Final Review.
- .3 RCABC RGC RoofStar Guarantee:
 - .1 Provide to the Owner, the RGC RoofStar Five (5) Year Guarantee. The cost of the RCABC Guarantee administration fee and milestone reviews to be included in the Tender price.
- .4 Cost of all warranties to be included in Bid Price.
- .5 Cost of all Field Reviews to be paid by Owner.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION - 01 11 00

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PART 1 - GENERAL

1.1 DESCRIPTION

- .1 This section details procedures to be followed for delivery of Submittals identified and required by other specification sections, consisting of but not limited to:
 - .1 System Letter if required for CSA 123.21-14 Wind Uplift
 - .2 Shop drawings
 - .3 Samples
 - .4 Mock-ups
 - .5 Certificates and transcripts

1.2 GENERAL REQUIREMENTS

- .1 Transmittal for Submissions: Accompany all submittals with transmittal letter containing:
 - .1 Date of transmittal,
 - .2 Sequential number for tracking of each submission,
 - .3 Project title and number,
 - .4 Identification and quantity of each shop drawing, product data sheet, sample, etc,
 - .5 Contractor's business name and address,
 - .6 Name of reviewer for Contractor,
 - .7 Contractor's review stamp: completed, dated, and signed certifying submittal has been reviewed, checked, and approved for compliance with Contract documents.
- .2 Delivery: Direct submittals identified and required by individual technical sections to Consultant for review at following address, unless otherwise directed in writing:

Attention:	Jat Malhi, AScT
Office:	IRC BUILDING SCIENCES GROUP
Address:	250 – 21900 Westminster Hwy, Richmond, BC, V6V 0A8
Telephone:	604.295.8070
Facsimile:	604.279.9644
Email:	jmalhi@ircgroup.com
	Attention: Office: Address: Telephone: Facsimile: Email:

- .2 All deliveries prepaid by Contractor.
- .3 Time and Scheduling:
 - .1 Deliver submittals with reasonable promptness and in orderly sequence to avoid delay in progress of Work.
 - .2 Allow up to ten (10) working days for Consultant's review of each submission.
 - .3 Time for review to begin and be noted upon receipt of submittal by Consultant.
 - .4 No adjustments to Contract Time or Price allowed due to delay in progress of Work caused by review, rejection, and re-submission process.

- .4 Deviations from Contract Requirements: Notify Consultant in writing of any deviations from Contract Document requirements and state reasons for said deviations at time of submission:
 - .1 Contractor is responsible for errors and omissions in submission and is not relieved by Consultant's review.
 - .2 Contractor is responsible for deviations in submission from requirements of Contract Documents and is not relieved by Consultant's review.
- .5 Review Before Delivery: Contractor to:
 - .1 Review each submittal for completeness and compliance with Contract Documents.
 - .2 Ensure that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work.
 - .3 Verify co-ordination of field measurements and affected adjacent Work.
- .6 Incomplete Submissions:
 - .1 Entire submission package to be returned to Contractor if deemed incomplete during a preliminary review, for reasons including:
 - .1 Insufficient number of copies provided,
 - .2 Transmittal for submission incomplete, missing, or unsigned,
 - .3 Submittal not stamped, completed, signed, dated, or identified to specific project.
- .7 Re-submissions:
 - .1 Use same procedure indicated here and above for re-submission.
 - .2 Clearly identify each correction or change made to submittal.
 - .3 Use original submittal number with appended suffix at end to indicate revision number.
- .8 Acceptance and Rejection:
 - .1 Where review by Consultant discovers no errors and omissions or only minor corrections, min. two (2) copies to be returned for fabrication and installation of Work to proceed.
 - .1 One copy of accepted submission to be retained by Consultant for project record.
 - .2 If submittals are rejected or require significant modification, noted copies to be returned to Contractor and marked with request for correction and re-submittal.
 - .1 One copy of rejected submission to be retained by Consultant for project record.
 - .3 Re-submit corrected submittals using same procedure indicated above and listed in this section. Include required number of copies for subsequent re-submission.
- .9 Distribution:
 - .1 Proceed with Work affected by submittals only after Consultant's review is complete.
 - .2 Distribute copies of accepted submittals as required. Deliver one copy to Owner or Owner's Representative for project management.
 - .3 Keep one copy of each reviewed submittal on site during performance of Work.

1.3 ACTION SUBMITTALS

- .1 Manufacturer's System Letter:
 - .1 Upon award of the work, and prior to loading, the roofing contractor must provide a System Letter from the membrane manufacturer, which clearly states the appropriate mechanical fastening and / or adhesive fastening patterns for the specified assembly based upon CSA 123.21-14 Wind Uplift testing.
 - .2 System letter shall include reference to the Specified Wind Uplift Pressures stated Scope of Work.
 - .3 System Letter shall include a copy of the applicable Roof System Assessment Report of Wind Uplift Resistance (or proprietary equivalent), including specific sizes / gauges / TPI of fasteners, size and shape of insulation or membrane plates, and size of adhesive row(s).
 - .1 Shop drawings of required fastener and plate or adhesive row placement is encouraged from the manufacturer to assist the field forces of the roofing contractor.
 - .4 Work performed prior to receipt of System Letter may be rejected if not compliant with the Design Letter.
- .2 Shop Drawings:
 - .1 Definition: "Shop Drawings" to mean drawings, diagrams, illustrations, schedules, performance charts, brochures and other data to illustrate details of a portion of Work.
 - .2 Number of Copies: Submit three (3) copies of shop drawings for each requirement identified and requested in technical sections, and as many additional copies as Consultant may reasonably request.
 - .1 Where shop drawings will not be prepared due to standardized manufacture of product, submit copies of product data sheets or brochures.
 - .3 Identify and Indicate: Products and materials to be used, methods of construction, attachment or anchorage, erection diagrams, connection diagrams, explanatory notes, and any other information necessary for completion of Work.
 - .1 Where articles or equipment attach to or connect to other articles or equipment, indicate that such items have been coordinated; regardless of Section under which adjacent items to be supplied and installed. Indicate cross references to design drawings and specifications.
 - .4 Drawings and Diagrams:
 - .1 Field Measurements: Note critical dimensions established by field measurement and any relationships to other critical features of Work.
 - .2 Project specific information and dimensions to be drawn accurately to scale.
 - .3 Manufacturer's Standard Drawings: Supplement standard information to provide detail specifically applicable to project. Modify to delete information not applicable to project.

- .4 Measurements and Units: Present shop drawings, product data, samples, and mock-ups in SI Metric units. Where items or information are not produced in SI Metric units, converted values are acceptable.
- .5 Submittals to Include:
 - .1 Date and revision dates,
 - .2 Project title and number,
 - .3 Name and address of Subcontractor, Supplier, and Manufacturer,
 - .4 Contractor's stamp, signed by authorized representative certifying approval of submissions, verification of field measurements, and compliance with Contract Documents,
 - .5 Where required, licensed Engineer's signed and dated stamp or seal, valid for Place of Work,
 - .6 Details for appropriate portions of Work, as applicable including:
 - .1 Fabrication,
 - .2 Dimensioned layouts, including field dimensions and clearances,
 - .3 Setting or erection details,
 - .4 Capacities,
 - .5 Performance characteristics,
 - .6 Standards,
 - .7 Operating weight,
 - .8 Wiring diagrams,
 - .9 Single line and schematic diagrams,
 - .10 Relationship to adjacent work.
- .6 Changes and Adjustments:
 - .1 Make noted changes to shop drawings as Consultant may require, consistent with Contract Documents. When re-submitting notify Consultant in writing of any revisions other than those requested.
 - .2 Adjustments to shop drawings made by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .3 Samples:
 - .1 Number of Copies: Submit duplicate (2) samples for each requirement identified and requested in technical sections, and as many additional sample copies as Consultant may reasonably request.
 - .2 Identify and Indicate: Label sample's source or manufacture, material, size, model number, and intended usage in Work.

- .3 Sample Size:
 - .1 Full size samples, cured and finished, as indicated in technical sections,
 - .2 Physically identical to product proposed for use in Work,
 - .3 Prepared from same materials and methods to be used for installation of Work.
- .4 Mount, display, or otherwise package samples in sufficient way to facilitate review of sample for quality.
- .5 Where colour, pattern, or texture is criterion, submit full range of samples.
- .6 Notify Consultant in writing, at time of submission, of any deviations in samples provided from requirements of Contract Documents.
- .7 Changes and Adjustments:
 - .1 Make noted changes to samples as Consultant may require, consistent with Contract Documents.
 - .2 Adjustments to samples made by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .8 Do not proceed with any Work associated with samples until each has been reviewed and accepted by Consultant.
 - .1 Acceptance of samples to be noted in writing by Consultant.
- .9 At least one of each accepted sample to be returned to Contractor to store on site.
- .10 Reviewed and accepted samples to become standard of workmanship and material referenced for comparison and verification of finished Work.
- .4 Mock-ups:
 - .1 Erect sample mock-ups for each requirement identified and requested in technical sections, and as requested by Consultant.
 - .2 Mock-ups to be full scale and in section sizes as identified in technical section or as requested by Consultant.
 - .3 Coordinate location for onsite installation of mock-ups with Consultant.
 - .4 Deliver one submittal letter noting completion of mock-up installation and requesting on site review by Consultant.
 - .5 Do not proceed with any Work associated with mock-up until it has been reviewed and accepted by Consultant.
 - .1 Acceptance of mock-ups to be noted in writing by Consultant.
 - .6 Accepted mock-up to constitute minimum project standard of workmanship and material to be maintained throughout performance of Work.
 - .7 Maintain and protect mock-ups on site during progress of Work as reference for comparison and verification of finished Work.

.1 Any Work completed after review not meeting mock-up standard to be removed and reinstalled, at Consultant's discretion, with new materials at no additional cost to Owner.

1.4 INFORMATIONAL SUBMITTALS

- .1 General:
 - .1 Number of Copies: Unless otherwise noted, submit three (3) copies for each requirement identified and requested in technical sections, and as many additional copies as Consultant may reasonably request.
- .2 Copy of the Scope appropriate Notice of Project (NOP) filed with WorkSafe BC for Place of Work.
- .3 Insurance and Bonds: True copies of transcripts for specified insurance and bonds:
 - .1 Naming Owner as Additional Insured,
 - .2 Indicating amount and type of coverage,
 - .3 Notarized and executed.
- .4 Manufacturer's Safety Data Sheets (SDS):
 - .1 Published or written information documenting physical and chemical characteristics of products to be installed with handling, safety, and first aid guidelines, including:
 - .1 Manufacturer's name,
 - .2 Product name and model number,
 - .3 Current and latest edition.
- .5 Trade or Installer Qualifications:
 - .1 Present accreditation cards or tickets, or true copy of, to QA Observer at start of Work and whenever Observer requests, containing:
 - .1 Name and photo of qualifying individual,
 - .2 Identification of training type or certification received,
 - .3 Date achieved or received, or expiry of certification.
- .6 Applications for Payment:
 - .1 One copy by courier, fax, or email with all required accompanying submittals and documentation in accordance with Section 01 29 00 Payment Procedures. Send additional copies to Diane Schibild of IRC at dschibild@ircgroup.com.
- .7 Closeout Submittals:
 - .1 Upon completion and acceptance of Work, deliver copies of submittals in accordance with Section 01 77 00 Closeout Submittals.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION - 01 33 00

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PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section includes for compliance and submittals required for health and safety during Work.

1.2 REFERENCES

- .1 Federal regulations, latest edition including all amendments up to project date:
 - .1 Fire Commissioners of Canada, FC 301, Standard for Construction Operations.
 - .2 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
- .2 Provincial regulations, latest edition including all amendments up to project date:
 - .1 Provincial or National Building Code for Place of Work.
 - .2 WorkSafe BC Workers Compensation Act, OHS Regulations, Policies, Guidelines, WCB Standards, and Other OHS Legislation.

1.3 SUBMITTALS

- .1 Informational Submittals:
 - .1 Copy of the Scope appropriate Notice of Project (NOP) filed with WorkSafe BC for Place of Work.
 - .1 Submit to WSBC in accordance with OH Regulation 20.2 and if appropriate, OH Regulation 20.2.1.
 - .2 Contractor shall have their current Health and Safety Plan for Specific Work Site ready and available for review if required, including, but not limited to:
 - .1 Name and contact info of Contractor's Health and Safety Representative for Work Site; including twenty-four (24) hour emergency contact phone numbers.
 - .2 Phone numbers of local fire, police, and ambulance outside of 911 services.
 - .3 Location of nearest medical facility and level of injury that each can service.
 - .4 Copies of certification for all employees on site of applicable safety training including, but not limited to:
 - .1 Workplace Hazardous Materials Information System (WHMIS).
 - .2 Fall arrest and protection.
 - .3 Suspended Access Equipment
 - .4 License for powder actuated devices.
 - .5 Safety Data Sheets (SDS) of controlled products to be used.
 - .6 On-site Contingency and Emergency Response Plan addressing:
 - .1 Standard procedures to be implemented during emergency situations.

- .2 Preventative planning and protocols to address possible emergency situations. For example, if swing stage work is required, list protocol to be followed if supporting cable breaks.
- .7 Guidelines for handling, storing, and disposing of hazardous materials that may be encountered on site, including measures to prevent damage or injury in case of an accidental spill.
- .3 Incident and accident reports, promptly if and upon occurrence.
- .4 Make submittals in accordance with Section 01 33 00 Submittal Procedures.

1.4 **RESPONSIBILITY**

- .1 Contractor responsible for health and safety of persons on Work Site and for protection of persons adjacent to Site to extent that they may be affected by performance of Work.
- .2 Contractor responsible for safety of property and environment on Work Site and for protection of same adjacent to Site to extent that they may be affected by performance of Work.
- .3 Contractor is responsible for health and safety at Work Site and is not relieved by Consultant's review of Health and Safety Plan for Specific Work Site.

1.5 OCCUPATIONAL HEALTH AND SAFETY

- .1 Comply and conform to all health and safety work practices in accordance with regulations and authorities having jurisdiction at Place of Work including, but not limited to:
 - .1 WHMIS awareness and training.
 - .2 Fall-arrest, temporary guardrails, and travel-restraint systems.
 - .3 Eye protection, hardhats, and safety boots.
- .2 Maintain one reference copy on site of Occupational Health and Safety Act and Regulations for Construction Projects for Place of Work, latest edition.
- .3 Ensure that all personnel are adequately equipped to comply with safety regulations and that sufficient safety equipment is available.
- .4 Provide at Work Site sufficient equipment to supply first aid.
- .5 Promptly report to Owner and Consultant all accidents, and any claims made against Contractor or Subcontractor on account of accident.
- .6 Enforce proper work methods and act immediately on directions regarding safety and work practices given by authorities having jurisdiction or by Owner, at no additional cost to Owner.
- .7 Failure of Contractor to comply with verbal or written instructions or orders from the WorkSafe BC Inspector, other authorities, Owner, or Consultant regarding safe work practices or provision of specified requirements under regulations to be considered in Non-Compliance with Contract.
 - .1 Regulatory agencies, Owner, or Consultant may stop Work for failure to rectify noncompliance of health and safety regulations at no cost to the Owner.

1.6 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

.1 Contractor to be familiar with WHMIS regulations and be responsible for compliance.

- .2 Controlled products to be properly labeled.
- .3 Provide proper warning labels and training at workplace.
- .4 Provide copies of safety data sheets (SDS) for any controlled product in workplace.
- .5 Be responsible for all other requirements of regulations as applicable to Employers.
- .6 Contractor shall, before commencing work, provide Owner with a proposal as to how hazardous materials will be stored and dispensed on-site. Specifically outline measures to be taken to prevent damage or injury in event of an accidental spill. Immediately inform Owner and Consultant if any unforeseen or peculiar safety-related factor, hazard, or condition becomes evident during performance of Work.

1.7 SAFETY AND PROTECTION

- .1 Latest edition of all listed references to apply:
 - .1 CAN/CSA S269.2M: Access Scaffolding for Construction Purposes.
 - .2 Fire Commissioner of Canada: FC 301 Standard for Construction Operations.
- .2 The Roof Contractor shall be designated as "Prime Contractor" and will be responsible to ensure that Section 118 of the WSBC Act and Regulation 20.3 are complied with.
 - .1 The Roofing Contractor / "Prime Contractor" is responsible, among other things, for:
 - .1 Establishing a system of roof orientations; and
 - .2 Establishing a system of supervision for all workers on the roof; and
 - .3 Ensuring all employers' workers who access the roof comply with regulations, and the act including insuring documented fall protection planning, access/egress, first aid & emergency procedure issues are addressed.
 - .2 The Prime Contractor is responsible for ensuring that every employee and worker who access the roof area for which he / she is primarily responsible, complies with all WSBC regulations.
 - .3 Workers at the roofing construction site include: sub-trades, delivery personnel, visitors, consultants, & owner's agents / employees.
- .3 Fire Safety:
 - .1 The Contractor has sole responsibility for fire protection. The Consultant and the Owner assume no role in managing fire safety. Comments and observations may be made by the Consultant regarding fire protection materials, such as fire tape, that are incorporated into the roofing system to help ensure quality relating to the proper use and installation of the materials; this is not to be interpreted as approval of the adequacy for the fire prevention measures that the Contractor is using.
 - .2 The Consultant or Owner may comment verbally, or in writing, on work activities that appear unsafe including fire safety measures, as it is everyone's responsibility on a job site to report potentially unsafe conditions to the Prime Contractor. Such comments are based on isolated observations and are not to be considered safety audits, and are not to be construed as a safety review, which is not part of the professional obligation of the Consultant. The Consultant and Owner are not assuming an expanded role of monitoring site safety by providing any safety related comments, and are intended to show support for the WSBC "Safety is Everyone's Business!" initiative.

- .3 Contractor is responsible at all times for determining and assessing fire risk and for taking all necessary precautions and to employ whatever means and methods that are required to protect the roofing assembly and the building from exposure to flame and the risk of fire.
 - .1 Contractor shall consider all products manufactured or approved by the primary membrane manufacturer, including self-adhering, cold process and liquid, as approved for use in areas they have determined to be flame sensitive as part of their risk assessment process.
 - .2 The Consultant may review and comment on the Contractor's use of these materials to help ensure conformance with the design intent and performance expectations of permanently installed materials.
- .4 Contractor must keep charged and ready fire extinguishers on site at all times, including on roof and at access points to building interior.
- .5 Contractor is responsible to provide a minimum two (2) hour fire watch at completion of each day's activities on all projects implementing use of propane torches and/or burners. Longer fire watches may be required is deemed necessary by WSBC or the Owner, or due to site specific hazards as determined by the Contractor.
- .6 At minimum, a handheld, thermal optic camera suitable for roofing applications and fire alert must be kept on site at all times during torching procedures. Check seams and flashings at regular intervals for flare ups. Check adjacent attic spaces to review the back side of the work area when applicable. This activity is to be recorded by the roofing contractor. If Contractor's requirements are greater, the higher standard shall be followed.
- .4 Solvents, Adhesives and Membranes:
 - .1 Store only enough solvents and adhesives on roof for same day's use. Do not leave adhesives on roof over night. Manufacturer supplied adhesives should be stored in their overnight containers. Minimum temperature for solvent based adhesives and primers is -5°C (23°F).
 - .2 Do not install roof membrane when temperature remains below 5°C (41°F) for selfadhered installations. Apply materials in accordance with manufacturer's recommendations and in accordance with Canadian Modified Bitumen Manufacturer's Association.
 - .3 Refer to Manufacturer's literature for additional guidelines.
 - .4 Protect walls where hoisting is required.
 - .5 Protect roofs from damage due to traffic and materials handling until completion.
 - .6 Keep a fire extinguisher at access to building interior wherever solvent based products are stored or used.

1.8 WELDING AND CUTTING

- .1 Safety Provisions
 - .1 Ensure compliance with following regulations regarding welding and cutting operations and other operations generating flames, sparks, smoke, and heat;

- .1 Prior to commencement of welding/cutting/torching operations confirm with Consultant or Owner's Representative.
- .2 Provide as a minimum a Type ABC 20lb, dry chemical fire extinguisher and a small hose at all welding, cutting and torching locations. Ensure a knowledgeable operator trained in its use is provided at all times.
- .2 Safety Procedures by Contractor
 - .1 Clear area in immediate vicinity of welding, cutting and torching locations as much as possible of combustible materials and refuse and obstacles to operations.
 - .2 Cover or protected with a non-combustible material all combustible materials which cannot be removed to satisfaction of Consultant and Owner's Representative. Provide shielding to prevent spread of sparks and molten metal from welding, cutting and torching operations.
 - .3 Shield or otherwise protect sprinkler heads, smoke and heat detectors from any welding, cutting and torching operations. If it is likely that shielding will not prevent activation of any of these devices, it to be necessary to have affected fire protection zones(s) isolated for duration of any of operation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION - 01 35 23

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PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Barriers
- .2 Environmental Controls
- .3 Fall Arrest
- .4 Traffic Controls
- .5 Fire Routes

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.189M Primer, Alkyd, Wood, Exterior
 - .2 CGSB 1.59 Alkyd Exterior Gloss Enamel
- .2 Canadian Standards Association (CSA)
 - .1 CSA O121M Douglas Fir Plywood
- .3 Occupational Health and Safety Act and regulations for Construction Projects.
- .4 Canadian Standards Association (CSA), CSA S350-M, Code of Practice for Safety in Demolition of Structures.
- .5 Comply with National Building Code of Canada, Part 8, "Safety Measures at Construction and Demolition Sites", and Provincial requirements.

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.4 WORK AREA HOARDING

- .1 Erect temporary site enclosures where required using:
 - .1 38 x 89mm (2" x 4") construction grade lumber framing at 600mm (2') centres and 1200 x 2400 x 13mm (4' x 8' x .5") exterior grade fir plywood to CSA O121. Apply plywood panels vertically flush and butt jointed.
 - .2 1800 mm (6') high interlocking steel fence, with openings no greater than 38 mm (1.5")
- .2 Where required provide a minimum of one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .3 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.

- .4 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189M and one coat exterior paint to CAN/CGSB 1.59. Maintain public side of enclosure in clean condition.
- .5 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.5 COVERED HOARDING

- .1 Covered hoardings will be required when working over exits that serve as fire exits and locations where entrance or exit is required to remain open during work as stipulated by Owner.
- .2 Covered hoardings to be erected from vertical face of exit/entrance a minimum of:
 - .1 A line from top of work extending on 60° angle from vertical, or
 - .2 6000mm (20') long.
- .3 Covered hoardings to be provided when work occurs overhead of following:
 - .1 Emergency exits
 - .2 Safe Areas
 - .3 Emergency access roads
 - .4 Entrances and exits determined by Owner to remain open during work
 - .5 Entrances and exits required to remain open to provide adequate egress in and out of building.
- .4 Covered hoardings for pedestrian traffic to be constructed as follows:
 - .1 Scaffolding frames with X-bracing at 2400mm (8') o/c;
 - .2 2"x10' planks across top of frames tight together fastened to scaffolding frames;
 - .3 19 mm (.75") plywood fastened to top of 2"x10' planks;
 - .4 Minimum 12.7 mm (.5") plywood on 38 x 89 mm framing side walls set inside of overhead framing;
 - .5 Hoarding to be constructed to provide unobstructed sight lines both into and out of any enclosed spaces, with 203mm (8") open spaces between sheathing. Netting or mesh strips are to be used to cover the openings.
 - .6 Provide and maintain lighting to a minimum of 50 lux, constructed in a fashion that will mitigate vandalism.
- .5 Covered hoardings for Access roads and Safe Areas to be designed by a Professional Engineer licensed in province for Place of Work under guidelines of provincial Occupational Health and Safety Act and with local authorities having jurisdiction.

1.6 WORKING FROM ROOF

- .1 If and when work is performed on roof, existing roof composition to be protected by following:
 - .1 Minimum 25mm (1") rigid insulation;

.2 12.7 mm (.5") plywood sheathing.

1.7 FALL ARREST

- .1 Conform to requirements of Occupational Health and Safety Act and regulations for Construction projects. Refer to Section 01 35 23 for additional information.
- .2 Any modifications or additions to the building such as guardrails, fall restraint systems, etc. are to be removed from the site at the completion of the work and the work made good.
 - .1 Any inability to restore the work to an as built condition is to be brought to the attention of the Consultant and Owner for review and discussion.

1.8 WEATHER ENCLOSURES

- .1 Weather to be considered incidental to work and to not be claimed as additional.
- .2 Applicable standard to be used for materials or building components when enclosures and/or heating is required to complete work.
- .3 Provide weather tight closures for, but not limited to:
 - .1 Unfinished door and window openings;
 - .2 Openings in floors and roofs;
 - .3 Openings through walls;
 - .4 Locations where daily work is not completed in a day's work and components left exposed are sensitive to weather conditions;
 - .5 Protection of materials used that are sensitive to weather conditions.
- .4 Design enclosures to withstand wind pressure, snow loading etc.

1.9 DUST TIGHT SCREENS

- .1 Provide dust tight screens to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.
- .3 Provide means for ventilating area if work is to occur in an interior or confined space.
- .4 Ventilate work area when it corresponds with areas used by tenants or patrons concurrently for parking or egress. If dust generation will affect tenants or patrons provide sealed enclosure with adequate ventilation for health and safety of workers.

1.10 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- .2 Provide all appropriate signage directing public and building occupants away from work area
- .3 Emergency exits: Maintain clear and unobstructed use of all existing exit doors and routes. This may include provision of overhead protection and enclosed exit walkways in case of overhead work. Provide adequate lighting for 24 hour use.

1.11 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.12 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- .2 Provide all required signage to inform emergency vehicles of temporary route for access if modified as part of work.

1.13 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.14 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Consultant locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

END OF SECTION - 01 56 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Consideration of Substantial Performance
- .2 Review and QA Observations required for applications of Substantial Performance and Total Completion
- .3 Closeout Submittals

PART 2 - (NOT USED)

PART 3 - EXECUTION

3.1 EXAMINATION AND DECLARATION

- .1 Contractor and all Subcontractors to conduct a review of Work; identify deficiencies and defects in preparation of list for application of Substantial Performance.
- .2 Consultant will schedule date within time allowance of Contract documents for both Consultant and Contractor to perform review of Work and to confirm Work identified on submitted list.
- .3 Consultant will within time allowance of Contract documents provide a breakdown of costs associated with deficiencies and defects for Consideration of Substantial Performance.
- .4 If Work is deemed incomplete in Consideration of Substantial Performance, complete outstanding items and request additional review following same protocol.
- .5 When Contractor is satisfied that Work is completed make application for final review by Consultant. Consultant will within allowances of Contract documents perform final review of Work.
- .6 Any deficiencies and defects to be tabulated with associated costing for Consideration of Completion.
- .7 If Work is deemed incomplete by Consultant, complete outstanding items and request additional review.
- .8 Defective products will be rejected, regardless of previous review and observations. Replace products with new at no expense to Owner.

3.2 MAINTENANCE AND RECORD DOCUMENTS

- .1 Following to be submitted to Owner at completion of Work:
 - .1 Maintenance manuals for, but not limited to, operating instructions, maintenance manuals, record of "as built" drawings, spare parts, maintenance of materials, special tools for completeness.
 - .2 Record of substantial and project completion correspondence inclusive, but not limited to Contractor lists, Consultant tabulations and certificates.
 - .3 Compile all shop drawings that have been submitted.

3.3 RECORDING ACTUAL SITE CONDITIONS

.1 Submit Actual Conditions as outlined in following sentences.

- .2 Record information on set of Project Specifications provided by Consultant.
- .3 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .4 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .5 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .2 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .3 Field changes of dimension and detail.
 - .4 Changes made by change orders.
 - .5 Details not on original Contract Drawings.
 - .6 References to related shop drawings and modifications.
- .6 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.

3.4 WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after certification of completion.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.

3.5 FORMAT

- .1 Organize data in form of an instructional manual.
 - .1 Binders to be vinyl, hard covered, 3 'D' ring, loose leaf 219mm x 279mm (8.5" x11") with spine and face pockets.
 - .2 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .3 Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .4 Arrange content under Section numbers and sequence of Table of Contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Manufacturer's printed data, or typewritten data will be accepted.
- .7 Drawings to be provided with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3.6 CONTRACT CLOSE-OUT

- .1 Expedite and complete deficiencies and defects identified by Consultants.
- .2 Submit required documentation such as statutory declarations, Workers' Compensation Certificates, warranties, certificates of approval or acceptance from regulating bodies.
- .3 Review QA Observation and testing reports to verify conformance to intent of documents and that changes, repairs or replacements have been completed.
- .4 Provide on-going review, examination and attendance to building, call-back, maintenance and repair problems during Warranty periods.
- .5 Provide warranties and bonds fully executed and notarized.
- .6 Execute transition of Performance of Labour and Materials Payment Bond to warranty period requirements.
- .7 Collect and assemble documents executed by Subcontractors, suppliers and manufacturers.

END OF SECTION - 01 77 00

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PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 11 00 Summary of Work
- .2 Section 01 56 00 Temporary Barriers and Enclosures
- .3 Section 07 52 00 SBS Modified Bituminous Roofing Membrane

1.2 REFERENCES

- .1 Latest edition of all listed references to apply:
 - .1 Canadian Standards Association CSA S350, Code of Practice for Safety in Demolition of Structures.
 - .2 National Building Code of Canada, Part 8, "Safety Measures at Construction and Demolition Sites", and Provincial requirements.
 - .3 Occupational Health and Safety Act and regulations for Construction Projects.
 - .4 Canadian Environmental Protection Act (CEPA).
 - .5 Canadian Environmental Assessment Act (CEAA).
 - .6 Transportation of Dangerous Goods Act (TDGA).

1.3 ASBESTOS AND DESIGNATED SUBSTANCES

- .1 Demolition of spray or trowel applied asbestos can be hazardous to health. Notify Consultant if material resembling spray or trowel applied asbestos is encountered on site. Stop work and do not proceed with further removal until written instructions have been received from Consultant.
 - .1 Abatement procedures for Asbestos Containing Materials (ACM) pertinent to successful performance of Work to be paid for by Owner, preapproved by Consultant, as an extra cost to Contract.
 - .2 All ACM work to be in compliance with current provincial asbestos abatement regulations for Place of Work.

1.4 STORAGE AND PROTECTION

- .1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Consultant and at no cost to Owner.
- .2 In all circumstances, ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Protect trees, plants and foliage on site and adjacent properties where indicated.

1.5 EXISTING CONDITIONS

- .1 Prior to start of any demolition work, remove contaminated or hazardous materials from site and dispose of at designated disposal facilities. All metals to be recycled.
- .2 Record and discuss with Consultant any deviations from existing assumed conditions as indicated by drawings and/or specifications.

1.6 **REGULATORY REQUIREMENTS**

.1 Ensure all work is performed in compliance with CEPA, CEAA, TDGA, and all applicable provincial regulations.

1.7 NOTICE

.1 Provide a minimum twenty-four (24) hour notice to Consultant and Owner prior to proceeding with any work that may disrupt building access or services.

PART 2 - NOT USED

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Examine site with Consultant and verify extent and location of items designated for removal, disposal, recycling, salvage and items to remain. Removal of HVAC units requires confirmation by Owner's Representative.
- .2 Locate and protect utilities where applicable. Notify and obtain approval of utility companies before starting demolition.

3.2 GENERAL PROTECTION

- .1 Prevent movement, settlement, or other damage to adjacent structures, utilities, and parts of building to remain in place. Provide engineered bracing and shoring as required.
- .2 Minimize noise, dust, and inconvenience to occupants.
- .3 Protect existing building systems, services and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .5 Provide required signage, barricades, hoarding, overhead protection and temporary egress.
- .6 Support affected structure or building components and if safety of structure being demolished or adjacent structures or services appears to be endangered, take preventative measures and then cease operations and notify Consultant immediately.
- .7 Ensure that demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .8 Do not dispose of waste or volatile materials such as: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers. Ensure proper disposal procedures are maintained throughout project.
- .9 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .10 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
- .11 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.

.12 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

3.3 DEMOLITION SALVAGE AND DISPOSAL

- .1 Remove parts of existing structure or roof system to permit repairs or new installation. Sort materials into appropriate piles for recycling and or reuse.
- .2 Carry in Base Bid Price all costs to salvage, protect from harm, and re-use following components, unless indicated otherwise elsewhere in specifications:
 - .1 Existing skylights, mechanical equipment, cladding, stairs and ladders, satellite and communications equipment, electrical lines, and service lines, etc.
- .3 Refer to drawings and specifications for items identified for reuse or salvage, if applicable.
- .4 Remove items to be reused, store in a protected location, and reinstall under appropriate section of specification.
- .5 Trim edges of partially demolished building elements to suit future use.
- .6 Include for disposal of removed materials to appropriate landfill and/or recycling facilities, except where specified otherwise, and in accordance with authority having jurisdiction.
 - .1 Where possible, all existing recyclable materials, gravel, asphalt products, etc. to be transported to an appropriate recycling facility.
 - .2 Provide location of local facility receiving removed recyclable materials to Owner and Consultant.
- .7 Dispose of debris on a continuous basis. Do not stockpile debris in a manner which would overload structure, or impede access around site.

3.4 SEQUENCE OF OPERATION

- .1 Removal:
 - .1 Remove items as indicated in technical sections, including roofing ballast or gravel, metal roof flashings, roofing membrane and flashings, roof insulation, and or vapour retarder.
 - .1 Do not disturb items designated to remain in place.
 - .2 Restrict roofing demolition work to sections in limited size that will be restored and made watertight by end of working day.
 - .3 Use extreme caution when performing demolition work around skylights, sloped glazing, and other force and vibration sensitive roof projections.
- .2 Removal From Site:
 - .1 Interim removal of stockpiled material may be required, if it is deemed to interfere with operations of Owner.
 - .2 Do not overload existing roof structures.
- .3 Salvage:
 - .1 Carefully dismantle items containing materials for salvage and stockpile salvaged materials at locations acceptable to Owner and Consultant.

.4 Disposal of Material:

- .1 Dispose of materials not designated for salvage or reuse on site to be hauled to an authorized disposal site and or recycling facilities.
- .5 Backfill:
 - .1 Backfill in areas as indicated.

3.5 ABANDONED AND UNUSED ITEMS

- .1 Items of unused and/or abandoned rooftop equipment, units, service lines, cabling, and any related supports which are not operational or in use are to be removed and disposed of.
- .2 Existing services for abandoned equipment to be dismantled to below roof deck, and closed off in accordance with local bylaws and Code requirements. Confirm all electrical lockout procedures with Owner's representative.
- .3 Existing roof deck openings to be closed using following guidelines:
 - .1 Openings greater than 152mm (6") in diameter or 152mm x 152mm (6" x 6"):
 - .1 Wood Planking: Replace with SPF #1 grade boards to match existing thickness. All replacement decking shall have 3 points of bearing. Provide new framing to match original as required.
 - .2 Plywood Decking: Replace with No.1 construction grade plywood sheathing, Good One Side (G1S), to match existing thickness. All replacement decking shall have 3 points of bearing and installed in logical rectangular shapes. New plywood decking to be supported by at least half thickness of roof joist, truss, or rafter underneath. Provide galv. H-clips to existing decking on unsupported sides.
 - .2 Openings greater than 915mm x 915mm (3' x 3'):
 - .1 Consult Structural Engineer for deck review and design of new framing, decking, securement, and any other required support.

3.6 DECK REPAIRS

.1 Wood Decking: Areas of deteriorated wood planking or plywood decking to be cut out and replaced with new to match existing.

3.7 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use only soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.8 CLEANUP

- .1 Upon completion of work, remove debris, trim surfaces and leave work site clean.
- .2 Use only cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

END OF SECTION - 02 41 19

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PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 11 00 Summary of Work
- .2 Section 01 56 00 Temporary Barriers and Enclosures
- .3 Section 02 41 19 Selective Demolition and Removal
- .4 Section 07 52 00 SBS Modified Bituminous Roofing
- .5 Section 07 62 00 Sheet Metal Flashing and Trim

1.2 REFERENCES

- .1 Latest edition of all listed references to apply:
 - .1 American Lumber Standards Committee (ALSC): Softwood Lumber Standards.
 - .2 American Plywood Association (APA) Product Guide: Grades and Specifications.
 - .3 American Wood Preservers Assoc. (AWPA): Timber Products Pressure Treatment.
 - .4 Canadian Standards Association (CAN/CSA):
 - .1 CAN/CSA B111: Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164M: Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA O121M: Douglas Fir Plywood.
 - .4 CAN/CSA-O141-91: Softwood Lumber.
 - .5 CAN/CSA O151M: Canadian Softwood Plywood.
 - .6 CAN/CSA-O325.0: Construction Sheathing.
 - .5 National Forest Products Association (NFPA): Grading Rules.
 - .6 National Lumber Grades Authority (NLGA): Stnd. Grading Rules, Canadian Lumber.

1.3 QUALITY ASSURANCE

- .1 Lumber identification to be by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification to be by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification to be by grademark in accordance with applicable CSA standards.
- .4 At all times during Work, Contractor will have on site a qualified project supervisor. It will be Supervisor's responsibility to ensure that Work is carried out in an efficient manner, according to Plans and Specifications.
- .5 Provide shop drawings of carpentry details or interfaces for Consultants review.

.6 Where requested, mock-up of exposed carpentry shall be made available for review of Owner and Consultant. This may be submitted by partial constructed components..

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Protect lumber and other products from dampness both during and after delivery at site.
- .2 Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- .3 Stack plywood and other board products so as to prevent warping.
- .4 Locate stacks on well drained areas, supported at least 152mm (6") above grade and cover with tarpaulins with sufficient to protect lumber from driving rain.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Set aside damaged wood and dimensional lumber off-cuts for acceptable alternative uses (e.g. bracing, blocking, cripples, bridging, finger-joining, or ties). Store this separated reusable wood waste convenient to cutting station and area of work.
- .2 Separate and recycle waste materials in accordance with applicable local, provincial and national regulations. Include for tipping fees associated with landfills and recycling depots
- .3 Unused preservatives and fire retardant materials are to be diverted from landfill through disposal at a special wastes depot.
- .4 Do not burn scrap at project site.
- .5 Fold up metal banding, flatten, and place in designated area for recycling.

PART 2 - PRODUCTS

2.1 LUMBER MATERIALS

- .1 Materials to be best merchantable lumber, straight and sized and shaped to correct dimensions from nominal sizes noted on drawings. Lumber to be selected from well seasoned stock, free from loose resinous knots, shakes, waxed edges, splits, dry rot or other defects which would impair strength or durability.
- .2 Lumber in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 Unless specified otherwise all framing members to be No.1/No.2 SPF.
- .4 All materials directly exposed to exterior or concrete surfaces to be pressure treated unless noted otherwise on drawings or elsewhere in specification.
- .5 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers to be pressure treated where exposed to exterior or concrete elements.
- .6 Moisture Content:
 - .1 At time of delivery and maintained at site.
 - .1 Boards and lumber 51mm (2") and less in thickness: 19% or less.

- .2 Lumber over 51mm (2") thick: 25% or less.
- .7 Preservative Treatment:
 - .1 All wood exposed to exterior environmental conditions, in contact with concrete or masonry to be treated with roof preservative.
 - .2 Do not treat Heart Redwood and Western Red Cedar.
 - .3 Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610mm (24") from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members used in connection with roofing and flashing materials.
 - .4 Treat other members specified as preservative treated (PT).
 - .5 Preservative treatment by pressure method to ASTM D1760; except any process involving use of prohibited Chromated Copper Arsenate (CCA) or Alkaline Copper Quaternary (ACQ).

2.2 PANEL MATERIALS

- .1 Douglas fir plywood (DFP): to CSA O121, standard construction, Good one side (G1S) when in contact with roofing membrane.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction, Good one side (G1S) when in contact with roofing membrane.
- .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O323.

2.3 ACCESSORIES

- .1 Bent metal plate: 18ga or 22ga, galvanized metal sheet, formed as required or as indicated on drawings to provide support for wood blocking or roof assembly components.
- .2 Anchorage to hollow masonry and gypsum walls: Galvanized toggle bolts.
- .3 Anchorage to solid masonry or concrete: Expansion shields and lag bolts:
 - .1 Rawl mushroom head lead anchors, min 6mm (0.25") diameter for sheathing,
 - .2 Hilti Kwik-Bolts for structural members.
- .4 Anchorage of wood members to sheet steel studs: Corrosion coated screws, min #14 thread, of length to penetrate minimum 19mm (0.75") through material into base.
- .5 Nails: Minimum 6d, hot dip galvanized spiral or ring shank nails, length to penetrate through material 38mm (1.5") into base. Common nails are not acceptable.
- .6 Anchorage of wood blocking to masonry: Masonry screws, Tapcon anchors of sufficient length to penetrate 32mm (1.25") into masonry surfaces.
- .7 Batt Insulation: Stone wool mineral fiber batt insulation, Rockwool by Roxul Inc.
- .8 Explosive actuated fastening devices are prohibited for use on this project.

2.4 ACCESSORY FINISHES

- .1 Galvanizing: to CAN/CSA-G164:
 - .1 Galvanized fasteners for all exterior work unless otherwise specified.
 - .2 Galvanized fasteners for all high interior humid areas unless otherwise specified.
- .2 Use stainless steel type 304 where noted on drawings.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Comply with safety regulations and applicable bylaws governing work included in this section. Provide and maintain necessary barriers, guards and rails.
- .2 Scope of work includes parapet wall, roof joint, and wall modifications as indicated on drawings or as required to provide a secure, smooth surface to receive the new roof and flashing assembly:
 - .1 Install wood blocking secured into existing surfaces adequately to resist movement and wind uplift forces as per FMG 1-49, minimum 200 pounds/foot.
 - .2 Install mineral fiber insulation at all voids and as indicated on drawings.
 - .3 Install plywood sheathing to drawings.
- .3 Complete wood blocking and sheathing to walls, curbs and drains as indicated on drawings.

3.2 SITE APPLIED WOOD TREATMENTS

- .1 Treat only wood blocking which will remain exposed to the elements.
- .2 Treat ends of site cut surfaces of materials delivered to site with wood preservative.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Apply wood treatments following manufacturer's instructions, and handle as per Safety Data Sheet instructions.

3.3 INSTALLATION

- .1 Comply with requirements of local Building Codes:
 - .1 Ensure continuity and completeness of vapour retarder membrane as coinciding with new wood blocking installation.
 - .2 Provide mineral wool insulation to fill voids at roof deck level or as otherwise required or indicated on detail drawings.
 - .3 Install furring and blocking as required to space-out and support new walls, window projections and louver extensions, fascia, soffit, siding and other work as required.
 - .4 Align and plumb faces of furring and blocking to tolerance of 1:600.
 - .5 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

- .6 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure with adequate fasteners.
- .7 Install sleepers as indicated.

3.4 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

END OF SECTION - 06 10 00

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PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Installation of a new roof system over prepared substrate.
- .2 Existing roofing components and related appurtenances to be removed including all unused curbs, sleepers and equipment as noted on the Roof Plan and specified herein in preparation for installation of a new low slope roof system including but not limited to:
 - .1 Roof Areas 3.1, 3.2, 3.3, and (2.1 Separate Price): Remove existing pea gravel, built up roofing membranes, fibreboard insulation, and kraft vapour retarder down to the existing wood (Roofs 2.1 and 3.1) or plywood (Roofs 3.2 and 3.3) decks, and install new replacement 2 ply SBS modified bitumen membrane system in accordance with this Section.

1.2 RELATED SECTIONS

- .1 Section 01 11 00 Summary of Work.
- .2 Section 01 35 23 Health and Safety.
- .3 Section 01 56 00 Temporary Barriers & Enclosures.
- .4 Section 02 41 19 Selective Demolition and Removal.
- .5 Section 06 10 00 Rough Carpentry.
- .6 Section 07 62 00 Sheet Metal Flashing & Trim.
- .7 Section 07 92 00 Joint Sealants.

1.3 REFERENCES

- .1 Latest edition of all listed references; most stringent requirements to govern in conflicts:
 - .1 American Society for Testing and Materials (ASTM) International:
 - .1 C578: Rigid, Cellular Polystyrene Thermal Insulation.
 - .2 C726: Mineral Fibre Roof Insulation Board.
 - .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 Fiber Reinforcements.
 - .11 D6163: SBS Mod. Bit. Sheets Using Glass Fiber Reinforcements.

- .12 D6164: SBS Mod. Bit. Sheets Using Polyester Reinforcements.
- .2 Canadian Standards Association (CAN/CSA):
 - .1 A123.21: Wind Uplift.
 - .2 A123.2: Asphalt Coated Roofing Sheets.
 - .3 A123.15: Polymer-Modified Bitumen Sheet, Prefabricated and Reinforced.
 - .4 A123.16: Asphalt Coated Glass Base Sheets.
 - .5 A231.1: Precast Concrete Paving Slabs.
 - .6 0121M: Douglas Fir Plywood.
 - .7 0151M: 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.
 - .7 51.34M: Vapour Barrier Sheet, Polyethylene Sheet for use in Construction.
- .4 Underwriters Laboratories of Canada (CAN/ULC):
 - .1 S701: Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 S702: Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 S704: Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Fixed.
- .5 Roofing Contractors Association of BC (RCABC): Roof Practices Manual, Latest Revision, and includes Technical Updates issued at the time of tender.
- .6 Canadian Roofing Contractors Association (CRCA): Roofing and Waterproofing Manual.

1.4 SUBMITTALS

- .1 Provide to Quality Assurance Observer, within five (5) working days after Notice of Award:
 - .1 Initial project work schedule showing anticipated progress stages and final completion of work from Start Date. Do not commence Work before project schedule has been provided and reviewed.
 - .2 Provincial Ministry's Notice of Project form or equivalent for Place of Work, notarized and executed.
 - .3 Current WorkSafe BC Clearance Letter for Place of Work.

- .2 Provide to Owner, at Prestart Meeting:
 - .1 Finalized project work schedule listing start date, anticipated number of working days working, and manpower assignments for project.
 - .2 Safety Data Sheets (SDS) pertaining to all proposed materials to be used on site to perform Work.
 - .3 Letter by Contractor certifying that all specified roof system components are compatible, are approved by Manufacturer, meet specified warranty terms, and are compatible with existing substrates.
 - .4 Applicable shop drawings for tapered insulation layout and other specified items to be reviewed by Consultant prior to prefabrication and delivery.
 - .5 Appropriate securement patterns for adhesive pattern for insulation and deck overlay boards, as applicable.
 - .6 List of "Trained Membrane Approved Applicators" to work and be present during performance of Work.

1.5 CONTRACTOR QUALIFICATION

- .1 Roofing Contractor to perform specified Work must:
 - .1 Have a minimum ten (10) years' work experience with materials specified or similar comparable products,
 - .2 Be a member in good standing with Roofing Contractors Association of BC (RCABC),
 - .3 And be licensed and insured for Place of Work.
- .2 Roofing Contractor must be pre-approved and certified by Membrane Manufacturer for specified materials and installation type.
 - .1 Contractor's installers must be certified for installation of specified materials.
 - .2 Owner reserves right to reject any proposed Subcontractor for reasonable cause.

1.6 QUALITY ASSURANCE

- .1 Compatibility between components of roofing system and wall system is essential. Provide written declaration to Consultant 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 Consultant and, if applicable, Manufacturer.
- .4 Contractor to arrange for a Technical Representative of Manufacturer to review installed roof system wherever a Standard or System Warranty requirement has been specified.
- .5 Upon completion of new installation, provide certification that all work has been done in strict accordance with Contract Documents and to Manufacturer's requirements.

1.7 QUALITY ASSURANCE OBSERVATION

- .1 IRC Building Sciences Group, hereafter known as "Observer", is an independent Quality Assurance Observation Agency appointed by Owner to observe performance of roof Work:
 - .1 Roofing Contractor to arrange Prestart site meeting with Observer no more than three (3) weeks prior to commencement of Work on site. Obtain Observer's instructions and reference procedures to be followed on project.
 - .2 Provide to Observer date when each phase of work will begin, at least forty-eight (48) hours prior to commencement of Work for phase.
 - .3 Arrange Final Observation and examination of installed roof with both Observer and Manufacturer's Technical Representative.
 - .4 Review Section 01 00 00 General Requirements, Item 1.21 Quality Control.
- .2 When required, provide roof sampling where directed by Observer and make good without additional cost to Owner.
- .3 Copies of Q.A. Observation Reports to be issued by Observer to Owner and Prime Contractor.
 - .1 Costs of Post Final Field Review(s) or extra field reviews due to Contractor not completing the work by the contractual Completion Date, if required, shall be charged back to the Contractor at a rate of \$750.00 per inspection.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Site storage is limited. Where applicable, location of storage and related facilities to be coordinated with Prime/General Contractor.
- .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 During extreme temperature, materials to be stored in a heated location with a 4.4°C (40°F) minimum temperature and removed only as needed.
- .6 Modified bitumen rolls to be kept clear of all flames and sparks when not being applied to roof.
- .7 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.
- .8 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.
- .9 Handle and store products in a manner to prevent damage and deterioration.
- .10 Remove and replace damaged products at own expense and to satisfaction of Consultant.

1.9 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 Owner.
- .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 WorkSafe BC 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 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 Consultant for corrective action prior to installation of roof system.
- .16 Immediately stop work if any unusual or concealed condition is discovered and immediately notify Consultant 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 Consultant.

- .18 All landscaped areas damaged by construction activities to be repaired at no cost to Owner.
- .19 Do not install membrane under following conditions without consulting Manufacturer's Technical Department for precautionary steps:
 - .1 Roof assembly permits interior air to pressurize membrane underside.
 - .2 Any exterior wall has 10% or more of surface area comprised of opening doors or windows.
 - .3 Wall to deck intersection permits air entry into wall flashing area.
- .20 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.
- .21 Protective wear to be worn when using solvents or adhesives or as required by job conditions.

1.10 PREPARATORY WORK

- .1 Review roof levels and advise Consultant of any deviation from specified tolerances.
- .2 Review roof drain locations and number. Advise Consultant 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.
- .4 When removing vents, skylights, etc, ensure the openings are covered to prevent moisture or odour infiltration into the building. Openings beyond a certain size may require to be identified as a fall hazard and protected appropriately.

1.11 SAFETY AND PROTECTION

.1 Refer to Section 01 35 23 - Health and Safety.

1.12 WIND UPLIFT

- .1 A wind load calculation (NRCA Wind Load Calculation for roof covering and add-ons) has been performed on this building. Contractor is required to confirm this calculation and interpretation with the primary membrane manufacturer.
- .2 Field area is defined as areas not identified as perimeter or corner zones, and must meet a wind uplift pressure of -1.1kPa (-22psf).
- .3 Perimeter area is defined as a 2.7m (9') picture frame at the edge of the building and must meet a wind uplift pressure of -1.4kPa (-29psf).
- .4 Corner area is defined as 2.7mx 2.7m (9'x9') and must meet a wind uplift pressure of -2.6kPa (-55psf).

1.13 WARRANTY

- .1 Contractor's Workmanship Warranty:
 - .1 Provide Owner with Contractor's two (2) year Warranty for Workmanship and Materials on Contractor's letterhead. Warranty period to commence on date of Approved Final Inspection. The Warranty is intended to provide coverage in the event the Manufacturer's labour and material warranty or the RGC Roofstar Guarantee is deleted or to cover items

not included in the Manufacturer's labour and material warranty or the RGC Roofstar Guarantee. Cost of Contractor's Workmanship Warranty to be included in the Bid price.

- .2 Manufacturer's System Warranty:
 - .1 Provide a written Ten (10) Year Membrane Manufacturer's No Dollar Limit System Warranty from the date of Approved Final Inspection. Cost of Manufacturer's Warranty to be included in the Bid price.
- .3 RCABC RGC RoofStar Guarantee:
 - .1 Provide to the Owner, the RGC RoofStar Five (5) Year Guarantee. The cost of the RCABC Guarantee administration fee and milestone reviews to be included in the Tender price.
- .4 Costs of Post Final Field Review(s) or extra field reviews as per 1.21 of Section 01 00 00, if required, shall be charged back to the Contractor.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 All system materials are to be sourced from a single manufacturer with accessory products meeting manufacturer's material compatibility requirements to achieve required System Warranty and other specified warranties.
 - .1 Equivalent systems that meet design intent may be proposed in writing, a minimum 5 days prior to project close. All accessory materials must be supplied and / or approved by the primary membrane manufacturer.
 - .2 Proposals must include a side by side material comparison table showing both the specified and proposed materials, and must comply fully with the experience and job reference requirements of Section 1.6 Quality Assurance of these specifications.
 - .1 Support documents such as Technical Data Sheets shall provide all figures to allow comparisons to base materials requirements.
 - .2 Support documents shall also indicate CSA 123.21-14 Wind Uplift testing to meet the building use and location.
 - .3 Equivalent systems shall qualify for all specified warranties.
- .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. Letters of acceptance from the primary manufacturer should be provided for the project record.
- .3 Specifications, installation instructions, limitations, and/or restrictions of respective manufacturers must be reviewed by QA Observer for acceptability for intended use with membrane manufacturer's products.

2.2 FASTENERS, PLATES & FASTENING BARS

- .1 Where required, all fasteners and plates to meet requirements of CSA 123.21-14 Standard for wind uplift.
- .2 Roofing Materials:
 - .1 Self-tapping, epoxy coated carbon steel or solid stainless steel deck screws approved by membrane manufacturer to meet warranty requirements, complete with securement

plates in a fastening pattern meeting CSA 123.21-14 requirements, and manufacturer's design letter:

- .1 #14 MP Fastener.
- .2 #15 HD Fastener. Confirm with Manufacturer if upgraded fastener is required.
- .3 Size of plate to be determined by membrane manufacturer for 2 7/8" HEX, 3" Round, or 2" Seam Plate.
- .3 Wood to Steel: Phillips Modified Truss Head fastener as manufactured by UCAN Fastening Products or Master Driller Wafer Plymetal or Wafer Reamer as manufactured by Leland Industries, of sufficient length to penetrate into substrate a minimum 6mm (.25"), zinc plated. Install according to manufacturer's instructions.
 - .1 When Alkaline Copper Quaternary (ACQ) treated wood is present, fasteners shall be upgraded to hot-dipped galvanized steel, stainless steel, silicon bronze, copper or specially coated suitable for use in ACQ such as DT1700.
- .4 Wood to Wood: No. 8 screws of a suitable length to penetrate into substrate a minimum 19 mm (0.75"). Install according to manufacturer's instructions.
 - .1 When Alkaline Copper Quaternary (ACQ) treated wood is present, fasteners shall be upgraded to hot-dipped galvanized steel, stainless steel, silicon bronze, copper or specially coated suitable for use in ACQ such as DT1700.
- .5 Steel to Steel: Master Gripper Self-Drilling Screws with wafer head as manufactured by Leland Industries, of sufficient length to penetrate into substrate a minimum 6mm (.25"). Install according to manufacturer's instructions.
- .6 Wood/steel to concrete or concrete block: 5/16" Ultracon Fastener as manufactured by Elco Construction Products or equal approved by membrane manufacturer, to penetrate substrate by 32mm (1.25").
- .7 Steel/aluminum to aluminum: 410 Case Hardened Stainless Steel Master Gripper MDP Self-Drilling Screws with wafer head as manufactured by Leland Industries, of sufficient length to penetrate into substrate a minimum 19mm (.75"). Install according to manufacturer's instructions.
- .8 Termination bar for membrane:
 - .1 Extruded aluminum, 1.5mm (0.060") thick x 25mm (1") wide x 3.05m (10') long with 6mm x 9.5mm (.25" x .375") slotted holes on 203mm (8") o/c. Acceptable material: TB-120 aluminum termination bar by Tru-Fast or equal approved by membrane manufacturer.
- .9 Termination bar fastener for wood, steel or aluminum:
 - .1 Tru-Fast Ultra Solid Stainless Steel fastener to penetrate substrate by 19mm (.75") c/w EPDM galvanized steel sealing washers or Construction Fasteners Inc. Woodgrip #14 screw complete with Sentri coating on threads, Chromagard colour match head and EPDM washer, or equal approved by membrane manufacturer.
- .10 Termination bar fastener for concrete or masonry:
 - .1 Tru-Fast Tap Grip Truss Head fastener with Perma-Coat Z3 corrosion protection or equal approved by membrane manufacturer, to penetrate substrate by 32mm (1.25") c/w EPDM galvanized steel sealing washers.
- .11 Membrane to wood:

- .1 Galvanized round top roofing nails with minimum 25mm (1") diameter heads or plate and head combination, to penetrate substrate a minimum 32mm (1.25").
- .12 Wood Sleeper to rooftop condensing unit:
 - .1 Hanger bolt: Grade 18-8 stainless steel, minimum 9.5mm (.375"{3/8"})-16 diameter, in length suitable to penetrate minimum 51mm (2") into sleeper and extend minimum 51mm (2") above, with 15.9mm (.625"{5/8"}) plain centre.

2.3 COVER BOARD – VERTICAL APPLICATIONS ONLY

- .1 Gypsum Cover Board: Dimensionally stable, fire resistant, gypsum based roof board with treated core for moisture and mould resistance; size no larger than 1.2m x 2.4m (4'x8'). Roof board to have factory laminated enhanced glass-mat facer meeting ASTM C 1177.
 - .1 Dens Deck Prime 6.4mm (.25") minimum thickness for horizontal applications (field), 12.7mm (.5") minimum thickness for vertical applications (unsupported walls) as manufactured by Georgia-Pacific LP or Owner Approved Equivalent.

2.4 ROOFING BOARD ADHESIVE

- .1 Adhesive for deck overlays, and / or insulation and / or cover boards on non-nailable decks:
 - .1 Ribbons of two component polyurethane foamable adhesive:
 - .1 DuoTack Adhesive by Soprema Inc or Owner approved equivalent.

2.5 MEMBRANE PRIMER

- .1 General Purpose:
 - .1 Solvent Based Primer: Composed of volatile solvents, synthetic polymers, and/or adhesive enhancing resins to prepare surfaces for torch application:
 - .1 Elastocol 500 by Soprema Inc. or Owner approved equivalent.
- .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:
 - .1 Elastocol Stick by Soprema Inc. or Owner approved equivalent.

2.6 VAPOUR RETARDER

- .1 SBS Field Membrane:
 - .1 Self-adhered modified bitumen: minimum 2.5mm thick with glass mat reinforcement scrim and conforming to CGSB 37-GP-56M. Top covered with sand and bottom surface covered with release protection film. Membrane shall utilize 60% self-adhesive and 40% torch welded side laps.
 - .1 Sopraflash Stick 40 by Soprema Inc.or Owner approved equivalent.
- .2 SBS Membrane Flashings and Tie-in Flashings:
 - .1 Self-Adhered grade SBS modified bitumen: minimum 3.0mm thick with composite reinforcement scrim, and conforming to CSA 123.21-15. Top surface covered with thermofusible polyolefin film with self-adhesive bitumen bottom surface.

- .1 Sopralene Flam Stick by Soprema Inc. or Owner approved equivalent.
- .3 SBS Membrane Flame Screen Protection:
 - .1 Self-Adhered grade SBS modified bitumen: minimum 1.6mm thick with glass mat reinforcement, impregnated and coated with SBS modified bitumen, and conforming to CSA 123.21-15 table in this Section. Top surface covered with sand and self-adhesive bitumen bottom surface.
 - .1 Sopraguard Tape by Soprema Inc. or Owner approved equivalent.

2.7 TAPERED INSULATION - POLYISOCYANURATE

- .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 during manufacturing process to inorganic coated glass facers on top and bottom surfaces:
 - .1 Approved and listed for a Class 1 Roof Assembly meeting requirements of CSA123.21 and fire resistance without use of sprinkler protection.
 - .2 Meet physical property requirements of ASTM C 1289 and CAN/ULC S704 with a min. compressive strength of 138 kPa (20 psi).
 - .3 Dimensional stability change of less than 2% conforming to ASTM D 2126.
 - .4 Conformity to CAN/ULC S704 and Can/ULC S770 for Long Term Thermal Resistance in polyisocyanurate insulation.
 - .5 Acceptable Products:
 - .1 Sopra-ISO Plus polyisocyanurate by Soprema Inc. or Owner Approved Equivalent.
- .2 Insulation Board Size: Individual panel size no larger than 1.22m x 1.22m (4' x 4').
- .3 Insulation Thickness:
 - .1 As recommended by supplier and confirmed via submitted sloped insulation shop drawing.
- .4 Insulation Layer Size: Tapered insulation as indicated on roof plan drawing. Unless otherwise noted on roof plan drawings, tapered insulation to have a slope of 2%.
- .5 All tapered insulation to be factory cut and mitered.
- .6 Tapered Drainage Sumps:
 - .1 Size to be 1.2m x 1.2m (4' x 4') and provide a 4% slope to drain. Provide a minimum 1" base layer within the sump, or notify QA Observer of any discrepancies found with the slope package.
- .7 Tapered Crickets:
 - .1 Crickets shall be tapered at 4% with an appropriate ratio to promote drainage, and located as shown in the roof plans as recommended by supplier.
 - .2 Curbs or rooftop penetrations wider than 610mm (24") are to receive a 4% cricket sized appropriately to divert water around the curb, and / or as indicated on drawings.

.8 Submit all shop drawings to QA Observer for review prior to prefabrication.

2.8 POLYISOCYANURATE INSULATION

- .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 during manufacturing process to inorganic coated glass facers on top and bottom surfaces:
 - .1 Approved and listed for a Class 1 Roof Assembly meeting requirements of CSA123.21 and fire resistance without use of sprinkler protection.
 - .2 Meet physical property requirements of ASTM C 1289 and CAN/ULC S704 with a min. compressive strength of 138 kPa (20 psi).
 - .3 Dimensional stability change of less than 2% conforming to ASTM D 2126.
 - .4 Conformity to CAN/ULC S704 and Can/ULC S770 for Long Term Thermal Resistance in polyisocyanurate insulation.
 - .5 Acceptable Products:
 - .1 Sopra-ISO Plus polyisocyanurate by Soprema Inc. or Owner Approved Equivalent.
- .2 Insulation Board Size: Individual panel size no larger than 1.22m x 2.44m (4' x 8').
- .3 Insulation Thickness: Base layer of minimum R20 installed in 2 layers.

2.9 LAMINATED HIGH DENSITY SUPPORT PANEL (BASE SHEET AND COVER BOARD)

- .1 Laminated High Density Support Panel: High density polyisocyanurate insulation support panel factory-laminated to a 2.2mm (3/32") non-woven polyester reinforced SBS modified bitumen base sheet membrane recovery board conforming to CSA 123.21-15. Panel boards to have a membrane duo selvedge edge width of 90mm (3.5") for overlapping onto next board.
 - .1 14.9mm (19/32") Soprasmart ISO HD 180 as manufactured by Soprema or Owner Approved Equivalent.

2.10 MODIFIED BITUMEN MEMBRANE

- .1 Base Sheet Flashing: Install S. A. flashings before base sheet field membrane at combustible perimeters and curbs:
 - .1 Self-Adhered grade SBS modified bitumen: minimum 3.0mm thick with composite reinforcement scrim, and conforming to CSA 123.21-15. Top surface covered with thermofusible polyolefin film with self-adhesive bitumen bottom surface.
 - .1 Sopralene Flam Stick by Soprema Inc. or Owner Approved Equivalent.
- .2 Base Sheet Cover-Strip
 - .1 Adhere grade SBS modified bitumen: Minimum 2.5mm thick and 330mm (13") wide with composite reinforcement and conforming to CSA 123.21-15. Top surface to be sanded with bottom covered with silicone release film.
 - .1 SopraLap Stick by Soprema Inc. or Owner Approved Equivalent.

- .3 Cap Sheet Field and Flashing Membrane:
 - .1 Torch grade modified bitumen; minimum thickness 3.3mm, with minimum 250 g/m² nonwoven 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 or lightly sanded. Colour of granules to be chosen by Owner from Contractor supplied samples of standard colour palette.
 - .1 Sopraply Traffic Cap 560 by Soprema.

2.11 LIQUID APPLIED PMMA RESIN FLASHINGS

- .1 Catalyzed Acrylic Resin Flashing System: Materials consisting of a liquid-applied, fully reinforced, multi-component acrylic membrane installed over a prepared or primed substrate. The flashing system consists of a catalyzed acrylic resin primer, basecoat and topcoat, combined with a non-woven polyester fleece. The resin and catalyst are mixed immediately prior to installation. The use of the specialty flashing system shall be specifically approved in advance by the primary membrane manufacturer for each application.
 - .1 Alsan RS 230 by Soprema Inc. or Owner approved equivalent.

2.12 ROOFING ACCESSORIES

- .1 Roofing accessories to be manufactured from spun aluminum or copper as required, and complete with removable caps where applicable. Unless otherwise designated by QA Observer, pitch pockets are strictly prohibited. Flanges to be primed with rubberized asphalt compatible primer. Drain materials must meet CSA-B79 and ASME A112.6.4 standards, and be listed with QAI Laboratories.
 - .1 Supply and install new aluminum or copper through wall box scuppers, with the following requirements:
 - .1 Braised or welded full 102mm (4") flange.
 - .2 Incorporated clamping collar.
 - .3 Exterior cleanout box sized to fit drain outlet.
 - .4 76mm (3") downspout on outlet cleanout box.
 - .5 Drain to include strainer kit specifically designed to fit this scupper drain type
 - .1 Materials to be manufactured by Menzies Metal Products, or Owner Approved Equivalent.
 - .2 Overflow Drains: 76mm (3") Clamp-Tite Overflow Scupper Drain by Menzies Metal Products, or Owner Approved Equivalent.
 - .3 Drain Seals: Fernco Couplings and associated hose clamps, or Owner Approved Equivalent.
 - .1 Use of other mechanical seals to be confirmed in advance with the QA Observer.
 - .1 If and when internal mechanical seals are accepted, seals shall be U-Flow by OMG Roofing Products. Allow for potential delays for ordering.

- .4 Plumbing Stack Flashing: Welded Aluminum by Menzies Metal Products or Owner Approved Equivalent. Flashings to have been tested to CSA B272 standard and be marked by way of adhesive label or die stamp.
- .5 B-Vent Flashing or similar round duct penetrations: spun Aluminum penetration hardware as manufactured by Menzies Metal Products or Owner Approved Equivalent, or site constructed curbs complete with shop fabricated 'square-to-round' flashings, or Owner Approved Equivalent complete with 2 caulked storm collars on each "B-Vent" flashing. Top of penetration hardware or curb to be a minimum of 8" above finished roof surface.
- .6 Conduit & gas piping supports: fabricated from UV resistant re-cycled rubber complete with 14ga galvanized channel:
 - .1 C-Port C-Series Roof Blocks as manufactured by Clearline Technologies Inc. or Owner Approved Equivalent.
- .7 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.
- .8 Pourable Sealer: As recommended by primary membrane manufacturer.
- .9 Sealing Compound: Rubberized Sealing Compound to CAN/CGSB-37.29, and as recommended by primary membrane manufacturer.
- .10 Spray Urethane foam: One or two component polyurethane spray foam insulation. Use low pressure spray foam insulation at force sensitive areas.
- .11 Fire Protection in flame sensitive locations, as determined by the Contractor: 165mm wide tape consisting of a glass fleece reinforcement and SBS modified bitumen, and as recommended by primary membrane manufacturer.
- .12 Firestop Sealant: One component, neutral cure silicone sealant meeting ASTM E84 and CAN4-S115M, designed for firestop applications at joints and through-wall penetrations; TREMstop Fyre-Sil silicone sealant (red) by Tremco or Owner Approved Equivalent.
- .13 Foam Gaskets for mechanical curbs: Self-adhering tape seal made from open polyurethane foam impregnated with a water based acrylic. MST by EmSeal LLC or better.
- .14 Sheet Metal Flashings and Trim: As per Section 07 62 00 and fabricated from SMP coated 24 gauge prepainted steel. Hook strips to be 2 gauges heavier than flashings. Colour to be determined by Owner.
- .15 Sealants: As per Section 07 92 00. Colour of sealants to match component applied to.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- .1 Perform roofing work which is not specifically covered by these Specifications in accordance with applicable industry standards and good roofing practices of:
 - .1 Canadian Roofing Contractors Association (CRCA),
 - .2 Roofing Contractors Association of BC (RCABC): Roof Practices Manual, Latest Revision, and includes Technical Updates issued at the time of tender,

- .3 Canadian Modified Bitumen Manufacturer's Association's recommendations,
- .4 Manufacturer's preprinted and published technical specifications,
- .5 ULC Design No. S-107 criteria,
- .6 CSA 123.21-14 testing protocols.
- .7 Compliance with local fire insurance requirements,
- .8 Compliance with local building codes.
- .2 Procedures for application of materials should be in accordance with Manufacturer's printed instructions and recommendations.
 - .1 Advise Consultant of adjustments to specified roofing procedures recommended by Manufacturer or due to site conditions.
 - .2 Written approval by Consultant is required to make any adjustments to specified procedures.
- .3 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 approved by Consultant prior to installation.
- .4 While work is in progress, all steps must be taken to safeguard building from damage due to weather, fire, and structural overloading.
- .5 Examine underside of roof deck when installing mechanical fasteners, where possible, to avoid accidental damage to existing services.
- .6 Apply each part of roofing system when surfaces are free of moisture for successful application.
- .7 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 Consultant 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 Cover openings in the roof such as curbs for mechanical or skylight, to prevent moisture, dirt / debris, and odour entering the structure.
- .7 Do not use spray installation methods on days with significant wind.
- .8 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 (0.75") plywood sheathing over 38mm (1.5") expanded 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 Consultant.
- .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 Immediately halt work during inclement weather, including but not limited to rain fall, snow, drizzle, fog, and hail. Protect exposed building substrates, open building cavities, and moisture sensitive products.
 - .2 At end of each work day or when stoppage occurs due to inclement weather, provide suitable protection from elements for completed work and materials out of storage.
 - .3 Place in to heated storage any temperature sensitive materials such as membranes, adhesives, and sealants when temperature falls below 5 °C (40 °F).

- .4 Protect all vents, stacks, drains and related deck openings from inclement weather and contamination from debris.
- .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 / or 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 Owner.
 - .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 Consultant.
 - .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 Any roof top equipment requiring disconnection to be responsibility of Contractor in consultation with Owner unless otherwise specified elsewhere in contract documents.
- .2 Existing Roof Removal:
 - .1 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 in preparation for installation of new roof system. Dispose removed items to an appropriate site for building material waste.

- .2 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 Client before removing and disposing of any suspected unused or abandoned projections.
 - .2 Install new roof decking as required to close off any deck openings before proceeding with new roof system installation.
- .3 Substrate Review:
 - .1 Exposed roof deck surfaces to be reviewed by Contractor with Consultant. Ensure to review entire roof area to satisfy any warranty requirements from the manufacturer for the new roof membrane system.
 - .1 Notify Consultant 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 Consultant and Owner 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.
 - .1 Verify that roof drains have been installed at proper elevations relative to finished roof surface to allow for sufficient drainage of roof surface.
 - .4 Review securement of existing projections and equipment (electrical conduit, gas lines, etc.). If inadequate securement is found, inform QA Observer and halt work around that area until situation is rectified.
 - .5 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 Refer to detail drawings for carpentry requirements. Install wood blocking, plywood, and cant strips to accommodate required slopes, insulation, roofing membranes, and prefinished 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.
 - .1 At Existing Roof Curbs: Minimum height to be 203mm (8") above finished roof membrane and at least 51mm (2.0") higher than adjacent roof perimeters, up to a maximum 460mm (1'-6") above finished roof membrane.
 - .1 At metal roof curbs: Where extension height required is greater than 102mm (4.0"), install new galvanized metal C-Channel, prefab curb extension, prefab curb adapter or reducer to raise curb as required to suit new height.
 - .2 At Existing Parapets: Minimum height to be 102mm (4") above finished roof membrane, unless otherwise indicated on detail drawings.
 - .1 Wood cant exists at the base of the wall, remove cant to blocking or deck level.

- .2 If fibre-cant exists, remove and install blocking to suit to receive new plywood sheathing.
- .3 Replace any seriously damaged or deteriorated wood at perimeters and projections with new construction grade SPF wood blocking or exterior grade plywood, good one side, to match existing. Determination of suitability to re-use or replace existing wood to be at discretion QA Observer.
 - .1 Ensure existing wood blocking remaining at perimeters and curbs is securely fastened to existing substrate before installing new blocking and plywood.
- .4 Install wood blocking as required to ensure that all roof curbs and sleepers supporting H.V.A.C. 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 in a staggered pattern.
 - .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 is to be considered part of roof, and to be made watertight by end of each work day to eliminate moisture infiltration into roof system.

3.6 VAPOUR RETARDER

- .1 Install one (1) ply vapour retarder membrane (adhered) and flashing (self-adhered) as per manufacturer's written instructions, free of blisters, tears, wrinkles and fish-mouths.
 - .1 Power vacuum deck surfaces to remove any loose dirt and debris. Substrate must be clean, dry, and free of non-bitumen compatible residues, dust, grease, and other contaminants.
 - .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 Review deck for proud nails or other sharps. Correct existing conditions to provide a smooth substrate.
- .2 Primer Installation:
 - .1 If required by primary membrane manufacturer, install primer to deck at rate recommended in writing by primary membrane manufacturer.
 - .2 Prime all non-metal exposed surfaces to receive vapour retarder membrane and flashing. Apply primer to clean and dry surfaces with a paint brush, roller or sprayer at temperatures 0°C (31°F) and above.
 - .3 Ensure all substrates are fully covered with primer leaving no areas bare, avoid pooling.
 - .4 Allow primer to dry completely prior to installation of new vapour retarder membrane.
- .3 Vapour Retarder Installation (Adhered):
 - .1 Begin application at bottom of roof slope. Unroll membrane onto prepared substrate without adhering for alignment.
 - .2 Roll out membrane perpendicular to slope.

- .3 Overlap each preceding sheet by a minimum of 76mm (3") lengthwise following reference chalk line and by a minimum of 152mm (6") at each end. Stagger end laps by at least 305mm (12").
 - .1 Apply primer / adhesive in continuous ribbon in all side and end laps while holding lap open. Press closed and ensure full contact.
- .4 Install target piece of vapour retarder, embedded in primer / adhesive at all penetrations.
- .5 Repair all holes, tears, or cuts with a minimum 152mm (6") wide strip of new material, embedded in primer / adhesive.
- .4 Membrane Flashing Installation:
 - .1 Prime substrate to receive self-adhered base sheet flashing with primer and rate of application as recommended by manufacturer. Avoid pools and heavy areas and allow primer to dry a minimum 30 minutes or until staining does not occur to touch and surface becomes tacky.
 - .2 Ensure complete coverage of primer to both prepared substrates and to field sheet membrane prior to placement of membrane flashing.
 - .3 Install membrane flashing onto substrate in strips one membrane roll wide (40" or 1m) and extend over perimeters as shown on detail drawings.
 - .4 Field measure and cut flashing membrane to length required for flashing at each detail and roll up for installation.
 - .5 Unroll and install membrane flashing onto substrate by removing release paper and discarding.
 - .6 Using weighted roller as recommended by manufacturer, roll all surfaces of roof membrane to ensure continuous adhesion with membrane to substrate. Firmly press membrane into substrate to ensure proper bond.
 - .7 Lap membrane flashing onto field vapour retarder membrane a minimum 152mm (6"). Side laps between adjacent sheets to be a minimum of 102mm (4") wide, or as required by the membrane manufacturer.

3.7 TAPERED INSULATION

- .1 Install tapered base insulation over prepared vapour retarder according to layout on reviewed shop drawings and roof plan drawing(s) and in accordance with insulation manufacturer's written instructions. Report any discrepancies to Consultant before proceeding.
 - .1 Tapered insulation package shall be installed in soldier fashion as per supplier installed layout.
 - .2 Tapered and/or cricket packages shall be placed between flat stock insulation on multilayer systems, or on the bottom of single layer systems.
- .2 Do not install more insulation board than can be covered with membrane by end of work day or before onset of inclement weather.
- .3 Do not install warped, curled, damaged, or wet insulation boards.
- .4 Check underside of deck before installation to eliminate damaging any existing conditions below deck.

- .5 Mechanically attach all tapered insulation using membrane manufacturers written instructions.
- .6 The Contractor is responsible for confirming attachment rates with the primary membrane manufacturer, and providing it in writing to the QA Observer prior to start.

3.8 OVERLAY INSULATION

- .1 Install overlay insulation boards over tapered insulation in accordance with insulation manufacturer's instructions. Overlay insulation is to be adhered.
- .2 Do not install more insulation board than can be covered with membrane by end of work day or before onset of inclement weather.
- .3 Do not install warped, curled, damaged, or wet insulation boards.
- .4 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 (12") between rows.
- .5 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 CSA A123.21 requirements. Use a "Z" pattern over an application area no larger than 3.66m (12'-0") at a time. Minimum securement pattern:
 - .1 Adhesive ribbons to be no less than 13mm (1/2") to 19mm (3/4") in width at time of application.
 - .2 Parallel rows of adhesive ribbons to be no more than 305mm (1'-0") apart in field of roof.
 - .3 Along 3.05m (10'-0") wide perimeter zones, rows of adhesive to be no more than 127mm (6") apart.
 - .4 Rows of adhesive to be no more than 102mm (4") apart in corner zones.
 - .2 Do not allow rising foam adhesive to skin-over. Place insulation panels immediately into wet adhesive.
 - .3 Walk-in board panels to ensure positive adhesion of substrate across full panel. Repeat walk-in every five (5) minutes until insulation is firmly attached.
- .6 At all existing roof drain locations, delete a section of overlay insulation in a 1.2m x 1.2m (4' x 4') area centered around each drain.
 - .1 At each drain location, install a new 1.2m x 1.2m (4' x 4') prefabricated, tapered insulation drain sump over prepared substrate.
- .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.

3.9 LAMINATED ASPHALTIC BOARD (BASE SHEET AND COVER BOARD)

- .1 Cover Board Adhered Installation:
 - .1 Install a layer of field cover board panels with joints offset and staggered, adhered over installed insulation as per manufacturer's written instructions and to meet CSA 123.21-14 requirements. Refer to manufacturer's design letter.
 - .2 Do not install more insulation board than can be covered with membrane by end of work day or before onset of inclement weather.
 - .3 Do not use wet or damaged cover board panels. Panels must be dry for proper installation.
 - .4 Determine and mark, as required, areas to receive new cover board installation to avoid over application of quick adhesive.
 - .5 Custom cut cover board panels at perimeters and projections to suit, dry fitting as necessary. Install cover boards tightly together with no gaps between boards larger than 3mm (0.125").
 - .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.
 - .6 Install continuous ribbons of polyurethane adhesive in parallel lines to the insulation. Use a blocked "S" pattern over an application area no larger than 3.66m (12') at a time to minimum securement pattern:
 - .1 Adhesive ribbons to be no less than 1/2" (13mm) to 3/4" (19mm) in width at time of application, or as required by manufacturer.
 - .2 Ribbons shall be contained within the board size, do not apply adhesive outside of board edges.
 - .1 Adhesive shall be applied at or near the edge of the board, to correspond to the manufacturer's required application rate. If application rate is 304mm (12") apart, then beads to begin within 152mm (6") of the board edges.
 - .7 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 minimum 152mm (6").
 - .1 Do not allow rising foam adhesive to skin over. Place roof board panels immediately into wet adhesive.
 - .8 Ballast boards immediately after placing them into position.
 - .1 Do not walk in boards, ballast continuously until adhesive is set.
 - .2 Do not remove and re-apply board once laid in. If board must be moved, remove any set adhesives and apply new adhesive ribbons.
 - .9 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 Base sheet membrane and flashing membrane are to be self-adhered. Cap sheet field membrane and cap sheet flashings are to be torch applied.
 - .1 Contractor is permitted to use self-adhered, blackline adhered, mechanically attached, liquid applied, and accessories materials from the membrane manufacturer's range of products that are equivalent in performance to specified materials. This measure is provided as a means to aid the installers in the safe execution of their duties and not an opportunity for additional costs or downgrading performance. The purpose is to support the required Contractor risk assessment and fire safety measures during the installation of the roofing assembly. Notify the observer of modifications prior to proceeding for record keeping purposes.
 - .2 Contractor is to have considered order of material application via a risk assessment, and determined if pre-stripping is desired.
- .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 Base Sheet Flashing, Self-Adhered Installation:
 - .1 Field measure and cut flashing membrane to length required for flashing at each detail and roll up for installation.
 - .2 If pre-stripped, install membrane gusset flashing onto substrate in strips one membrane roll wide (40" or 1m) by 152mm (6") to tie base sheet into previously installed base stripping.
 - .3 Install base sheet flashing centered between the 90° transition from field of roof to vertical area, so that 76mm (3") of gusset extends onto the flat of the roof and 76mm (3") up wall or curb.
 - .1 Ensure the 90° transition is kept tight and adequately bonded.
 - .2 Bridging will be directed to be cut out and repaired.
 - .4 Overlap each preceding flashing sheet by min. 76mm (3") 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 (4").
 - .5 Membrane gusset reinforcement to be installed using hot air gun or torch application on top of base sheet membrane at all inside and outside corners. Consultant to review gusset installation before installation of cap sheet membrane.
 - .6 If base flashings were not pre-stripped, refer to Item 3.7.4 for application method.
 - .7 Where required as determined by the contractors' fire safety risk assessment weld all side and end laps of membrane with hot air gun or torch. Laps to be bonded to the satisfaction of QA Observer.
- .6 Cap Sheet Field Membrane, Torch Installation:

- .1 Prior to the installation of the cap sheet field membrane installation contact the consultant to review the completed base sheet installation with regards to locating and installing extra spun copper roof drains to enhance and improve drainage. Failure to observe this milestone and proceeding with cap sheet installation before drainage is evaluated will result in any capped areas being fully degranulated and recapped at no expense to the owner.
- .2 Complete installation of base sheet flashing prior to installing membrane cap sheet and cap sheet flashings.
- .3 Field measure and cut membrane to length of run required and roll up for installation.
- .4 Starting at low point on roof, perpendicular to slope, unroll cap sheet, align and re-roll from both ends.
- .5 Unroll and install cap sheet carefully in straight and parallel rows keeping majority of flame on membrane roll.
- .6 Cap sheet to be torched across flat of roof, overtop of base sheet, and terminated at perimeters and vertical surfaces ensuring a good bond.
- .7 Lap sheets 76mm (3") for side laps and a minimum 152mm (6") for end laps. Offset side laps in cap sheet 305mm (12") minimum from those of base sheet.
- .8 Where required as determined by the contractors' fire safety risk assessment weld all side and end laps of membrane with hot air gun or torch. Laps to be bonded to the satisfaction of QA Observer.
- .7 Cap Sheet Flashing, Torch Installation:
 - .1 Cap sheet membrane flashing to be torched up and over perimeter details, extending a minimum 51mm (2") onto horizontal surfaces.
 - .2 Install membrane flashing onto substrate in strips one membrane roll wide (40" or 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 flashing membrane to offset base sheet flashing joints by 50% and extend a minimum of 152mm (6") onto degranulated cap field sheet. All end lap joints to be offset a minimum 305mm (12") from base stripping side laps.
 - .5 Align bottom edge to a chalk reference line along cap sheet membrane.
 - .6 Overlap each preceding cap sheet flashing sheet by min. 76mm (3") on side laps.
 - .7 Properly secure flashings to their support, without sags, blisters, fish-mouths or wrinkles with terminations as indicated on drawings and details.
 - .8 Where required as determined by the contractors' fire safety risk assessment weld all side and end laps of membrane with hot air gun or torch. Laps to be bonded to the satisfaction of QA Observer.
- .8 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 Z pattern with torch as recommended by manufacturer over membranes that are covered with thermofusible film.
- .6 Staggering of Sheets: End laps between base and cap sheets to be offset a min. of 305m (24"). Side laps between base and cap sheets to be offset a min. of 305mm (12"), centered alignment preferred. Laps in same membrane layer to be min. 76mm (3") wide for side laps and min. 305mm (12") wide for end laps. When selvedge side laps of base and cap sheets are unequal, adjust cap roll width occasionally to maintain alignment.12
 - .1 If installing a half sheet to restore stagger, ensure cut edge is straight and true.
- .7 Procedure to Seal Voids: Where voids are created by overlapping rolls of membrane, cut off corner of selvedge edge where covered by next roll of material.
- .8 Selvedge Edge Protection: Granules along edge of membrane to be primed prior to application of adhesive to provide good adhesion of laps.
- .9 Membrane Flashings: Base flashings to extend min. 102mm (4") onto field of roof. Cap flashings to overlap base sheet flashings and extend min. 152mm (6") onto field or roof. Use wider overlap widths where required by manufacturer for warranty requirements.
- .10 Compound Flow (bleed out) at Seams: When torch applying membrane, provide consistent, continuous bleed-out along all seams, no less 3mm (.125") and no greater than 6mm (.25") in width.
- .11 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.
- .12 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.
- .13 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 chalk lines to mark outline of areas requiring degranulation. Achieve a uniform black surface of bitumen across 100% of embedment areas to be overlapped.
- .14 Primer Application: Sanded membrane left exposed overnight or longer to be primed before continuing membrane installation to ensure good adhesion.
- .15 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.
- .9 Correction Requirements for Defects and Deficiencies to as per Manufacturers Published directions, with the following exceptions:
 - .1 Membrane Patches: Cap sheet membrane patches to be installed from seam to seam. Minimum size of membrane patch to be 915 x 915 mm (36" x36"). Smaller sizes are not acceptable. Neatly cut / remove the selvedge edge from cap sheet prior to application, ensuring a straight edge.
 - .2 Correction of granule loss or degranulated area with primer and granules is not acceptable. If liquid applied membranes and granules are intended by the contractor, discuss first with QA Observer, and ensure all applications are installed straight and with a clean edge, and extended from edge to edge of the membrane being repaired.
 - .3 The intent of all repairs is to look like the work was intended.

3.11 LIQUID APPLIED PMMA RESIN FLASHINGS

- .1 Where specifically indicated in detail drawings and at any junctions where conventional installation of membrane flashings are not feasible, install new liquid applied resin flashing system.
- .2 Resin system to be a layered application consisting of two coats of thixotropic catalyzed polymethylmethacrylate (PMMA) resin encapsulating a layer of polyester fleece reinforcement.
- .3 Installation of liquid applied flashing system to follow in strict accordance with manufacturer's written instructions.
- .4 Ensure that 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.
 - .1 Some surfaces may require scarification, shot-blasting, or grinding to achieve a suitable substrate. Wipe surfaces with a clean cloth saturated with specified cleaner/solvent to remove grease, oils or dust that may affect adhesion and to cured PMMA surfaces to receive a subsequent coat of resin.
 - .2 Concrete substrates to receive an application of specified PMMA roofing system to have a maximum moisture content of 6% and a maximum internal relative humidity of 75%.
- .5 Preparation/Mixing/Catalyzing Resin Products:
 - .1 Pour desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir liquid for time period specified by resin manufacturer.
 - .2 Calculate amount of catalyst powder needed using manufacturer's guidelines and add pre-measured catalyst to resin component.
 - .3 Mix again for time period specified by resin manufacturer, ensuring that product is free from swirls and bubbles.
 - .4 Ensure that air is not entrained into product during mixing process. To avoid aeration, do not use a spiral mixer unless spiral section of mixer can be fully contained in liquid during mixing process.
 - .5 Mix only enough product to ensure it can be applied before expiration of resin pot life.
- .6 Primer Application:

- .1 Apply primer resin using a roller or brush at minimum rate specified by primer manufacturer over poured reinforced concrete substrates.
- .2 Apply primer resin using a roller or brush at increased rate specified by primer manufacturer over DensDeck, DensDeck Prime, and granule surfaced membrane substrates.
- .3 Increase application rates over other absorbent substrates. Do not let resin pool or pond. Do not under-apply or over-apply primers as this may interfere with proper primer catalyzation.
- .4 Make allowances for saturation of roller covers and application equipment.
- .7 Paste Application:
 - .1 Allow primer to set and apply catalyzed preparation paste using a trowel.
 - .2 Before application of resin over catalyzed paste surface, specified cleaner/solvent, wipe surface of paste using specified cleaner/solvent and allow to dry.
 - .3 Treat surface again if not followed up by resin application within 60 minutes.
- .8 Flashing Membrane Application:
 - .1 Using masking tape, mask perimeter of area to receive flashing system.
 - .2 Apply resin primer to substrates requiring additional preparation and allow primer to set.
 - .3 Pre-cut fleece to ensure a proper fit at transitions and corners prior to membrane application.
 - .4 Apply an even, generous base coat of flashing resin using a roller at minimum rate specified by resin manufacturer to prepared surfaces requiring flashing coverage.
 - .5 Work fleece into wet, catalyzed resin using a brush or roller to fully embed fleece in resin and remove trapped air.
 - .6 Lap fleece layers a minimum of 51mm (2") and apply an additional coat of catalyzed resin between layers of overlapping fleece.
 - .7 Again using a roller, apply an even top coat of catalyzed resin at minimum rate specified by resin manufacturer immediately following embedment of fleece, ensuring full saturation of fleece.
 - .8 Ensure that flashing resin is applied to extend a 6mm (0.25") beyond fleece. Remove tape before catalyzed resin sets. Make allowances for saturation of roller covers and application equipment.
 - .9 Should work be interrupted for more than 12 hours or surface of catalyzed resin becomes dirty or contaminated by elements, wipe surface to be lapped with new flashing resin using specified cleaner/solvent.
 - .10 Allow surface to dry for a minimum 20 minutes and a maximum 60 minutes before continuing work.

3.12 ROOF PENETRATIONS & ACCESSORIES

- .1 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.
- .2 Coordinate and cooperate with the supply and installation of fall protection anchors and related accessories / accessories. Ensure all penetrations and installations are sealed and watertight at the end of each day.
 - .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 152mm (6") 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 ROOF DRAINS

- .1 General Practice:
 - .1 Ensure existing roof drains, scuppers 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 Owner.
 - .2 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 Owner.
 - .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 Where applicable, downpipes to be connected to all existing subsurface drains. Fabricate and install a new, fully soldered square to round transition to attach new downpipe to existing sub surface drain as required.
 - .1 Drain Inserts (If required and approved in advance by the Consultant): Menzies Clamp Tite spun copper or aluminum drains. Flange to be secured to substrate with min. four (4) fasteners per drain as required to properly secure drain body.

- .1 Affix Fernco connector seal to bottom of drain stem before insert into existing storm drainage pipe.
- .2 Set metal flange of drain body into continuous bed of manufacturer recommended and system compatible roofing cement applied over base sheet membrane.
- .3 Mechanically secure drain body to deck and substrate with min. four (4) fasteners per drain through drain flange or by underdeck clamping ring.
- .2 Additional drains: evaluate roof drainage upon completion of the base sheet and before cap sheet is installed.
 - .1 Additional, unit cost, drains where required shall be specified spun copper and installed as noted herein and sealed or covered over to prevent drainage until such time that internal plumbing can be supplied and installed by others.
- .3 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.
- .4 Install target patch of membrane reinforcement over metal drain flange. Use a square of 1m x 1m (39" x 39") base sheet membrane and install over drain at a 45° angle to direction of base sheet rolls.
- .5 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 (36") 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.
 - .3 At drain sump areas larger than 1.2m x 1.2m (4' x 4'), install cap sheet over sump area first without any end laps and picture-frame into remainder of roof.
- .6 Place Clamping Ring over raised bolt studs. Install stainless steel self-locking nuts to tighten Clamping Ring against membrane flashings until secure.
- .7 Install ballast guard strainer dome and secure with cotterless pin or wing nut screw.
- .3 Overflow Scuppers: Overflow Scupper Drain Installation:
 - .1 Where applicable and indicated on the Consultant drawing, install new metal scupper over flow drains at perimeter locations indicated on roof plan and/or where directed on site. Coordinate suitable locations with Consultant to suit site conditions. All roof areas must have overflow scuppers.
 - .2 Height of Overflow Scupper Drains:
 - .1 On roof areas without sloped roof deck or tapered insulation, install overflow scupper drains 25mm (1") to 76mm (3") above finished roof membrane as directed on site by QA Observer for each roof area.
 - .2 On roof areas with sloped roof deck or tapered insulation, install overflow scupper drains at level of finished roof membrane, unless directed otherwise on site by QA Observer.

.3 Solder all joints to make continuous water tight seal. Outer face of scupper penetrating through or beyond parapet/perimeter to be encapsulated with prefinished metal cover.

3.14 PLUMBING

- .1 Interior plumbing drain connections where required for the Work shall be the responsibility of the Roofing Contractor.
- .2 Contractor shall provide any plumbing hook-up to drains as part of the contract and to co-ordinate the installation of same with the Client.
- .3 Test all existing drains to verify that they are free flowing.

3.15 MISCELLANEOUS MECHANICAL & ELECTRICAL

- .1 Unless stated in writing elsewhere, Contractor responsible for all Mechanical and Electrical Work required to perform complete installation of new roofing. Any and all costs associated with HVAC disconnection, lifting, removal, and reconnection, including modification of gas and conduit lines, to be included in Bid Pricing, unless specified otherwise on Bid Form.
- .2 Unless stated in writing elsewhere, Contractor responsible to lift all mechanical units to facilitate roofing under this Section.
- .3 Unless stated in writing elsewhere, Contractor is responsible for restoring the mechanical unit functions by the end of each day.
- .4 When lifting mechanical units, remove existing foam gasket and replace with new specified foam gasket. Ensure surface receiving new gasket is clean and dry, with no remnants of the old gasket.
 - .1 Notify QA Observer if existing mechanical curb is of bolt together type, and has open corners.
- .5 To minimize inconvenience, coordinate any planned disruptions by providing 5 working days advance notice to the Owner.
- .6 The following is a step by step procedure for removal and re-installation of all Mechanical and Electrical Equipment consisting of:
 - .1 Combined heat/cool units.
 - .2 Cooling only units.
 - .3 Split systems (cooling only).
 - .4 Exhaust Fans.
 - .5 Removal of units.
- .7 Combined heating and cooling units:
 - .1 Locate power source in store and turn off, lock out or tag.
 - .2 Check power source at unit on roof and disconnect.
 - .3 Shut off gas and disconnect gas piping and cap both ends to keep out moisture and dirt.
 - .4 Disconnect duct work.

- .5 Lift unit using slings, spreaders where necessary and A-Frame with wheels and move to neutral area over plywood sheets.
- .6 Upon completion of roofing, replace unit.
- .7 If unit has been raised; modify duct work, insulation, electrical and gas piping to suit.
- .8 Reseal same to make watertight.
- .9 Turn power on in store, recheck at unit, restart unit.
- .8 Cooling only units:
 - .1 Locate power source in store and turn off, lock out or tag.
 - .2 Check power source at unit on roof and disconnect.
 - .3 Disconnect duct work.
 - .4 Lift unit using slings, spreaders where necessary and A-Frame with wheels and move to neutral area over plywood sheets.
 - .5 Upon completion of roofing, replace unit.
 - .6 If unit has been raised; modify duct work, insulation, electrical piping to suit. Reseal same to make watertight.
 - .7 Turn power on in store, recheck at unit, restart unit.
- .9 Split systems (cooling only):
 - .1 Check power source in store and turn off, lock out or tag.
 - .2 Check power at unit and disconnect.
 - .3 Remove refrigerant into cylinders and store for re-use.
 - .4 Final removal of refrigerant will be accomplished by using approved reclaimer.
 - .5 Disconnect and cap refrigerant lines to keep moisture out.
 - .6 Remove unit using slings, spreaders and A Frame with wheels to a neutral area.
 - .7 *Recharge only with refrigerant removed and stored; not responsible if unit is short of refrigerant.
 - .8 Set unit back on sleepers after reroofing.
 - .9 Reconnect piping and modify as required if unit has been raised.
 - .10 Leak test and evacuate system and recharge with stored refrigerant only.
 - .11 Reconnect electrical, turn power on, turn unit on.
- .10 Exhaust fans:
 - .1 Locate power source in store and turn off tag or lock out.
 - .2 Check power at unit and disconnect electrical and duct work.

- .3 Raise and move unit using slings and A Frame with wheels to a neutral area.
- .4 Put unit back on sleepers or curb after reroofing.
- .5 Reconnect electrical and duct work with modifications as required.
- .6 Reseal duct work to provide watertight seal.
- .11 Removal:
 - .1 Locate and disconnect power to unit, tag or lock out.
 - .2 Remove electrical to below roof level and disconnect electrical at source and make safe.
 - .3 Tag disconnected line as to location at both ends.
 - .4 Disconnect and remove duct work to below roof level.
- .12 Electrical Instructions:
 - .1 Contractor shall carry the costs of the following electrical work associated with the roof replacement:
 - .1 Where existing Roof Top HVAC Units to be raised or relocated temporarily (to replace curbs etc.), these units should be disconnected, existing feeders to be extended to be extended to the temporary location connected. When the necessary work is completed the units will be disconnected at the temporary locations and reconnected at the permanent locations.
 - .2 Where existing Telephone / Cellular / Cable / Satellite cables run on the existing roof, these cables shall be raised in sections to follow the phasing of the roof replacement and placed back on the new roof. The Contractor to co-ordinate this work with Service Provider.
- .13 Remove and dispose of identified and designated abandoned, redundant, and unused HVAC equipment from roof and worksite.
- .14 Gas Lines and Conduits: Disconnect, modify, and reconnect all gas lines, electrical lines, and conduits as required to suit new roof installation height and configuration of projection detailing.
 - .1 All gas line work must be performed by a qualified Gas Fitter and must conform to requirements of CSA B149.1-10.
 - .2 Re-install gas lines and conduits at a height of 150mm (6") to 200mm (8") above finished roof surface. Secure all loose cabling and conduits off surface of roof membrane.
 - .3 Ensure that all gas line penetrations are separated from all electrical line penetrations with their own roof flashing supports. Provide any new sleeves, goosenecks, or curbs required using IRC Group approved flashing supports and installation methods.
 - .4 At threaded gas line piping, which cannot be permanently enclosed or covered, construct new insulated and waterproof dog house detail with removable lid for periodic thread inspection.
 - .5 Paint all gas lines on areas of roof work with exterior grade, yellow paint for metal surfaces; Rust Paint by Tremclad or Consultant approved equivalent.
- .15 Underdeck Securement: Where existing sections of roof decking are to be removed, ensure any cabling, conduits, and attachments (plumbing, electrical wiring, lighting fixtures, etc.) secured to

underside are disconnected, removed, and relocated. Notify Owner's Representative, if necessary, to have interior services disconnected, removed, and relocated by Owner.

.16 Temporary Security: Provide overnight security, at no additional cost to Owner, where removal of any venting or HVAC equipment results with an opening in roof deck that cannot be permanently sealed on same day. Security company must be preapproved by both Owner and Consultant in advance.

3.16 TEMPORARY WATER CUT-OFFS (NIGHT SEALS)

- .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 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.
- .4 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.
- .5 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.
- .6 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.

3.17 METAL FLASHINGS

.1 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 detail drawings.

3.18 SEALANTS

.1 After installation of roof membrane and membrane flashings, install sealants as per Section 07 92 00 – Sealants and as recommended by membrane manufacturer.

3.19 CLEAN-UP

- .1 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.

END OF SECTION - 07 52 00

PART 1 - GENERAL

1.1 SECTION INCLUDES

- .1 Supply and installation of new prefinished sheet metal flashings and counter flashings to complete roof system installation. Unless specifically indicated otherwise, all references to Sheet Metal Flashings in specifications and drawings to refer to new pre-painted steel.
- .2 Form, break, and install metal flashings to suit perimeter and projection details as specified and as shown on detail drawings.
- .3 Coordination of all work in this section with other sections and trades as required to ensure proper installation of specified components.

1.2 RELATED SECTIONS

- .1 Section 01 11 00 Summary of Work
- .2 Section 02 41 19 Selective Demolition & Removal
- .3 Section 07 52 00 SBS Modified Bituminous Membrane Roofing
- .4 Section 07 92 00 Joint Sealants

1.3 **REFERENCES**

- .1 Latest edition of all listed references; most stringent requirements to govern in conflicts:
 - .1 American National Standards Institute/Single Ply Roofing Industry (ANSI/SPRI):
 - .1 ES-1: Wind Design Standard for Edge Systems (Low Slope Roofing).
 - .2 American Society for Testing and Materials (ASTM).
 - .1 A606: Steel Sheet, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .2 A653/A653M: Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - .3 A792/A792M: Steel Sheet, 55% Alum.-Zinc Alloy-Coated by Hot-Dip.
 - .3 Canadian Standards Association (CAN/CSA):
 - .1 B111: Wire Nails, Spikes and Staples.
 - .4 Canadian General Standards Board (CAN/CGSB):
 - .1 51.32M: Sheathing, Membrane, Breather Type.
 - .2 93.1-M: Sheet, Aluminum Alloy, Prefinished.
 - .5 Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - .1 Architectural Sheet Metal Manual
 - .6 Roofing Contractors Association of BC (RCABC): Roof Practices Manual, Latest Revision, and includes Technical Updates issued at the time of tender.
 - .7 Canadian Roofing Contractors Association (CRCA): Roofing and Waterproofing Manual.

1.4 SUBMITTALS

- .1 Mock-ups: Create mock-up sample of irregular metal flashing details and related accessories for review by Consultant. Examples: irregular parapet saddle flashings or gum edge flashings.
 - .1 Provide any additional mock-up samples as reasonably requested by Consultant.
 - .2 Mock up must include at least one outside or inside corner.
 - .3 Finished and approved mock-ups to remain as example of standard to be met, and may remain in place as part of installed and completed work.
- .2 Warranty: Upon completion of the project provide Owner with guarantees and warranties listed in Section 1.8 of this specification.

1.5 CONTRACTOR QUALIFICATIONS

- .1 Sheet metal installers must be pre-approved by membrane manufacturer and Consultant if installing membranes.
- .2 Contractor must be a member in good standing with Roofing Contractors Association of BC (RCABC) and have a minimum ten (10) years relevant experience with similar roof materials.

1.6 STORAGE AND HANDLING

- .1 Do not store metals in direct contact with earth, road surface, roof deck, or other metals.
- .2 Provide protection where sheet metal flashings will be stored on finished roof surfaces.
- .3 Place suitable supports or pallets under metal stock upon delivery. Protect metal from scratches, dents, punctures, and moisture.
- .4 Store caulking and sealants at +5°C minimum.
- .5 Handle and store products in a manner to prevent damage, oxidization, and deterioration.
- .6 Remove and replace damaged products at own expense and to satisfaction of Quality Assurance Observer/Consultant.
- .7 Store membranes and related accessory materials in accordance with Manufacturer's recommendations.

1.7 SAFETY AND PROTECTION

- .1 References:
 - .1 CAN/CSA S269.2M: Access Scaffolding for Construction Purposes.
 - .2 FCC No. 301: Standard for Construction Operations.
 - .3 Comply with all safety requirements as per current printed edition of applicable health and safety Act, Regulations, and Code applicable in the jurisdiction for the Work, and with RCABC standards.
- .2 Solvents, Adhesives and Membranes
 - .1 Store only enough solvents and adhesives on roof for same day's use.
 - .2 Manufacturer supplied adhesives should be stored in their overnight containers. Minimum temperature for solvent based adhesives and primers is -5°C.

- .3 Hoisting:
 - .1 Protect walls and roof perimeters where hoisting is required.
 - .2 Protect roofs from damage due to traffic and material handling until completion of project.

1.8 WARRANTY

- .1 Sheet Metal Flashings:
 - .1 Material and Workmanship Warranty covering sheet metal flashing material and workmanship for two (2) years on Contractor's letterhead.
 - .2 Work under this section is to be included in RGC RoofStar Year Guarantee as stated in Section 07 52 00.

1.9 QUALITY ASSURANCE OBSERVATION

- .1 IRC Building Sciences Group, hereafter known as "Observer", is an independent Quality Assurance Observation agency appointed by Owner to observe installation of sheet metal flashing Work:
 - .1 Arrange Prestart site meeting with Observer no more than three (3) weeks prior to commencement of Work on site. Obtain Observer's instructions and reference procedures to be followed on project.
 - .2 Provide to Observer date when work will begin, at least forty-eight (48) hours prior to commencement of Work for phase.
 - .3 Arrange Final Review of installed work with QA Observer, and where required with membrane Manufacturer's technical representative.
- .2 Cooperate with Observer and afford all facilities necessary to permit full Quality Assurance Observations during performance of Work. Act immediately on instructions given by Observer.
- .3 When required, provide cut-outs and samples in field where directed by Observer and make good without additional cost to Owner.
- .4 Pay for any additional testing and observations required by Observer for correction of Work, without additional cost to Owner, when initial tests and observations reveal work failing to meet contract requirements and when construction extends beyond the schedule submitted by the contractor.
- .5 Copies of Q.A. Observation Reports to be issued by Observer to Owner and Prime Contractor.

1.10 PREPARATORY WORK

- .1 Examine drawings and specifications and any other necessary data which may affect installation to determine extent of Work involved in this Section. No additional claims against Owner to be allowed resulting from failure to ascertain full extent of Work required as described or implied.
- .2 Prior to application of flashings, review roof perimeters and projections.
- .3 Examine installed membrane flashings for any defect of level or construction before proceeding with work.
- .4 Advise Consultant of any deficiencies that may affect performance of roof system and any deviations from specified tolerances.

.5 Defective or improper work must be corrected before proceeding with installation of sheet metal flashings.

PART 2 - PRODUCTS

2.1 PRE-FINISHED METAL FLASHINGS

- .1 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a completed assembly.
- .2 Prefinished Metal Flashing: 24 gauge (0.026" or 0.66mm) steel with G90 (Z275) zinc coating conforming to ASTM A653A/A653M. Surface with Silicone Modified Polyester (SMP) factory-baked finish. Colour selected by Owner from Manufacturer's standard colour range.
- .3 Cascadia Metals Inc. and Makin Metals are pre-approved manufacturers. Alternate manufacturers requires Approval by Owner.
- .4 Cleats and Hook Strips Not Otherwise Specified: Two gauges heavier of material matching that of flashing being employed; minimum 22 gauge (0.032" or 0.82mm).

2.2 ACCESSORIES

- .1 Underlay: To be specified base sheet and cap sheet membranes unless otherwise detailed. Selfadhered membrane conforming to CSA A123.3M, minimum 1.0mm thick of SBS modified bitumen, with a top surfacing of tri-laminate polyethylene film and an underside with a protective release film.
- .2 Joint Filler: Extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 210 kilopascals (20 to 30 psi), 25% to 30% wider than joint to be caulked.
- .3 Touch-up paint: As recommended by pre-finished material manufacturer.
- .4 Sealants: as per Section 07 92 00.

2.3 FASTENERS

- .1 Use galvanized, copper, aluminum, stainless steel or coated screws most compatible with materials being employed. Use fasteners as most generally suitable to not cause a galvanic reaction.
- .2 Wood to Wood: No. 8 screws of a suitable length to penetrate into substrate a minimum 19 mm (0.75"). Install according to manufacturer's instructions.
 - .1 When Alkaline Copper Quaternary (ACQ) treated wood is present, fasteners shall be upgraded to hot-dipped galvanized steel, stainless steel, silicon bronze, copper or specially coated suitable for use in ACQ such as DT1700.
- .3 Wood to Steel: Phillips Modified Truss Head fastener as manufactured by UCAN Fastening Products or Master Driller Wafer Plymetal or Wafer Reamer as manufactured by Leland Industries, or Owner Approved Equal, of sufficient length to penetrate into substrate a minimum 6mm (.25"), zinc plated. Install according to manufacturer's instructions.
- .4 Steel to Steel: Master Gripper Self-Drilling Screws with wafer head as manufactured by Leland Industries, or Owner Approved Equal, of sufficient length to penetrate into substrate a minimum 6mm (.25"). Install according to manufacturer's instructions.
- .5 Steel/aluminum to aluminum: 410 Case Hardened Stainless Steel Master Gripper MDP Self-Drilling Screws with wafer head as manufactured by Leland Industries, or Owner Approved Equal,

of sufficient length to penetrate into substrate a minimum 19mm (.75"). Install according to manufacturer's instructions.

- .6 Fasteners to Masonry or Concrete: MNA635R Nylon Drive Screw Anchor as manufactured by UCAN Fastening Products of a suitable length to penetrate into substrate minimum 38mm (1.5" or 5/16") Ultracon Fastener as manufactured by Elco Construction Products or Owner Approved Equal, to penetrate substrate by 32mm (1.25"), minimum unless otherwise shown. Install according to manufacturer's instructions.
 - .1 Drill hole 322mm (.75") deeper than embedment.
 - .2 Install colour matching plastic cap or paint to match sheet metal flashings.
- .7 Exposed Fasteners: UDrill Self-Drilling Screws with hex washer head and bonded EPDM fastener as manufactured by UCAN Fastening Products, or Owner Approved Equal, of sufficient length to penetrate into substrate a minimum 19mm (.75"). Install according to manufacturer's instructions.
 - .1 Hex Head and washer assembly are to be powder coated or 2 part epoxy painted to match metal flashings.
 - .2 Unless otherwise identified in drawings, fasteners are to be case hardened steel.
 - .3 Fasteners to be #8 or better.
- .8 Pop Rivets: 3mm (0.125") shank diameter, all stainless steel, blind pop rivets meeting ASME/ANSI B18.1.1. Head diameter to be 6mm (0.25") and with a grip range of 4.7mm to 6.4mm (0.1875 to 0.25"). Body and mandrel to be constructed from high-shear, 300 series stainless steel.

2.4 FABRICATION

- .1 Fabricate all possible work in shop in 3.05m (10') lengths by brake forming, bench cutting, drilling and shaping.
 - .1 On vertical sections over 406mm (16") and under 1.22m (48") in elevation install metal in 1.52m (5') section as specified and detailed. Profiled metal to include cross or horizontal stiffener breaks.
 - .2 On high vertical sections over 1.22m (48") in elevation sheet metal coverage shall be considered cladding. Bring to the attention of the Consultant if areas are not previously identified.
- .2 On coping or flashing with a horizontal dimension of 508mm (20") or greater, use 25mm (1") lock folded standing seam joints.
 - .1 Clips for Standing Seams must be a minimum 24 gauge in thickness, 38 mm (1-1/2") wide.
- .3 Form bends with straight sharp lines, angles and corners into true planes, free from twists, buckles, dents and other visual distortions.
- .4 Double-back exposed metal edges at least 12.7mm (0.5"). Exposed raw edges will not be permitted.
- .5 Drip edge flashings that will engage a hook strip shall be hemmed to allow a full 12.7mm (.5") of engagement.
- .6 Supply all accessories required for installation of sheet metal work of this Section. Fabricate accessories of same materials to which they will be used.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install sheet metal flashings at copings, walls, joints, roof openings and other components required to protect membrane flashings as shown on drawings, or otherwise required.
- .2 Install continuous concealed hook strips at all exterior faces. Install cleats as required to protect membrane roofs and flashings from damage at lock joints and as required to permanently hold flashing in place. Secure cleats at 305mm (12") on center keeping fastener within 32mm (1.25") of drip edge to a maximum 76mm (3") away from drip edge. Use of screw type fasteners are required, nails are not acceptable.
 - .1 No fastening of flashing is permitted within 89mm (3.5") of the roof surface.
 - .2 Discontinuous clips are not to be used without design authority written approval and the request shall have just cause.
- .3 Install in a uniform manner, true to line, free of dents, warping and distortion.
- .4 Install sheet metal with concealed fasteners at lock joints. Exposed fastening will be permitted only with approval of Consultant. Space all fasteners evenly in an approved manner. Use of screws are required, nails are not acceptable. Use nylon plugs and screws where fasteners are exposed, otherwise use concrete drive fasteners where metal flashings are installed over concrete or masonry..
- .5 Install underlay under sheet metal, installed directly over wood or masonry surfaces. Overlap joints 51mm (2") and turn up 76mm (3") at edges where horizontal surfaces intersect vertical planes.
- .6 Join sheet metal by "S" lock seams and / or standing seams. Space joints evenly where exposed. Form inside and outside corners by means of standing seams. Do not use pop rivets.
 - .1 Lap seams on vertical corners are acceptable only where the vertical run is less than 100 mm (4"). Otherwise corner mating to be completed with a standing seam.
 - .2 For s-lock applications 1 screw every 200mm (8") of width is required within the seams.
 - .3 For standing seam applications, clips must be secured with a minimum 2 screws, and placed a minimum of 1 clip every 200 mm (8") of width.
- .7 The top surfaces of all walls (parapets, expansion joints, roof dividers, etc) will be constructed to provide a minimum of 2% drainage to the interior of the roof.
 - .1 All cap flashings shall be fully supported by a rigid substrate, shims are not acceptable
 - .2 Do not form open joints or cupping that fails to drain water.
- .8 Caulk all sheet metal joints.
- .9 Where existing reglets cannot be reused, provide new saw cut into substrate sized minimum 25mm (1") deep and to suit site conditions.
 - .1 Clean saw cuts free of contaminates and dust.
- .10 At reglets or sawcuts wider than 10mm (.375") and deeper than 19mm (.75") provide polyethylene rod, 25% wider than joint width. Caulk all reglets to provide a continuous waterproof seal. Use colour to match materials. Conform to manufacturer's latest printed recommendations for use of products being employed.

- .11 Gum edge or gum lip flashings (also known as surface reglets) should be avoided in all circumstances. If job conditions allow for no other alternative, written permission from Consultant for use of gum edge flashing must be obtained.
 - .1 Unless otherwise detailed or stated all surface reglet flashings shall be double gum lip flashings.
- .12 Install sheet metal saddle flashings at parapet to wall locations, over membrane flashings, and secure in place. Saddles to direct water flow away from the sensitive vertical to horizontal transition joint.
 - .1 Punch lock seams are acceptable, however will require appropriate sealants.
- .13 Prepare cut sheet and mock-up installations of metal flashing details for approval by QA Observer prior to installation of sheet metal flashings.
 - .1 If existing substrate conditions are expected to create deflection or oil-canning in the finished flashings, the concern should be brought to the attention of the design authority for discussion prior to installation. Installation of the flashing will indicate the roofing contractors' acceptance of the existing conditions.

3.2 FINISH

- .1 At project's conclusion, leave surface and adjacent work areas free of damage and clean of debris. Finished surfaces of formed metal flashings to be free of oil canning, dents and be perfectly colour matched.
- .2 Changes in colour between sheets and dented or oil canned surfaces that detract from visual appearance of finished product will be rejected. Remove and replace damaged, defaced or defective work.
- .3 Paint all exposed metal due to cutting.
- .4 After erection touch-up finish surfaces damaged during handling and erection in conformance with manufacturer's recommendations. Refinish shop applied finishes as approved by Consultant.
- .5 Remove deposits or protections and wash metals left unpainted and exposed to view as specified by metal manufacturer.

3.3 CLEAN-UP

- .1 Daily as work proceeds and on completion, remove all surplus materials and debris resulting from foregoing work.
- .2 Drag a magnetic bar across work area and grounds to ensure removal of all discarded fasteners and sharp metal debris.
- .3 Remove all stains, caulking or other adhesive from all affected surfaces.

END OF SECTION - 07 62 00

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PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 01 11 00 Summary of Work
- .2 Section 02 41 19 Selective Demolition and Removal
- .3 Section 07 52 00 SBS Modified Bituminous Roofing Membrane
- .4 Section 07 62 00 Prefinished Sheet Metal Flashing & Trim

1.2 **REFERENCES**

- .1 All codes, standard specifications and by-laws referred to in this section shall be current editions including all revisions, addenda and supplements.
 - .1 ASTM C719 Standard Test Method for Adhesion and Cohesion of Elastomeric Sealant Joints Under Cyclic Movement (Hockman Cycle).
 - .2 ASTM C920 Standard Specification for Elastomeric Joint Sealants.
 - .3 ASTM C1193 Standard Guide for Use of Joint Sealants.
 - .4 ASTM C1311 Standard Specification for Solvent Release Sealants.
 - .5 ASTM C1330 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
 - .6 ASTM C1481 Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS).
 - .7 CAN/CGSB-19.13-M87 Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .8 CGSB 19-GP-5M Sealing Compound, One Component, Acrylic Base, Solvent Curing.
 - .9 CGSB 19-GP-14M Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
 - .10 CAN/CGSB-19.17 One-component Acrylic Emulsion Base Sealing Compound.
 - .11 CAN/CGSB-19.24 Multi-component, Chemical Curing Sealing Compound.
 - .12 SWRI (Sealant, Waterproofing and Restoration Institute) Sealant and Caulking Guide Specification.
 - .13 Sealants: The Professionals' Guide, Sealant, Waterproofing and Restoration Institute.

1.3 SUBMITTALS

- .1 Section 01 33 00 Submittal Procedures.
- .2 Manufacturer's Installation Instructions: Indicate special procedures, surface preparation, perimeter conditions requiring special attention, and field quality control testing.

1.4 QUALITY ASSURANCE OBSERVATION

.1 Observation of work will be carried out by designated QA Observer.

- .2 Prior to mobilizing on site, prepare and install sealant samples for adhesion testing, a minimum of two (2) samples for each substrate combination, according to manufacturer's written guidelines. Test sealant in contact with samples of materials to be caulked to ensure that proper adhesion will be obtained and no staining of material will result. Testing to be completed prior to mobilization on site. Do not proceed with Work until samples have been approved.
- .3 Adhesion tests on new sealant will be performed at random locations at discretion of Owner's representative. Any work that is found to be sub-standard, is to be removed and replaced at no cost to Owner. Contractor is to assist with sealant adhesion tests as directed.
- .4 Execute Work of this Section by Subcontractors approved by manufacturers of materials incorporated in Work; who has equipment, adequate for Project, and skilled tradesmen to perform it expeditiously; and is known to have been responsible for satisfactory installations similar to that specified during a period of at least immediate past five years.
- .5 Remove sealant and re-caulk disapproved joints.
- .6 Approved joints will establish minimum acceptable quality of workmanship and will serve as standard by which subsequent Work will be compared for Acceptance.

1.5 MOCK-UP

- .1 Construct mock-up with specified sealant types and with other components noted.
- .2 Construct mock-up at test area to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant.
- .3 Locate where directed.
- .4 Mock-up may be part of finished Work.
- .5 Allow 48 hours for inspection of mock-up by Consultant before proceeding with Sealant Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact.
- .2 Protect from freezing, moisture, water and contact with ground or floor.

1.7 ENVIRONMENTAL AND SAFETY REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of material safety data sheets acceptable to local Labour regulations.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .3 Dispose of surplus chemical and finishing materials in accordance with federal regulations.
- .4 Fold up metal banding, flatten, and place in designated area for recycling.
- .5 Use trigger operated spray nozzles for water hoses.

- .6 Return solvent and oil soaked rags for contaminant recovery and laundering or for proper disposal.
- .7 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.
- .8 Close and seal tightly all partly used sealant containers and store protected in well ventilated firesafe area at moderate temperature.
- .9 Place used hazardous sealant tubes and other containers in areas designated for hazardous materials.

1.9 WARRANTY

- .1 Contractor shall provide five (5) year warranty for Workmanship.
- .2 Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

- .1 Sealant shall be a high performance, high movement, single component, low modulus, low VOC, UV Stable, non-sag hybrid sealant.
- .2 Sealants and caulking compounds must:
 - .1 Meet or exceed all applicable industrial safety and performance standards.
 - .2 Be manufactured and transported in such a manner that all steps of process, including disposal of waste products arising therefrom, will meet requirements of all applicable governmental acts, by laws and regulations.
 - .3 Be of a hybrid nature, utilizing silyl-modified polyurethanes, also identified as an MS Polymer.
- .3 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information describing proper disposal methods.
- .4 Caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant to not be used in or near air handling units.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Acceptable single component neutral cure silicone sealants for skylight related work include:
 - .1 Tremco Dymonic FC or Approved Alternate Hybrid Sealants discussed with Consultant Colour of sealant to be selected to match cladding components.
 - .2 Primer: As recommended by sealant manufacturer to assure adhesion of compound, to prevent staining of substrate.
 - .3 Joint Backing: Polyethylene, urethane, neoprene, or vinyl, extruded closed cell foam in circular shape with diameter 25% greater than joint width before installation; joint breaking tape approved by sealant manufacturer where specified.
 - .4 Cleaning Material: As recommended by sealant manufacturer.

- .2 Concealed Sealants: To be Tremco Dymonic FC or Approved Alternate Hybrid Sealants discussed with Consultant.
- .3 Butyl (for concealed skylight related sealant joints): Tremco Curtainwall Sealant or approved alternate.
- .4 Primers:
 - .1 TREMprime Silicone Porous Primer for porous surfaces and TREMprime Silicone Metal Primer for metals or plastics, or primers as recommended by sealant manufacturer.
- .5 Cleaners:
 - .1 Acceptable cleaners:
 - .1 Dow Corning Primer/Surface Prep Solvent,
 - .2 Methylethylketone (MEK)
 - .3 Isopropyl Alcohol
 - .2 Surfaces to receive sealants are to not be cleaned with Xylol.
 - .3 All substrate materials to be cleaned with compatible cleaners.

2.3 PREFORMED COMPRESSIBLE AND NON-COMPRESSIBLE BACK-UP MATERIALS

- .1 Polyethylene:
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
- .2 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape.
- .2 Compatibility: All materials in a sealant system to be compatible with each other, with substrate and any coating or waterproofing to be installed. Sealants used with elastomeric coating or waterproofing systems must be approved by coating or waterproofing manufacturer.

2.4 JOINT PRIMER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant. Primer as recommended by sealant manufacturer.

PART 3 - EXECUTION

3.1 **PROTECTION**

- .1 Protect existing facades from staining or contamination.
- .2 Protect public from falling debris during installation.
- .3 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage. At no time shall unsealed joints be left open. If protection is required, then entire drop/bay to be adequately protected.

3.2 EXAMINATION

- .1 Before commencing Work, verify that joint configuration and surfaces have been provided as specified under Work of other Sections to meet intent of sealant Specification, that joint conditions will not adversely affect execution, performance or quality of completed Work and that they can be put into acceptable condition by means of preparation specified in this Section. Verify site conditions together with manufacturer's representative of sealant to be applied.
- .2 Examine existing conditions and substrates upon which work of this section is dependent. Report to Consultant in writing any defects or discrepancies. Commencement of work implies acceptance of existing conditions and assuming full responsibility for finished condition of work.
- .3 Ascertain that sealers applied to sealant substrates are compatible with sealant used and that full bond between sealant and substrate is attained. Request samples of sealed or coated substrate from their fabricators for testing of compatibility and bond if necessary.
- .4 Examine sealant configuration for width and depth. Depth of joint should be 1/2 joint width with a minimum depth of 6mm (0.25") and a maximum depth of 13mm (0.5") unless specified otherwise. For fillet joints, a minimum of 6mm (0.25") adhesion between sealant and substrate must be achieved on both sides of joint unless specified otherwise.
- .5 Defective work resulting from application to unsatisfactory joint conditions will be considered responsibility of those performing work of this section.

3.3 SURFACE PREPARATION

- .1 Prepare surfaces in accordance with manufacturer's directions.
- .2 Before any sealant repairs are made, type of existing sealant to be determined. If uncertain as to type, then a sealant manufacturer technical representative to be contacted to confirm type. Only sealant compatible with existing to be installed as part of repairs. Urethane based sealants are not to be applied over existing silicone sealants.
- .3 Where existing, remove sealant completely. In no case shall new sealant be applied over old. In addition:
 - .1 Remove existing sealants, dust, oil, grease, oxidation, mill scale, coatings and all other loose material by cutting, brushing, scrubbing, scraping and/or grinding. In no case, however, shall components be damaged during surface preparation.
 - .2 Clean substrates with recommended solvent cleaner. Apply solvent with a clean cloth, pad or soft paper towel. Applicator cloth or towel to not leave fiber residue on substrate surface. Surface should be wiped clean and dried with a second clean cloth to ensure removal of contaminants. If substrate surfaces is still not clean, repeat procedures as needed. Change cloths frequently to prevent depositing contaminants from cloth onto substrate surface.
 - .3 Use method of surface preparation suitable for substrate, as recommended by sealant manufacturer and that does not damage existing finishes.
- .4 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .5 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .6 Ensure joint surfaces are dry and frost free.

.7 Remove loose particles present or resulting from routing by sweeping particles out with a dry brush, blowing out joints with oil free compressed air or by vacuuming joints prior to solvent cleaning.

3.4 PRIMING

- .1 Where necessary to prevent staining or for neat appearance, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.
- .3 Use only primer approved by sealant manufacturer for particular installation, applying in strict accordance with manufacturers printed recommendations.
- .4 Always pour primers onto rag or brush, do not dip rag or brush into container.
- .5 Prime only as much area that can be packed and caulked in a single day.
- .6 Do not apply excess primer, and apply primer only to areas which it will be contacted by sealant.

3.5 BACKUP MATERIAL

- .1 Apply bond breaker tape where installation of backer rod is not possible, three point adhesion needs to be eliminated or throat to width ratio needs to be created as per manufacturers recommendations.
- .2 When using backing material comprised of tubular or rod stock, avoid lengthwise stretching of material. Do not twist or braid backer material.
- .3 Provide a stiff blunt-surfaced wood or plastic installation tool, having shoulders designed to ride on finished surface and a protrusion of required dimensions to assure a uniform depth of backup material below sealant. Do not puncture exterior skin or surface of backer material. A screwdriver is prohibited for use on this project.
- .4 Using approved tool, smoothly and uniformly place backup material to depth indicated on drawings or otherwise required, compressing backer material 25% to 50% and securing a positive fit.
- .5 Install backing material to a depth to provide a caulked joint meeting depth requirement as set out in sealant manufacturer's specifications.

3.6 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.7 APPLICATION

- .1 Sealant:
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exist to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.

- .5 Ensure that new sealant is adhered to substrates a minimum of 6 to 10 mm at each side of joint.
- .6 Use sufficient pressure to fill voids and joints solid.
- .7 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .8 Tool exposed surfaces before skinning begins to give slightly concave shape. Tooling to be performed by proper metal or wood tool. Finger tooling joints will not be accepted.
- .9 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

- .1 Cure sealants in accordance with sealant manufacturer's instructions.
- .2 Do not cover up sealants until proper curing has taken place.

3.8 CLEAN-UP

- .1 Clean adjacent surfaces immediately and leave work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.

END OF SECTION - 07 92 00

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PART 1 - GENERAL

1.1 SUMMARY

- .1 The work includes labour, materials, equipment and services for design, supply and installation of aluminum windows as indicated. Requirements of Section 08 80 00 Glazing apply and are to be read in conjunction with this section.
- .2 Contractor will arrange and pay for an independent third party testing company to test the windows.

1.2 **REFERENCES**

- .1 All codes, standard specifications and by-laws referred to in this section shall be current editions including all revisions, addenda and supplements.
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-08 North America Fenestration Standard/Specifications for Windows, Doors & Skylights (NAFS).
 - .2 CSA A440S1-09, Canadian Supplement to NAFS-08 Harmonized Standard 2013.
 - .3 CSA-A440-00 Windows
 - .4 ASTM E1105 Field Determination of Water Penetration of Installed Exterior Curtain Walls and Doors by Uniform or Cyclic State Air Pressure Difference, by using AAMA 502-90, Voluntary Specification for Field testing of Windows test Method B.
 - .5 BC Building Code 2018.
 - .6 CAN3-S157 Strength Design in Aluminum

1.3 SYSTEM DESCRIPTION

- .1 Extruded aluminum thermally broken double glazed windows.
- .2 Aluminum frame: extruded sections of 6063-T5 Alloy; with aluminum head deflection channels, aluminum installation angles and plates.
- .3 Glazing: to be designed in conformance with CAN/CGSB 12.20-M89. Refer to Section 08 80 00 Glazing for other requirements.
- .4 All glass, gaskets, splines, setting blocks and sealants.
- .5 All necessary internal concealed reinforcing members, posts, brackets, anchors, screws, and bolts etc. to ensure a first class installation, and to ensure compliance with the specific performance criteria and the requirements of BC Building Code 2018.
- .6 All exterior and interior aluminum flashing, closures, cover plates and trim, and self adhering perimeter frame membrane required in connection with window installations.
- .7 All fastenings, anchors, brackets, straps, shims, bolts, and nuts etc. required to be attached to building structure for the support of the aluminum framing.
- .8 Sealants between all metal contacts of aluminum framing components to ensure a weather-tight and waterproof assembly, and sealants between aluminum framing and adjoining construction.

1.4 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Notwithstanding the approved type of aluminum framing is specified herein, design, fabricate and install component parts of the aluminum framing and windows to meet or exceed NAFS requirements.
 - .1 Performance Class (CW) PG20 min
 - .2 U-Value = 1.4 W/(K.m^2) maximum
 - .3 Water Penetration Resistance Test Pressure , minimum = 220 Pa
 - .4 Design Pressure, minimum = 960 Pa
 - .5 Air Infiltration / exfiltration, minimum = A2
 - .6 Configuration: Contractor to verify the existing windows on site. All windows shall match the existing windows: Starline 9000 Series.
- .2 Air Tightness: maximum allowable rate of air leakage to be 1.10m³/h/m of crack length when tested according to ASTM E783 at an air pressure difference of 75 Pa.
- .3 An air seal consistent with the rain-screen principle shall be continuously installed at the glass line perimeter and connected to the structure as an integral part of the design to provide a complete impervious air and vapour barrier.
- .4 Water Resistance: No water to penetrate the curtainwall / windows assembly or be retained within any frame member, when tested in accordance with ASTM 1E1105 at air pressure difference of 220 Pa or tested in accordance with AAMA 501.2 without the pressure caps and exterior seals in place. There is to be no "water infiltration" as defined by CSA A440.
- .5 Energy Performance: Overall window performance must meet the BC Energy Efficiency Act. Contractor to provide written confirmation.
- .6 Condensation Resistance Index: minimum Temperature Index of 58, as determined by CSA A440.
- .7 The Aluminum framing shall be designed to withstand local positive and negative wind pressure loads in accordance with requirements of the BC Building Code 2018. Annual probability factor shall be 1 in 30 for reference velocity pressure.
- .8 Aluminum framing members, anchors and connections shall be designed to conform to seismic restraint requirements of The BC Building Code 2018.
- .9 Performance ratings shall be indicated on a non-permanent label using primary& secondary designators in accordance with AAMA/WDMA/CSA 101/I.S.2/A440-08. None permanent labels shall be removed from fenestration products only after Owner/Consultant review and approves them on site. Labels and trademarks including applied labels shall not be visible on the finished work, except for the identification of safety glass as required by code. All fenestrations and fixings shall be concealed. Permanent marking identifying manufacturer are required by CSA A440s1-90, the Canadian Supplement to NAFS.
- .10 The maximum deflection in a direction normal to the plane of the aluminum framing of any metal framing member when carrying its full design load, shall not exceed L/240 of its clear span; however in no instance shall the maximum deflection be greater than 13mm. The maximum deflection of any member in a direction parallel to the plane of the wall, when carrying its full design load, shall not exceed 75% of the design clearance dimension between that member and the top of glass of

any part immediately below it. For sections next to concrete walls, limit deflection to less than 6mm.

- .11 Head members and anchors for aluminum framing shall be designed and installed to accommodate the deflection of the building structure over. The windows shall accommodate the building live load deflection of 19mm at the floor edge.
- .12 Aluminum framing shall be so designed and constructed as to provide for such expansion and contraction of component materials as will be caused by an exterior temperature range of -15°C to +40°C, and building interior temperature range of +10°C to +29°C without causing harmful buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental effects. Aluminum framing shall be so designed and constructed as to provide for such expansion and contraction of component materials as will be caused by an exterior temperature range of -15°C to +40°C, and building interior temperature range of +10°C to +29°C without causing harmful buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental buckling, glass breakage, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .13 Aluminum framing shall withstand permanent deformation, weld or fastener failure, component disengagement of breakage under loading equal to 1.5 times the design loads according to ASTM E330.
- .14 Anchor assemblies or connectors including all related connections and fasteners for and related to the aluminum framing, shall be designed, engineered, furnished and installed to conform to CSA-A440.4, and as required for full compliance with the specified performance criteria.
- .15 Aluminum framing shall be designed, assembled and secured to the structure to accommodate the building structure dead and live load deflections.
- .16 For conformance to ASHRAE 90.1, the manufacturer shall submit, with the shop drawings, a signed and dated certification listing the U-factor (NFRC 100), SHGC (NFRC 200), and air leakage rate (NFRC 400) for site specific systems (windows, window wall, sliding doors, curtain walls, storefront, etc.).
- .17 The expected service life of the glazing systems shall be a minimum of 25 years. Throughout this period, the systems are to maintain their air tightness, water tightness, and structural performance as originally specified. Any maintenance that is required to ensure that this requirement is met is to be clearly identified by the manufacturer.
- .18 Contractor to verify the existing windows on site. All new windows shall suit the existing condition of support.

1.5 SUBMITTALS

- .1 Engineer-stamped shop drawings for all work included in this Section shall be submitted to the Consultant for review.
 - .1 The shop drawings should illustrate the integration of the window system into the building envelope and anchorage methods. The shop drawings should also note all materials and products used, demonstrate drainage paths, note conformance to applicable standards and list performance results.
 - .2 Do not proceed with the work until shop drawings are acceptable to the Consultant/Owner.
- .2 Samples
 - .1 Submit one representative sample of each proposed assembly type. Sample window supplied must be identical to the windows described in the submitted test report, in terms

of any components which may affect the performance ratings. These samples will clearly demonstrate all operational features and noted locations.

- .3 Test Reports
 - .1 Submit test reports with the shop drawings for Consultant's review. Documentation should meet the requirements of NAFS (latest edition). Information must be supplied by the manufacturer to confirm that all requirements of the standard are satisfied. Additional testing may be required to illustrate that the specifications are satisfied. Test reports submitted without drawings of the window tested are not considered acceptable by current regulations. A (Standards Council Canada) SCC approved laboratory must have carried out all testing.
- .4 Safety
 - .1 All work of this section to be completed to British Columbia Occupational Health and Safety Regulations.
 - .2 Submit to consultant work plan indicating tie off locations for workers during removal and replacement of windows.
 - .3 Submit plan indicating locations and configurations of covered hoarding for walkways etc.
- .5 Maintenance Data
 - .1 Provide operation and maintenance data for windows for incorporation into the Project Close Out Manual.
 - .2 Include the following information:
 - .1 Maintenance instruction for materials, finishes, operation and cleaning.
 - .2 Parts list indicating make, size, serial number, manufacturer, telephone number and address of the suppliers.
 - .3 Arrange with and demonstrate to building maintenance staff, window operation, sash removal, cleaning, reglazing and general maintenance procedures.

1.6 QUALITY ASSURANCE

- .1 Manufacturer and Installer Qualifications:
 - .1 Provide fabrications specified in this Section only by a manufacturer and erector who has adequate plant, equipment, and skilled tradesmen to perform it expeditiously, and are known to have been responsible for satisfactory fabrication similar to that specified during a period of at least the immediate past five years.
 - .2 Installation shall be by the window company or its approved installer using only skilled workers in this trade and in sealant trade as applicable. Installers to have a minimum of 5 years of experience on similar projects.
 - .3 Submit proof of experience upon Consultant's request.
 - .4 Contractor to coordinate and pay for an independent testing company to conduct Field Water Test in accordance with ASTM E1105. Testing will be done at 3% of sliding doors, and 3% of windows. The Consultant will randomly choose the windows and doors for field testing. Testing will be witnessed by the Contractor, Consultant and Owner representative.

1.7 MOCK UP

- .1 Install one complete prototype window assembly, including related accessories, in accordance with approved shop drawings, at location designated by the Owner. The prototype shall be complete in all respects, including unit finishing, sealants, trim and painting.
- .2 The mock-up will be field tested.
- .3 The mock-up shall be reviewed and modified if necessary, as required to conform to the contract documents and site conditions. The assembly may require re-testing, if applicable, at the contractor's expense.
- .4 Do not proceed with the balance of the work until mock-up has been approved in writing by the Owner.
- .5 The approved mock-up shall remain in place as the minimum standard of acceptance for the balance of the work.
- .6 The shop drawings shall be modified and resubmitted to reflect final installation procedures, as per the approved mock-up.

1.8 FIELD TESTING

- .1 Contractor to coordinate and pay for an independent testing company to conduct Field Water Test in accordance with ASTM E1105. Testing will be done at 3% of windows. The Consultant will randomly choose the windows for field testing. Testing will be witnessed by the Contractor, Consultant and Owner representative.
- .2 All window testing will be conducted using the following procedures:
 - .1 ASTM Standard E1105-15, Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .3 Windows failing to perform to the required test levels will be modified such that they pass and retesting will be conducted, at the Contractor's expense.
- .4 The Owner may conduct additional random testing of the window units during the installation. Failure to meet the test requirements specified will result in modifications to the window unit by the Contractor and re-testing by the Owner at the Contractor's expense. Upon successful passing of subsequent testing the Contractor will be responsible for modifying all windows previously installed and to be installed in the same fashion as the successfully tested unit.
- .5 Contractor to arrange for sealant representative to be on site during installation of Mock-up. Sealant representative to return after curing period has elapsed and perform pull test, providing report to Owner, Consultant and Contractor.
- .6 Contractor is responsible to provide a covered and heated work area when temperatures fall below 10°C.
- .7 The inspection and testing service does not relieve the Contractor of his responsibility for quality control of production and for subsequent mistakes.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Before shipment, brace frame units to prevent distortion in shipment and handling, and protect finished surfaces by sturdy protective wrappings.

- .2 Maintain squareness of the windows during packaging and hoisting.
- .3 Store on site on wood platforms with waterproof sheds.
- .4 Store in vertical position with spacers between to prevent damage.

1.10 WARRANTY

- .1 **Contractor's Obligation:** The contractor must summit a signed written warranty to the Consultant for the installation of work specified in this Section covering for a period of two (2) years from date of the Certificate for Substantial Performance. The window unit's installation warranty shall include but not be restricted to:
 - .1 Leaking, loosening of whole or of parts of units, glass breakage from excessive stresses developed exterior of the insulating glass unit (other than by accidental cause exterior to the glazed unit), or deformation of unit framing due to installation.

Window Manufacturers Obligation: Provide a warranty stating that the installation of new sealed insulating glass units specified in this Section shall not cause any deleterious effect on the air and water tightness and wind load resistance performance of the window, remain watertight and free of defects which shall include without being limited to breakage and loss of seal. Fogging of glass inside sealed units or failure of a field dew point test will be considered sufficient evidence of loss of seal. This warranty shall be for a period of ten (10) years from date of Substantial Performance. The warranty shall include all required materials and their installation, at no additional cost to the Owner.

- .2 Repair leaks into building within 24 hours of notification. Any repairs required shall be carried out in accordance with the recommendations of the Consultant.
- .3 Inspect glazing 30 days before expiry of warranty period and correct defects within 15 days of inspection.
- .4 Any repairs required shall be carried out in accordance with the recommendations of the Consultant at no cost to the Owner.
- .5 The cost of all warranties shall be included in the Contract price.

PART 2 - PRODUCTS

2.1 WINDOW MANUFACTURERS

- .1 Acceptable window manufacturers provided they meet all requirements of this specification. Contractors must submit test reports with bid submission.
 - .1 Starline (Aluminum) Windows
 - .2 Kawneer Company Canada equivalent products or
 - .3 Contractor may use an equivalent product from another manufacturer, provided that the product conforms and meets all current code requirements. Please attach supporting test data, material testing and certifications will be attached upon bid submission.

2.2 MATERIALS

- .1 Window Types: Aluminum fixed and operable.
- .2 Extrusions:

- .1 Aluminum Frame: Extruded sections of 6063-T5 alloy and temper.
- .2 Aluminum head deflection channel: Extruded sections of 6065-T5 alloy and tempered.
- .3 Aluminum installation angle: Extruded section of 6063-T6 alloy and temper.
- .4 Main Frame and mullions: Extruded aluminum, thermally-broken.
- .5 Sash: Extruded aluminum, thermally-broken.
- .6 Minimum metal thickness for window sash and frame shall be 2.36 mm and 1.58 mm for glazing beads.
- .7 Sheet Steel: Stainless steel or hot-dipped zinc coating at least equal to ASTM A525M coating designated Z275 and with sufficient ductility to permit necessary forming operation.
- .8 Exposed Aluminum Sheet and Plate: AA1100-H14, alloy and temper.
- .3 All extruded sections shall be CAN/CSA-A440 extruded from T5 or T6 Aluminum alloy. Stops to be square snap-in type extruded aluminum without exposed screws and all exterior stops shall be tamper-proof. Fasteners shall be 300/400 Series stainless steel or cadmium plated of the size and type to suit the intended performance.
- .4 Aluminum Finish: Coating to be selected by the Owner prior to any fabrication start.
 - .1 Finishing Standards:
 - .1 AAMA 2603-98 "Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels."
 - .2 AAMA 2604-98 "Voluntary Specifications for High Performance Organic Coatings on Aluminum Extrusions and Panels."
- .5 Exterior Aluminum Sills:
 - .1 Extruded: Utility grade minimum 1.60 mm thick, extruded aluminum complete with jamb drip deflectors, chairs and anchors, reinforced with integral stiffening ribs. Use 1.95 mm thick extruded aluminum when not reinforced. Sills to be interlocked to frame. Brake formed shapes and exposed fasteners will not be accepted. Anodized finish of sill to match windows.
 - .2 Drip Deflectors: 25 mm x 25 mm x 3 mm rounded corners, extruded aluminum jamb deflectors, finish to match window sills. Secure to window sill using aluminum rivets as outlined under PART 3 EXECUTION.
- .6 Glass: Provide sealed insulating glass units in accordance with CAN/CGSB-12.8, composed of two panes of glass factory sealed and separated by argon gas 'air' space. Refer to Section 08 80 00 for other details.
 - .1 Glass Stops: Extruded aluminum glass stops, finish to match windows.
- .7 Supporting angles, plates, bars, rods and other steel accessories: mild steel CAN/CSA-G40.21-M87, hot dipped galvanized to ASTM A123 min coating of 610 g/m³, thickness as required to sustain imposed load and in no case less than 4.8mm thick.
- .8 Installation anchors to be specified by Professional Engineer and indicated on shop drawings.

- .1 Galvanized steel, aluminum or stainless steel anchors.
- .2 Length, diameter and spacing to suit application, and as indicated on engineered shop drawings to provide adequate securement such that all loads subjected to the window will be transferred to and be carried by the anchors and anchor support systems (All anchors to be designed to meet loads and stresses as dictated by the BC Building code).
- .3 All fasteners to be concealed.
- .9 Sheet aluminum flashings: Alloy 1100, F temper, 0.040" minimum thickness exposed sheet finished to match framing.
- .10 Fasteners: Stainless steel, of suitable size and grade to sustain imposed loads.
 - .1 Exposed fasteners to be 300 series stainless steel
 - .2 Concealed fasteners partially exposed to moisture to be 300 or 400 series stainless steel or Leyland Industries DT2000.
- .11 Thermal separator: Polyvinylchloride, 50 Shore A durometer hardness +5.
- .12 Isolating Coating: Alkali resistant bituminous enamel paint conforming to CGSB 1-GP-108M to prevent deterioration due to corrosion or electrolytic action, as recommended by manufacturer. Isolate aluminum from following components:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.
- .13 Thermal break: Extruded rigid cellular PVC conforming to CGSB 41-CP-19M, or poured in polyurethane. Poured and de-bridged thermal break installation must follow AAMA guidelines, and employ cavity serration technique to mitigate dry shrinkage.
- .14 The perimeter of window frames shall be supplied with integrally attached "peel and stick" air barrier minimum width of 203 mm (8"). Acceptable Products: Protecto-wrap;
- .15 Ventilator Windows: Shall be horizonally hung, thermally broken type to suit window type specified. Ventilators shall be weather-stripped with fin-seal weather-stripping. Ventilators shall be equipped with heavy duty zinc coated steel Anderberg hinges (Type 33ST) and zinc die cast white bronze cam handle. Acceptable Vent Type: Starline Series 9000 Window; or other pre-approved type.
- .16 Anti rotation blocks: Extruded PVC.
- .17 Weather-stripping:
 - .1 To be constructed of material resistant to weathering and aging.
 - .2 Weather-stripping shall be compatible with associated materials.
 - .3 Open celled or surface applied or glued weather-stripping shall not be used.
 - .4 All weather-stripping shall be continuous (including mitred joints of awning vents) and installed in specially extruded parts and mechanically secured to prevent shrinkage, movement or loss when removing sash for cleaning or glass replacement

- .5 Must be mechanically fastened in a manner to ensure easy replacement.
- .6 Pile weather-stripping used in sliding sashes must have fins on interior pair only. Exterior pairs of sashes to have only pile weather-stripping.
- .18 Operating Hardware (windows):
 - .1 Conform to CAN/CGSB 69 series "Builders Finishing Hardware"
 - .2 Unless noted otherwise, provide zinc-plated 1018 steel or 304 stainless steel for operating hardware, nuts, washers, bolts, rivets and other fastening devices incorporated in the windows.
 - .3 Equip operable sashes with strong, durable lifts, pulls and latches as required. Pulls shall be continuous and integral with sash.
 - .4 Security Latches: Provide zinc die cast spring-loaded security latches to provide automatic locking in closed position. No vinyl latches are to be used.
 - .5 Safety Restrictors:
 - .1 All operable vents will be restricted to 4" opening for safety, structural and envelope performance requirements.
 - .2 Provide controlled sash operation to restrict, when engaged, the opening of the operable sash to not more than 100 mm, in accordance with National Building Code of Canada.
 - .3 Safety restrictors shall allow manual by-pass to allow full opening of sash and automatically reset when the sash is moved to the closed position.
 - .4 Do not use spring loaded pins requiring holes in main frame.
 - .5 Provide means to prevent sash lifting over latch when latch is installed at bottom rail only. (e.g. metal block in head track as approved by the Owner).
 - .6 Operable sashes to be fitted with concealed nylon rollers on upstanding monorails to remain operable despite accumulation of dust and dirt on sill.
 - .7 Where windows latching devices are located in excess of 1900 mm above floor level, equip sliding units with hardware or design sash to permit remote operation (pole, coaxial crank etc.).
- .19 Perimeter Insulation: Polyurethane Foam: non-shrinking, low expansion (25%), closed cell, no CFC, single component polyurethane foam, complying with CAN/CGSB 51-GP-23M "Urethane, Foamed-in-place Insulation", such as Enerfoam manufactured by Dow Chemical Company, or an approved equivalent.
- .20 Sealant: See Sealant Section 07 92 00

2.3 FABRICATION

- .1 Fabricate windows in accordance with NAFS-08.
- .2 Workmanship: All work shall be performed by skilled workers, especially trained and fully experienced in the applicable trades employed and in full conformity with applicable provisions of the listed references and standards and/or as specified herein. Work shall be carefully fabricated and assembled with proper and approved provision for thermal expansion and contraction, fabrication

and installation tolerances and adjoining building component tolerances and design criteria. All extruding, forming, welding and cutting operations shall be done prior to finishing.

- .3 All work shall be true to detail with sharp, clean profiles, straight and free from defects, dents, marks, indentations, waves or flaws of any nature impairing strength or appearance; fitted with proper joints and intersections and with specified finishes. All members shall be extruded unless otherwise indicated on the drawings and shall be securely engaged into adjacent components. Extrusions shall allow tolerances to eliminate any edge projection or misalignment at joints.
- .4 Expansion joints within aluminum framing shall be so designed and constructed to provide noiseless and free movement and remain, permanently watertight.
- .5 No field forming, cutting and/or alterations of aluminum framing members will be allowed. All framing members will be shop fabricated and finished. No unfinished surfaces will be permitted on exposed surfaces.
- .6 Protection of Metals: Provide PVC separators or other suitable protection against galvanic action wherever dissimilar metals are in contact, as applicable.
- .7 Joints in Metal Work: All exposed work shall be carefully matched to produce continuity of line, design and finish. Joints in exposed work shall be temporarily assembled in the shop and marked before disassembly to ensure proper assembly later on the project site.
- .8 Shop Assembly: In a far as practicable, all fitting and assembly of the work shall be done in the shop. Work than cannot be permanently shop assembled shall be temporarily assembled in the shop and marked before disassembly to ensure proper assembly later on the project site.
- .9 Fasteners: All fasteners, connectors, anchors including washers and accessory items shall be scheduled and designated on the reviewed shop drawings.
- .10 Tolerances:
 - .1 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for vertical, horizontal, and diagonal dimensions of units under 1830 mm, and plus or minus 3 mm for dimensions greater than 1830 mm.
 - .2 Fabricate mullions to ensure under specified wind loads a maximum deflection of L/175 of mullion span or 19 mm, whichever is less.
 - .3 Fabricate horizontal mullions, for the worst condition of loading, to ensure under specified gravity loads a maximum deflection of L/360 of mullion span or 3 mm or smaller than the gap to the adjacent component, whichever is less.
- .11 Dimensions shown on drawings are diagrammatic only. Field measurements of rough window opening shall be performed by contractor and shown on submitted shop drawings. Maintain sight lines indicated and clearances to other construction components.
- .12 Mechanically joined sections shall have hairline joints.
- .13 Reinforce members for attachment of hardware.
- .14 Ensure that glazing rabbet is provided with depth and width to accommodate specified glass in accordance with glass manufacturer's recommendations.
- .15 Finish steel clips and reinforcement with 380 g/m zinc coating to CAN/CSA-G164.
- .16 Assembly of Units:

- .1 Join members by welding where practicable, using materials recommended by manufacturers of metals being welded. Remove flux completely following welding, and grind and polish joints smooth and clean.
- .2 Join members where welding is impractical by mechanical methods. Reinforcement or fasteners visible on exposed faces of members when window is in the closed position will not be acceptable.
- .3 Incorporate weep holes to drain off pocketed water. Baffle weep holes to prevent entry of driven water to conform to specified performance.
- .4 Except where shipping makes impossible, fabricate units in shop and ship completely assembled with operating hardware attached.
- .5 All butt joints in the window assembly must be sealed prior to assembly by the use of tapes. Surface application of sealant at butt joints shall not be accepted as a suitable alternative.
- .6 Deburr and make smooth all sharp milled edges and corners of frames.
- .17 Window Pannings and Brake Formed Shapes:
 - .1 All exterior exposed blocking at window perimeters shall be covered by extruded aluminum panning, interlocked to frame. Brake formed shapes and exposed fasteners will not be accepted.
- .18 Aluminum Flashings:
 - .1 Fabricate flashings and starter strips to dimensions and profiles indicated on reviewed shop drawings and to meet specified requirements. Determine dimensions from site measurements.
 - .2 Provide required joint covers and concealed anchoring devices. Do not use exposed fasteners or anchors except these indicated on reviewed shop drawings.
 - .3 Hem all exposed edges a minimum of 13 mm for appearance and stiffening.
- .19 Fastenings:
 - .1 Where fastenings are exposed, use Series 300 stainless steel for steel-to-steel, aluminum for aluminum-to-aluminum.
 - .2 Where fastenings are not exposed to dampness or moisture, cadmium plated steel may additionally be used for all combinations of metal noted in preceding subparagraphs.
- .20 Thermal Movement: Fabricate units and assemblies to provide for expansion and contraction of component members and between units when subjected to surface temperatures from -34°C to 82°C.
- .21 Anchors:
 - .1 Incorporate anchorage to structure as required by the reviewed Shop Drawings.
 - .2 Allow for complete adjustment in anchorage for levelling and positioning of units during installation.
- .22 Cut rigid insulation to fit snugly in frame sections, without voids.

.23 Place manufacturers and identification name plates in semi-concealed locations.

PART 3 - EXECUTION

3.1 PRELIMINARY WORK

- .1 Examine job conditions before commencement of work. Commencement of work will denote acceptance of existing conditions unless the client has been notified in writing of unacceptable conditions prior to commencement.
- .2 Remove existing blinds, drape tracks, hardware, and store for reinstallation by Contractor after all interior finishing is completed.
- .3 All work shall be erected in strict accordance with the reviewed shop drawings by the erection force of the fabricator of the aluminum framing under the direct supervision of the fabricator.

3.2 WINDOW INSTALLATION

- .1 All vertical members shall be plumb, all horizontal members shall be level; all sections shall be set in perfect alignment throughout and be securely and rigidly fastened in place.
- .2 As erection progresses, the members shall be securely connected to take care of all dead loads, wind and erection stresses. Any failure to make proper and adequate provisions for stresses during erection shall be entirely at sole risk and responsibility of this Contractor.
- .3 Provide all necessary shims and blocking where required, to suit the existing site condition. Locate shims under each fastener to prevent frame bowing.
- .4 Install perimeter wood blocking as required to suit the existing site condition.
- .5 Securely install frames plumb, true, square and straight in openings and free from distortion. Do not exceed 3 mm in 3m (1/8" in 9'-0") variation from plumb and level.
- .6 Arrange components to prevent abrupt variation in colour.
- .7 Completed installation shall be satisfactory in all respects, so that any unit can be tested in-situ and meet the minimum performance criteria of the approved window unit.
- .8 At door sill locations, use polymer modified cementitious repair mortar to fill any holes or irregularities in the sill from anchorage, closers, etc. Install mortar as per manufacturers written guidelines.

3.3 POLYURETHANE FOAM INSTALLATION

- .1 Fill cavity between window frames and rough opening with foam insulation, as described below. Ensure cavity is completely filled to CAN/CGSB 51-GP-39M for foam insulation. Control quantity of insulation to avoid main frame from deforming.
- .2 Use brand new materials only.
- .3 Store materials at 24°C (74°F), in a clean dry area. Do not store at temperatures at above 49°C (120°F). Avoid prolonged storage in direct sunlight or near heat sources. Store a partially used kit with the safety latch on and the tank valves turned off. Remove the used nozzle, reapply petroleum jelly to the face of the gun and reinsert the used nozzle. Once used, the remainder must be used within 60 days.
- .4 The nozzle must be replaced if more than 30 seconds elapses between each use. Foam will harden in the nozzle after this time.
- .5 The foam is organic and combustible and may constitute a fire hazard if improperly used.
- .6 Avoid contact with eyes and skin. Always wear protective eyewear, gloves and clothing when operating. Use only with adequate ventilation and certified respiratory protection. In unventilated areas, do not remove respirator for at least 15 minutes after use.
- .7 Install specified polyurethane foam sealant to perimeter of new window installation. Ensure that cavity is completely filled and free of air pockets, particularly around shims. Avoid contact with other surfaces.
- .8 Allow foam to set prior to trimming and installing sealants.

3.4 SILL INSTALLATION

- .1 Install wood blocking ensuring positive slope to exterior.
- .2 Sills shall be continuous at column locations. Trim back vertical leg to allow continuation.
- .3 Prior to installation of sill, install specified waterproofing membrane flashing at sill opening onto slopped blocking. Membrane at sill to be upturned at interior stool and at jambs (minimum 50 mm upturn at jambs).
- .4 Install specified membrane flashing at jambs. Jamb membrane to overlap sill membrane. The design intent is to prevent water that may enter at the window sill or jamb from entering the wall cavity below.
- .5 Install sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use maximum length possible, allowing for expansion. Where opening is greater than 3600 mm (12'0"), multiple pieces will be permitted.
- .6 Maintain 6.35 mm to 9.5 mm (1/4 to 3/8") space between butt ends of continuous sills for sills over 1219 mm (4') in length and maintain 0.125 mm to 6.35 mm (1/8 to 1/4") space at each end.
- .7 Secure drip deflectors to sill as described below.
 - .1 Install drip deflectors at sills of all windows as shown on Drawings.
 - .2 Secure deflector to window sill using aluminum rivets. Deflector to be installed a maximum 5 mm from the surface of the adjacent surface.
 - .3 Install sealant under deflector prior to installation, and between deflector and masonry, as shown on Drawings.
- .8 All sharp and protruding corners, as determined by the Consultant shall be trimmed and made smooth.
- .9 Secure sills in place with anchoring devices located at ends, joints of continuous sills and evenly spaced at 600 mm o.c. (2'0") in between.

3.5 SELF ADHERING MEMBRANE INSTALLATION

- .1 Shall be self-adhering strips shall be minimum 150 mm (6") wide applied to the perimeter of all window frames and over all junctions, penetrations and transitions to ensure the integrity of the infiltration barrier.
- .2 Remove loose or foreign matter which might impair adhesion of materials.

- .3 Ensure all substrates are clean of oil or excess dust; all masonry joints struck flush, open joints are filled; and all concrete surfaces are free of large voids, spalled areas or sharp protrusions.
- .4 Ensure all substrates are free of surface moisture prior to application of self-adhesive membrane and primer.
- .5 Ensure metal closures, existing cut metal brick masonry ties are free of sharp edges and burrs.
- .6 Apply primer to prepared and approved substrate and allow minimum of 30 minutes open time. Only apply primer in area that can be completed within the allowable time as specified by manufacturer. Primed surface does not covered during the same working day must be re-primed.
- .7 Extend membrane to all adjacent surfaces ensuring a seal below metal closures.
- .8 Apply primers and membranes within recommended application temperature ranges. Consult manufacturer when materials cannot be applied within these temperature ranges.

3.6 SEALANT

- .1 Apply sealant in accordance with Section 07920 Joint Sealants.
- .2 Apply sealant and joint packing to joints between aluminum framing and adjoining construction.
- .3 Sealant materials shall be used in strict accordance with manufacturer's written instructions and shall be applied only by mechanics specially trained for application of sealants. Before applying sealant, all mortar, dirt, dust, moisture and other foreign matter shall be completed removed from surfaces it will contact. Adjoining surfaces shall be masked.
- .4 All joints shall be tooled and exposed sealed joints both tapes and tooled. All joints to be sealed shall be thoroughly pre-treated to ensure the full bond capabilities of the sealant. Tapes shall be removed as soon as possible after tooling.
- .5 Sealants, tapes, gaskets, separators, joint fillers and back-up materials shall be physically and chemically compatible with each other and with adjacent materials. Items shall be installed so that they will not become dislodged during or after assembly of units.
- .6 All metal to metal joints between elements shall be thoroughly sealed by buttering joints with sealant immediately prior to final assembly of abutting sections. Clean off all excess sealant.
- .7 Seal all joints as per the applicable sealant manufacturer's recommendations. Clean all excess sealant from exposed surfaces.

3.7 FIELD QUALITY CONTROL

- .1 Verify that substrate conditions are acceptable for product installation in accordance with manufacturer's instructions.
- .2 The Owner/Consultant maintains the right at any time during the work to test any window units in accordance with CAN/CSA-A440 in a completed in-situ location.
- .3 Tested windows shall meet or exceed requirements of this Section as indicated above in Section 1.7 Field Testing.
- .4 Copies of test reports will be provided to Contractor.
- .5 Air infiltration testing will be performed before water penetration testing.

- .6 Work failing any tests shall be repaired or replaced without cost to Owner. Such failure will also require retesting of subject window to satisfaction of the Consultant and Owner. All costs for additional testing to be paid by Window Contractor.
- .7 Contractor to provide pull tests of sealants as requested by Consultant/Owner.

3.8 PROTECTION AND CLEANING

- .1 Protect installed product's finish surfaces from damage during construction. Protect aluminum window system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- .2 Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- .3 Final cleaning of window installation shall be performed by the Contractor.
- .4 Upon completion of the work of this section, remove protective coverings from exposed surfaces, and clean surfaces free of all smears, marks and discoloration. Cleaning shall be in accordance with applicable provisions of listed standards and the requirements of the aluminum manufacturer; where doubt exists, make spot tests
- .5 Be responsible for immediately cleaning off all smears, marks, etc. caused during erection of the aluminum entrances, curtain wall, window wall and windows.
- .6 Provide the Owner with four (4) copies of recommended cleaning procedures for the aluminum framing including materials and methods to be used which will not stain or harm the aluminum components, and for glass, sealants and glazing materials, in any manner whatsoever. All cleaning requirements and/or recommendations during and after erection shall be coordinated with the Contractor.

END OF SECTION - 08 51 13

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PART 1 - GENERAL

1.1 SUMMARY

- .1 Provide labour, materials and equipment necessary to complete work of this section. This is a performance specification and is issued in conjunction with the drawings which indicate the general arrangement of work, the dimensions, structural system, and the major elements of the construction. As performance documents, the drawings and specifications do not necessarily indicate or describe all items required for the full design, performance and completion of work of this section. The type of skylight required with this performance specification is listed below:
 - .1 Existing skylights are to be replaced with fixed (custom sized, as required) Metal-Framed Double Glazed acrylic dome skylights from Velux or Columbia Skylights.
 - .2 New Skylight System is to be designed to suit the existing structural supports, and sized to fit existing curbs.
 - .3 Include a temporary working platform / hoarding to seal off and weatherproof the skylight opening, and keep the building secure once the old skylight has been removed.
- .2 Section includes:
 - .1 Structural design, engineering and fabrication of complete Metal-Framed Skylight system, including aluminum framing, integral closures, trim, perimeter flashings and surface reglets as indicated on IRC drawings provided.
 - .2 Acrylic glazing for metal-framed Skylight System including gaskets, sealants, spacers, blocking and related materials.
 - .3 Fasteners, anchors and related reinforcement of framing system as required to resist design loads.

1.2 RELATED SECTIONS

- .1 Section 01 11 00 Summary of Work
- .2 Section 07 62 00 Sheet Metal Flashings and Trims
- .3 Section 07 92 00 Joint Sealants

1.3 REFERENCES

- .1 Vancouver Building ByLaw 2014
- .2 BC Building Code 2018
- .3 CSA A440S1-09 Canadian Supplement to AAMA/WDMA/CSA101/I.S.2/A440-08 (NAFS-08 North American Fenestration Standards/Specification for Windows, Doors, and Skylights)
- .4 ASTM E1105 "Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference
- .5 British Columbia Energy Efficiency Act Information Circular (Windows, Glazing, Doors and Skylights)

1.4 SYSTEM DESCRIPTION

- .1 Performance Requirements: Provide metal-framed skylights which have been manufactured, fabricated and installed to withstand loading required by current Vancouver Building ByLaw, Canadian Supplement to NAFS-08 (CSA A440S1-09) and the BC Energy Efficiency Act. Provide performance criteria required by these specifications without defects, damage or failure.
- .2 Energy Efficiency Requirements: The new Skylight System shall have a maximum thermal conductance (U value) of 2.40 W/(K.m²).
- .3 The minimum Performance Requirements are as follows:
 - .1 Product Performance Class = CW
 - .2 Performance Grade (PG) minimum = PG20
 - .3 Water Penetration Resistance Test Pressure, minimum = 220 Pa
 - .4 Design Pressure, minimum = 960 Pa
 - .5 Air Infiltration / exfiltration, minimum = A2
- .4 Skylight systems must have adequate resistance to pressure differentials.
- .5 Skylight systems must have adequate provision for thermal movement without thermal fractures of framing members, glazing and/or sealants.
- .6 Skylight systems must have adequate provision for live, dead, wind, snow and rain loads without failures, distortion or fracture.
- .7 Skylight systems must have adequate support and anchorage of components taking into consideration all loading factors and combination.
- .8 Skylight systems must have a water and weather-tight installation with gaskets, seals, and sealants to effectively prevent water entry into building.
- .9 Skylight system must conform with the "open rainscreen principle" (i.e., be pressure-equalized and self-drained to the exterior). Provide pressure equalized and self-drained vents at exterior frame members without causing air flow around glazing.
- .10 Skylight system must have continuous air and vapour seals to control transfer of moisture vapour into system of insulated glass units.

1.5 SUBMITTALS

- .1 Product Data: Submit product data, including manufacturer's product literature for specified system.
- .2 Engineer-Stamped Shop drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colours, patterns and textures. Submit shop drawings for review and approval by the Owner/Consultant prior to fabrication. Include detailed plans, elevations, details of framing members, glazing infill materials (if any), sealants, fasteners, anchors and thicknesses and types of formed flashing and closures and relationship with adjacent materials. Indicate maximum horizontal and vertical forces at rafter anchors.
 - .1 Do not proceed with the work until shop drawings are acceptable to the Owner.
- .3 Submit Letters of Assurance by a Professional Engineer registered with the Engineers and Geoscientists British Columbia Association (EGBC).

- .4 Samples: Submit selection and verification samples for finishes, colours and textures.
 - .1 Aluminum Finish: Submit 2 sets colour charts or range samples for initial color selection. Submit finished sample of color selected for use.
 - .2 Glazing Materials: Submit 2 pieces verification sample 12" square, of the specified glazing including any integral tints, coatings as specified.
 - .3 Submit standard sealant colours for selection and approval.
- .5 Upon request, submit verification of Skylight System U-Value certified by a Professional Engineer registered with the Engineers and Geoscientists British Columbia Association (EGBC).
- .6 Quality Assurance / Test Reports: Include manufacturer's air and water resistance test reports showing compliance with specified performance requirements.
 - .1 Test Reports: Submit test reports showing conformance to the requirements of AAMA/WDMA/CSA 101/IS2/A440-08 Standards.
 - .2 Certification for Structural Sealant: Submit written documentation from sealant manufacturer stating that the sealant selected has been tested for adhesion and compatibility on representative samples of metal, glass and other glazing components, and that the sealant joint design and application procedures shown on the shop drawings are suitable for this project.
- .7 Close Out Submittals to be submitted upon Substantial Completion:
 - .1 Provide Operations and Maintenance Manual to be submitted to the Consultant with the following documents and information:
 - .1 Record drawings and Schedule C.
 - .2 Maintenance instruction for materials, finishes, operation and cleaning.
 - .3 Parts list indicating make, size, serial number, manufacturer, telephone number and address of the suppliers.
 - .4 Arrange with and demonstrate to the Consultant, cleaning, re-glazing and general maintenance procedures.
 - .2 Warranty: Submit warranty documents specified herein.

1.6 WARRANTY

- .1 Contractor's Obligation: The contractor must submit a signed written warranty to the Consultant for the installation of work specified in this Section covering for a period of Two (2) Years from date of the Certificate for Substantial Performance.
- .2 Contractor must submit ten (10) years Manufacturer's Material Warranty.
- .3 In addition to the above, provide a two (2) year written guarantee on the following:
 - .1 Aluminum: Guarantee against the following:
 - .1 Excessive Non-Uniformity: Any non-uniform fading during guarantee period.
 - .2 Pitting or Corrosion: No pitting or other type of corrosion resulting from natural elements in local atmosphere.

- .2 Sealants: Guarantee shall state that installed sealants are guaranteed against:
 - .1 Adhesive, cohesive or shear failure of joints.
 - .2 Staining of surfaces adjacent to joints by sealant or primer by migration through building materials in contact with them.
 - .3 Chalking or visible colour change on surface of the cured sealant materials.
- .4 Glazing: Guarantee to remove and replace at the Subcontractor's expense any and all glass lights that fail to meet the design and performance requirements. Insulated sealed double glazing units shall be guaranteed against obstruction of vision as a result of dust or firm formation on the inner glass surfaces for a period of ten (10) years from the date of Substantial Performance. Any units failing to comply with this guarantee shall be replaced without cost to the Owner.
- .5 Defective work shall be removed and replaced with acceptable work at no cost to the Owner, and at such times as designated by the Owner.
- .6 The cost of all warranties shall be included in the Contract price.

1.7 QUALITY ASSURANCE AND FIELD TESTING

- .1 Skylight System Manufacturer shall have a minimum Ten (10) years' experience in the fabrication and installation of custom architectural metal-framed skylights. Manufacturer shall be capable of providing structural calculations, applicable independent product test reports, installation instructions, review of the application methods, customer approval, and periodic field service representation during construction.
- .2 Skylight System Installer shall have a minimum Ten (10) years' experience in glazing and installation of metal-framed skylights. Installer shall be experienced to perform work of this section and has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
- .3 Water Test: Contractor to arrange and allow for a third party water infiltration testing of one complete section of the skylight systems. Testing will be coordinated and scheduled by the Contractor after the completion of the work. The Contractor, in the presence of the Consultant and the Owner, will perform field water testing, but prior to the installation of the exterior beauty caps. The testing shall be deemed fail if any water penetrates the assembly and enters into the building or past the drainage channels during or after the testing.
 - .1 Water Testing will be conducted using ASTM Standard E1105-15, Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
 - .2 Skylight systems shall conform, meet or exceed the following water tightness ratings:
 - .1 Skylight water tightness shall be tested to water penetration resistance of 500 Pa when tested in accordance with CSA A440-00 and ASTM E1105.
- .4 Skylights failing to perform to the required test levels will be modified such that they pass and retesting will be required and performed at the Contractor's expense.
- .5 The inspection and testing service does not relieve the Contractor of his responsibility for quality control of production and for subsequent mistakes.
- .6 Contractor to arrange for sealant representative to be on site during installation of Mock-up. Sealant representative to return after curing period has elapsed and perform pull test, providing report to Owner, Consultant and Contractor.

1.8 PROJECT SITE CONDITIONS:

- .1 Field Measurements: Verify actual measurements / openings by taking field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
- .2 Field-verify existing dimensions against approved submittal drawings and advise Consultant of any deviations prior to commencing installation.

1.9 DELIVERY STORAGE AND HANDLING

- .1 Deliver materials with identification labels and in unopened, undamaged containers.
- .2 Store materials protected from exposure to harmful weather conditions, temperature, and humidity. Handle skylight material and components to avoid damage. Protect skylight material against damage from sunlight, weather, excessive temperatures, construction activities, and other hazards.

PART 2 - PRODUCTS

2.1 METAL-FRAMED SKYLIGHT SYSTEM

- .1 Acceptable Manufacturers/Products: Velux skylights or Columbia skylights or Owner approved equivalent. Contractor must submit a request for approval of equal system, complete with brochures and technical data, at least 7 days prior to RFQ closing.
 - .1 Fixed Metal-Framed Curb Mounted, Double Glazed, Clear Acrylic Dome Skylight Unit.
 - .2 New Skylight System is to be designed to suit the existing structural supports. Contractor is to verify the existing site conditions prior to any shop drawing preparation.
 - .3 New skylight frame colour is to be chosen by the Owner.

2.2 MATERIALS

- .1 All materials shall be compatible and by the same manufacturer.
- .2 Extrusions:
 - .1 Extrusions to be designed in accordance with CAN/CSA-S157.
 - .2 Extruded aluminum: Aluminum Association Alloy AA6063-T5 with minimum yield strength 110 MPa for thickness up to 12.7 mm.
 - .3 Sheet Steel: Stainless steel or hot-dipped zinc coating at least equal to ASTM A525M coating designated Z275 and with sufficient ductility to permit necessary forming operation.
 - .4 Exposed Aluminum Sheet and Plate: AA1100-H14, alloy and temper. Minimum thickness of flashings shall be 1.0 mm (0.040") for exposed flashings and 0.6mm (0.024") for interior or concealed flashings.
 - .5 The main frame depth shall be not less than 62mm (2.44") complete with frame extension if necessary (confirm existing conditions).
- .3 Aluminum Finish:
 - .1 Clear Anodized Finish:

- .1 Finish aluminum components in accordance with "Aluminum Association Designation System for Aluminum Finishes AAC22A31
- .2 Anodized to attain a Type II (Class 1 for exterior) and (Class 2 for interior) anodic coating; exterior coating not less than 0.7mil (18 microns); interior coating not less than 0.4 mil (10 microns).
- .3 Coating mass when tested to ASTM B137; Class 2, density shall not be less than 24.0 g/m2 except for interior trim which shall have a minimum coating area density of 12.0 g/m2.
- .4 Exposure to Salt Spray to ASTM B117: Class 2, capable of withstanding 250h of exposure without pitting; interior trim Class 3, minimum time exposure of 100h without pitting.
- .4 General Configuration:
 - .1 Skylight shall incorporate internal drainage systems.
 - .2 Glazing shall be fixed with external pressure plates at both the purlins and rafters.
 - .3 Purlins to incorporate a structural sealant joint with no exposed pressure plates.
 - .4 Pressure plates shall be provided with a snap cap.
 - .5 Silicone sealant needle bead shall be installed at all of the up slope sides of the purlin pressure plates and extended a minimum of 152mm (6") up the adjacent rafters.
 - .6 Both purlins and rafters shall be provided with internal condensate gutters.
 - .7 All joints shall be fully sealed with butyl tape.
- .5 Glazing: Sealed Insulating Glass Units, IGMAC certified to meet specified requirements of CAN/CGSB-12.8 with a dual perimeter edge seal, 13mm air space and glass which meets the specified requirements of CAN/CGSB-12.3. Spacer shall be stainless steel. Glass thickness to meet BC Building Code and CAN/CGSB-12.20 requirements but not less than 6 mm (0.25") thick for each lite. Glass and glazing materials to meet specified requirements specified herein.
- .6 Sealants: Refer to Section 07 92 00 Sealants.
- .7 Isolating Coating: Alkali resistant bituminous enamel paint conforming to CGSB 1-GP-108M to prevent deterioration due to corrosion or electrolytic action, as recommended by manufacturer. Isolate aluminum from following components:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.
- .8 Perimeter Insulation: non-shrinking, low expansion (25%), closed cell, no CFC, single component polyurethane foam, complying with CAN/CGSB 51-GP-23M. Minimum R-5 per inch.
- .9 Fasteners: Screws, nuts, bolts, etc. to be of 300/400 series stainless steel where exposed to dampness and moisture. Cadmium plated steel may be used where fastenings are not exposed to dampness and moisture.
- .10 Thermal break: Continuous high density polyurethane. As recommended by the Skylight Manufacturer.

- .11 Glazing gaskets: as recommended by Skylight Manufacturer.
- .12 Exterior Sealants: As recommended by Skylight Manufacturer and conforms to applicable CGSB-19-GP Series.
- .13 Isolating Coating: Alkali resistant bituminous enamel paint conforming to CGSB 1-GP-108M to prevent deterioration due to corrosion or electrolytic action, as recommended by manufacturer. Isolate aluminum from following components:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.

2.3 FABRICATION

- .1 Fabricate components per manufacturer's installation instructions and with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline and weatherproof.
- .3 Dimensions shown on drawings are diagrammatic only. Field measurements of rough skylight opening shall be performed by contractor and shown on submitted shop drawings. Maintain sight lines indicated and clearances to other construction components.
- .4 Aluminum Flashings:
 - .1 Fabricate flashings and starter strips to dimensions and profiles indicated on reviewed shop drawings and to meet specified requirements. Determine dimensions from site measurements.
 - .2 Provide required joint covers and concealed anchoring devices. Do not use exposed fasteners or anchors except these indicated on reviewed shop drawings.
 - .3 Hem all exposed edges a minimum of 13 mm for appearance and stiffening.
- .5 Fastenings:
 - .1 Where fastenings are exposed, use Series 300 stainless steel for steel-to-steel, aluminum for aluminum-to-aluminum.
 - .2 Where fastenings are not exposed to dampness or moisture, cadmium plated steel may additionally be used for all combinations of metal noted in preceding subparagraphs.
- .6 Thermal Movement: Fabricate units and assemblies to provide for expansion and contraction of component members and between units when subjected to surface temperatures from -34°C to 82°C.
- .7 Anchors:
 - .1 Incorporate anchorage to structure as required by the reviewed Shop Drawings.
 - .2 Allow for complete adjustment in anchorage for levelling and positioning of units during installation.
- .8 Place manufacturers and identification name plates in semi-concealed location.

2.4 FINISHES

.1 Submit colour / material samples for approval by the Owner prior to any fabrication start.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install Skylights plumb and level, and true to line, without warp or rack of frames with manufacturer's prescribed tolerances and installation instructions. Provide support and anchor in place.
- .2 Dissimilar Materials: Provide separation of aluminum materials from sources of corrosion action contact points.
- .3 Glazing: Glass and glazing materials shall be outside glazed and held in place with extruded aluminum pressure plates anchored using stainless steel fasteners.
- .4 Water Drainage: Water shall be typically diverted to the rafters and exit to the exterior of the building through weeps in the baffle and gutter.
- .5 Comply with manufacturer's product data, including product technical bulletins, product erection / installation instructions, and product carton instructions for installation.
- .6 Repair or replace any interior finishes to match the existing installation, up to and including painting interior finishes.

3.2 FIELD QUALITY CONTROL

- .1 Mock-up test is required.
- .2 Contractor shall expose the top and bottom supports of the existing Skylight systems, and advise the Consultant / Owner of any discrepancy found between the drawings and on site prior to any shop drawing submittal. Failure to do so will mean that Contractor has accepted all the site conditions and are all found to be consistent with what is stated on the contract documents.
- .3 In-situ testing is required and included in the scope. Where modifications are necessary to the new skylight system to achieve the required performance, the contractor shall undertake required modifications to the manufacturing or installation process to the satisfaction of the Consultant and Owner. The Contractor shall repair or replace the system and re-test the system at no cost to the Owner.
 - .1 The Field Testing will be in accordance with ASTM E1105 "Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference. The test procedure shall correspond to the method of test used to qualify the product for water penetration resistance under AAMA/WDMA/CSA 101/I.S.2/A440. The field test chamber shall be installed so as to test both the product and the interface joint to the adjacent wall/s.
- .4 Verify that substrate conditions are acceptable for product installation in accordance with manufacturer's instructions.
- .5 Should testing be required; testing shall be performed per AAMA 503 by a qualified independent testing agency.

3.3 PROTECTION AND CLEANING

- .1 Protect installed product's finish surfaces from damage during construction. Protect aluminum skylight system from damage from grinding and polishing compounds, plaster, lime, acid, cement, or other harmful contaminants.
- .2 Cleaning: Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to owner's acceptance. Remove construction debris from project site and legally dispose of debris.
- .3 Final cleaning of skylight installation shall be performed by the Contractor.

END OF SECTION - 08 63 00

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PART 1 - GENERAL

1.1 APPLICABLE PUBLICATIONS

- .1 CAN/CGSB-12.1, Tempered or Laminated Safety Glass
- .2 CAN/CGSB-12.3, Flat, Clear Float Glass
- .3 CAN/CGSB-12.8, Insulating Glass Units
- .4 CAN/CGSB-12.20, Structural Design of Glass for Buildings
- .5 IGMA TM-3000 North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use.
- .6 CSA A440S1-09 Canadian Supplement to AAMA/WDMA/CSA101/I.S.2/A440-08 (NAFS-08 North American Fenestration Standards/Specification for Windows, Doors, and Skylights)
- .7 British Columbia Building Code 2012
- .8 Energy Efficiency Act (EEA)

1.2 SUBMITTALS

- .1 Submit Insulating Glass Certification conforming to ASTM E2190. The certification must apply to the insulating glass makeup used in the fenestration products.
- .2 Submit to the Owner and Consultant:
 - .1 Submit 2 pcs of 12" square samples of each type of glass indicated in this specification to the Owner/Consultant for approval.
 - .2 Submit technical data including written installation recommendations from the manufacturer for each product which will be used in this section.
- .3 Provide to the Consultant, written confirmation from the manufacturer as to the compatibility of all materials to be used.
- .4 Insulated Glass Units (IGUs) must bear the IGMAC stamp. IGUs without a stamp will be rejected and will require replacement at no additional cost to the Owner or Consultant.

1.3 JOB CONDITIONS

- .1 Before commencing work each day, ensure that all surfaces to receive glazing tapes, sealants or primers are clean and dry.
- .2 Apply glazing tapes and sealants at air and substrate temperatures not less than the minimum recommended by the material manufacturer. Work shall not be carried out during inclement weather conditions.
- .3 Proceed with glazing only when glazing surfaces are accumulating no moisture from rain, mist or condensation.
- .4 Obtain approval from the manufacturer, when temperature of glazing surfaces is below 4°C, for the glazing methods and protective measures which will be used during glazing operations.

1.4 WARRANTY

.1 Provide a warranty stating that:

- .1 The installation of new sealed insulating glass units specified in this Section shall not cause any deleterious effect on the air and water tightness and wind load resistance performance of the windows and remain watertight and free of defects which shall include without being limited to breakage and loss of seal. Fogging of glass inside sealed units or failure of a field dew point test will be considered sufficient evidence of loss of seal.
- .2 This warranty shall be for a period of ten (10) years from date of Substantial Performance.
- .2 Repair leaks into building within 24 hours of notification. Any repairs required shall be carried out in accordance with the recommendations of the Consultant.
- .3 The cost of all warranties shall be included in the Contract price.

PART 2 - PRODUCTS

2.1 Windows

- .1 Glazing: Shall be low-e double-glazed Insulating Glazing Units, minimum of 19mm overall IGU assembly thickness.
 - .1 Design shall be in accordance with CAN/CGSB-12.20 Structural Design of Glass for Buildings and CAN/CGSB 12.8, Insulating Glass Units. Heat strengthened and tempered glass to conform to CAN/CGSB 12.1
 - .2 Low-E coating, edge spacer, gas fill to be in accordance with labeled fenestration product energy performance.
 - .3 Insulating Glazing Units, double-glazed, conforming IGMA Standard Specifications. Installation shall be in accordance with IGMA TM-3000.
- .2 The perimeter edge seal is to consist of a continuous polyisobutylene primary seal and a continuous silicone secondary seal in full contact with the primary seal. Edge delete film as required by glass and edge seal manufacturer
- .3 The edges of all glass shall be free from spalls, flake chips or rough edges which would be either visible or compromise the adhesion of the exterior weather seal.

2.2 GLAZING ACCESSORIES

- .1 Ensure that glazing tapes, sealants, splines, and setting blocks are completely compatible with insulating glass unit sealants.
- .2 Setting Blocks: Neoprene, EPDM or Silicone with Durometer hardness of Shore "A" 80 to 90. Thickness to be 6 mm. Width of setting blocks to slightly exceed width of sealed insulating glass unit. Length of setting blocks to be 25 mm for every 1 square metre of glass with a minimum length of 50 mm. Setting blocks shall be compatible with all adjacent components, including edge seal and must not inhibit water by blocking weep holes. Wood spacers, shims or setting blocks are not acceptable.
- .3 Silicone Glazing Sealant: to comply with CAN/CGSB 19.18-M80-Type 2.
- .4 Preshimmed Glazing Tape: preshimmed glazing tape such as POLYshim II Tape as manufactured by Tremco Ltd., or approved equivalent.
- .5 Exterior Glazing Material: Tremco VisionStrip co-extruded EPDM gasket with butyl glazing tape.

- .6 Glazing Spline: neoprene, silicone or polyvinyl chloride standard glazing spline to suit glass stops, Polyshim II glazing Spline, as manufactured by Tremco, or an approved equivalent.
- .7 Glazing Gaskets: extruded neoprene, or EPDM conforming to CAN/CGSB 41-GP-20M
- .8 Cleaning Material: MEK, Xylol, Toluol, or as recommended by glazing and sealant manufacturer.
- .9 Primers: to glass and sealant manufacturer's recommendation.

2.3 FABRICATION

- .1 Fabricate glass to fit openings and to allow clearances, which will ensure that glass, is held firmly in place while providing clearances for thermal expansion and contraction, but not less than 3mm on each side.
- .2 Replace oversize or flared lights with entirely new units of proper dimensions.
- .3 Label each piece of glass to indicate manufacturer, type, and quality. Remove labels on glass units at time of installation.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Check opening dimensions prior to fabricating glass units.
- .2 Commencement of work implies acceptance of existing conditions and assuming full responsibility for the finished condition of the work.
- .3 Clean glazing rebate surfaces of all traces of sealant, dirt, dust, or other contaminants.
- .4 Ensure that projections have been removed from the glazing surfaces and that sufficient width and depth clearances are provided for the glass units.
- .5 Prime all surfaces to receive glazing tapes or sealants per sealant manufacturer's recommendations to provide a positive and permanent adhesion and to prevent staining. Apply primers per manufacturer's directions and test substrates for adhesion. Primer shall be suitable for materials affected.
- .6 Do not cut or nip tempered glass to fit. Replace oversize or flared lights with new units of correct dimensions. Do not cut or abrade tempered, heat strengthened or coated glass.

3.2 INSTALLATION

- .1 When requested by the owner or consultant, arrange for the presence of a technical representative of the glazing materials manufacturer to advise on procedures and methods when glazing commences.
- .2 Set shims when required to allow a space of no less than 6 mm (1/4") between shim edges and sight lines. Spacer shims are not required where glazing tape is used.
- .3 Provide edge clearance of 3 mm (1/8") or to manufacturer's recommendation.
- .4 Cut tape or gasket to full length of opening. Ensure glazing material is fully sealed at corners. Glazing tape: Butt tape tightly at corners and knead all joints to form one continuous strip. Dap with compatible sealant. Glazing Gasket: Butt tightly at corners and seal with compatible sealant. Do not overlap gaskets or tape at corners.

- .5 Apply sealants with backing where indicated on reviewed shop drawings as specified in Section 07 92 00 Joint Sealing. Use glazing sealants without addition of thinners from new and unopened containers clearly marked with the product name, batch number, and product manufacturer. Tool newly applied sealants with a slight bevel away from the glass surface.
- .6 Ensure that glazing sealants, gaskets, tapes, and splines are in full contact with glazing surfaces.
- .7 Install glass, ensure compression to glazing tape is achieved.
- .8 Remove protective coating from new glazing.

3.3 CLEANING

- .1 Remove as work progresses all corrosive and foreign materials which may set or become difficult to remove at time of final cleaning or which may damage components of the window system. Examine all surfaces as often as required to ensure cleanliness.
- .2 Clean and polish interior and exterior surfaces of glass after installation to the satisfaction of the Consultant and Owner, with a commercial glass cleaner or water and household hand dishwashing detergent solution.
- .3 Remove excess sealants, stains, deposits, marks or blemishes from work of this section and all adjacent surfaces, by methods not harmful to the surfaces. Replace or make good all defective, scratched or damaged materials.
- .4 Remove labels and perform final cleaning after completion of entire installation and immediately prior to Date of Substantial Performance.
- .5 Collect broken glass and cuttings in boxes and remove from site.

END OF SECTION - 08 80 00








































