

PROJECT MANUAL FOR
ROOF REPLACEMENT
ERNESTOWN SECONDARY SCHOOL

**50 Main St.,
Odessa, ON K0H 2H0**

Prepared for:



Limestone
DISTRICT SCHOOL BOARD

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END OF SECTION

1.1 CONTRACT

- .1 The Contract shall be in the form as outlined in the Limestone District School Board – Financial Services Request for Quotation document, consisting of Parts 1, 2 & 3. In addition, the following associated supplemental appendices, which are comprised of the Division 01 and technical specifications, shall further form part of the overall Contract.

1.2 DEFINITIONS

- .1 "CONSULTANT" and "Fishburn Sheridan & Associates Ltd.", "Fishburn Sheridan Kingston Inc." and "FSA" are synonymous.
- .2 "OWNER" and "Limestone District School Board" and "LDSB" are synonymous.
- .3 "CONSTRUCTOR" and "CONTRACTOR" are synonymous.

1.3 OTHER CONTRACTORS

- .1 Other Contractors, Sub-Contractors and the Owner's own forces, may be performing work on the site at the same time as the Work is being done under this Contract. The successful bidder shall provide all reasonable co-operation and collaboration with these other forces to ensure a timely completion of the work, taking into consideration and without undermining its own role as the "Constructor".

1.4 USE OF THE SITE

- .1 Carry out the Work so as to have the least possible interference and disturbance to the normal use of the premises. The successful bidder is expected to include in the bid an allowance for the performance of off-hours work should it be required to conform with the above.
- .2 Maintain services to existing building and provide for personnel and vehicle access.
- .3 Restrict construction access to and from site to approved location. Do not allow construction traffic to block entrances or exits for any reason.
- .4 Co-ordinate any interference with Owner's operation in this area and abide by Owner's direction in this regard. In cases of conflicting requirements, Owner's operation takes precedence but all reasonable effort to accommodate Contractor's needs will be made.

1.5 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
- .2 Remove abandoned service lines within 2.4 m of structures. Cap or otherwise seal lines at cut-off points as directed by Consultant.
- .3 Services are to be left operational unless otherwise authorized by Owner.
- .4 Unless otherwise specified, the Contractor will be responsible for disconnection, relocation, re-installation and extending all services required to facilitate work under this Contract. Co-ordinate work with the Owner and provide minimum 48 hours notification if services are to be interrupted.

1.6 CUTTING AND PATCHING

- .1 Generally patch and "make good" any and all surfaces cut, damaged, exposed, or disturbed to comply with any appropriate statutory requirements and to the Owner's acceptance.

1.7 PROTECTION OF PROPERTY

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

1.8 PRECONSTRUCTION CONDITIONS

- .1 Prior to commencing mobilization, the Contractor shall record preconstruction conditions by photographing all items that could potentially be claimed by the Owner or Consultant as damaged during the course of the work.
- .2 These items should include adjacent wall areas, landscaping, pavement, windows, paint finishes and any roof top equipment on or adjacent to the subject roof.
- .3 In the event that the Contractor is permitted to store materials or equipment on adjacent roofs or use adjacent roofs to access the subject roofs, these areas shall also be reviewed for preconstruction damage and photographed.
- .4 Provide Consultant and Owner with photographic record of preconstruction photographs a minimum of 24 hours prior to commencing mobilization.
- .5 All such damages observed during final or post construction review that cannot be verified as pre-existing, are potentially considered the Contractor's responsibility to rectify.

1.9 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during the performance of the Work as required by insurance companies and governing codes, regulations and by-laws having jurisdiction.
- .2 Work requiring the generation of open flames (welding, soldering, etc...) cannot be performed until an Owner's Permit has been issued. It is the responsibility of the successful bidder to apply for here said permit.
- .3 Open fires and burning of rubbish are not permitted on site.

1.10 OCCUPATIONAL HEALTH AND SAFETY

- .1 Follow the Ontario Provincial Occupational Health and Safety Act and Regulations for Construction Projects. For the purposes of the act, the person or company contracted to carry out the work shall be deemed the "**Constructor**".
- .2 Hazardous materials, not identified by the Owner, may be encountered at the worksite. Use all necessary precautions when handling such material. It is possible that asbestos may exist in some form and if encountered the Contractor is responsible to notify the Owner and to follow Ontario Ministry of Labour regulations governing the handling of asbestos in the workplace.

- .3 The Owner may cause those who do not comply with the O.H.S.A. and Regulations to be escorted from the site.

1.11 PROTECTION OF BUILDING FINISHES AND EQUIPMENT

- .1 Prevent movement, settlement, or other damage to other adjacent structures, utilities, and parts of building to remain in place. Provide bracing and shoring if required.
- .2 Keep noise, dust, and inconvenience to occupants to a minimum.
- .3 Protect building systems, services and equipment. Protect all furnishings within work area with (6 mil) polyethylene film during construction. Remove film during non-construction hours and leave premises in clean, unencumbered and safe manner for normal daytime function.
- .4 Provide temporary dust tight screens, partitions, covers, railings, barricades, supports and/or other protection as required. Protect workers, finished areas of work and public.

1.12 PARKING

- .1 Parking is available on site. Permits will be required for all vehicles parked on the property, as required.
- .2 All vehicles must be parked in designated parking areas (except for reasonable loading and unloading of equipment and/or materials to a local entrance). Contractor's vehicles on site shall be limited to reasonable loading and unloading of equipment and/or materials to a local entrance. Failure to observe these requirements may result the vehicle being ticketed and/or towed.

1.13 SIGNS AND ADVERTISEMENTS

- .1 No signs or advertisements of any description other than notices regarding safety shall be displayed at the Work Site without permission of the Owner.
- .2 Upon completion of the Work, all signs shall be removed except those specifically directed by the Owner to remain.

1.14 CLEAN-UP

- .1 Maintain the work area in tidy condition, free from the accumulation of waste products and debris.
- .2 Remove waste and materials regularly so as to maintain a tidy work site. Do not dispose of any waste in the Owner's facilities unless specifically directed to do so by authorised personnel.
- .3 Store materials in areas specially designated by the Owner. Dispose of this debris in a legal manner so as to avoid causing a hazard to occupants and visitors on site.

1.15 MATCHING

- .1 Where new work occurs in or adjacent to existing work, it is the intent that colours and textures of visible finishes within these areas shall be matched to the satisfaction of the Owner.

1.16 PERMITS, FEES, CERTIFICATES

- .1 A Building Permit may be required for this work at the discretion of the municipality. Upon award of the project, the Contractor shall submit all required documentation to the Authority Having Jurisdiction in order to determine if a permit is required.
- .2 Should the Authority Having Jurisdiction determine a permit IS NOT required, the Contractor shall receive confirmation in writing prior to work commencing.
- .3 Should the Authority Having Jurisdiction determine a permit IS required, the Contractor shall submit a building permit application and required documentation with the assistance of the Consultant. Permit fees will be paid for directly by the Owner.
- .4 Obtain and pay for all other permits required to complete the work.
- .5 Arrange and pay for all inspection certificates required by Authorities having jurisdiction, (i.e., Electrical Safety Authority Certificate). Provide the Owner with copies of these certificates upon completion.

1.17 DISRUPTION OF SERVICES

- .1 The Contractor is responsible to provide adequate written notice to the Owner of any interruption of services (i.e., mechanical, electrical etc.) for the connection of new services or the alteration of existing.
- .2 The Contractor is expected to co-operate reasonably with the Owner in the scheduling of service interruptions.

1.18 SANITARY FACILITIES

- .1 Temporary sanitary facilities will be provided by the Constructor in compliance with the Occupational Health and Safety Act and Regulations for Construction Projects.

1.19 POWER

- .1 Maximum power of 110V will be available at no cost. Any connection to this power source will be done at the Contractor's expense and liability, and in accordance with the Canadian Electrical Code.

1.20 WATER SUPPLY

- .1 Water supply is available at no cost. Connection and disconnection will be at Contractor's expense and liability.

1.21 TEMPORARY FACILITIES

- .1 Any temporary facilities provided at the site by the Contractor must be removed upon completion of the work and the area used must be returned to the original condition.

1.22 DOCUMENTS REQUIRED

- .1 Maintain at the job site, one copy each of the following:
 - .1 Original Plans and Specifications and completed Form of Tender.
 - .2 Building Department stamped drawings if required.
 - .3 Any changes to Drawings or Details.
 - .4 Shop Drawings and any changes.
 - .5 Addenda.
 - .6 Change Orders.
 - .7 Site Instructions.
 - .8 Contractor's Safety Policy.
 - .9 Safety Data Sheets.

1.23 WORK SCHEDULE

- .1 Proposed date for commencement of the Work is to be at the Contractor's earliest possible availability but shall be within two (2) weeks of Contract award.
- .2 Required dates for substantial and total completion of the Work shall be as outlined in the LDSB RFQ document.
- .3 Within 5 working days of intent to award, provide a schedule showing anticipated progress stages and final completion of the Work within the specified time period, indicating each trade and inter-phasing. Allow for expected poor weather days.

1.24 MAINTAIN WARRANTIES

- .1 Ensure that work of this Contract does not invalidate warranties on adjacent work. Provide written confirmation and arrange and pay for all services and costs to ensure that warranties on adjacent work are maintained.
- .2 The Contractor accepts full and complete responsibility of maintaining existing warranties.

END OF SECTION

1.1 GENERAL

- .1 The Contractor is responsible for reviewing all provided documents, including drawings and specifications as required to gain a full understanding of the scope of work. Costs associated with obstructions, existing conditions, etc., which could have been anticipated to have an impact on the scope of work are to be included as though the associated scope of work is indicated in the documents.
- .2 The contractor is required to request any clarification to the scope of work during the RFP period.

1.2 SCOPE

- .1 Mobilization, Access and Site Protection:
 - .1 Provide all labour, materials and equipment necessary to mobilize the site for recladding work.
 - .2 All work to be completed in a single mobilization.
 - .3 Provide pre-existing condition photo log of areas to be accessed and immediately adjacent work including interior faces of walls.
 - .4 Apply for and obtain all necessary road closure and sidewalk closure or encroachment permits as become necessary for the completion of the work.
 - .5 Provide all necessary signage, barriers, temporary ramps, guard rails and overhead protection necessary to appropriately delineate the extents of the site during recladding work and to maintain means of access and egress from the building.
 - .6 Provide all necessary means of access to complete the scope of work described, including to facilitate Consultant's review of the work. Maintain such access equipment available on site until such time as the work is deemed completed.
- .2 The scope of work of the project is summarized in the following items, however this is not intended to be an all-encompassing list of the scope of work. The inclusion of work in any of the documents is to be read as though it is included in all of them.
- .3 Removal of the existing BUR roof assemblies where replacement roof systems are indicated. Work is to include the removal of existing roof curbs, drains, metal flashings, etc., as required to expose the existing deck or existing air/vapour barrier membrane as indicated. Existing bell exhausts are to be removed and retained for reinstallation.
- .4 Abatement of all hazardous materials affected by and/or disturbed by the scope of work indicated or implied. Removal is to be in compliance with all codes and standards, by qualified personnel. Supply and installation of all materials and equipment required to infill the existing window openings along the north and south walls of the gymnasium, including but not limited to all masonry units, mortars, anchorage, paint, etc. The existing openings are to be infilled to match the adjacent interlocking double-wythe concrete block wall along the north and south walls of the gymnasium and the existing signage is to be reinstalled.

- .5 Supply and install all materials and equipment required to install new Mod. Bit. roof systems as indicated, including but not limited to specified and associated components such as membranes, insulation, sheathing, protection board, flashings, etc., as detailed. Existing bell exhausts are to be reinstalled on insulated steel roof curbs.
- .6 Supply and install all sheet metal caps, counter flashings, scuppers, torch stops, fascia and all other roof related metal flashings required to complete roof installation.
- .7 Supply and installation of roof drains as detailed and indicated on the drawings. New drains shall be in the existing locations and shall include all required clamps, hangers, insulation, vapour wrap and all other items required to complete the new drain installation.
- .8 Supply and installation of related rough carpentry at parapets and curbs.
- .9 Supply and installation of all sealants required to seal the transition of membrane and related metal detailing, the termination of sheet metal and non-membrane surfaces, perimeter edges of all door and window openings, and where indicated.
- .10 Mechanical and Electrical:
 - .1 Where existing mechanical equipment is indicated to be removed and reinstalled or replaced, the contractor is responsible for confirming the condition and operation of the noted equipment prior to commencing removal. This is to be done to confirm operational parameters, physical condition, and existing deficiencies. Where concerns are observed, the Contractor is to bring such concerns to the attention of the Owner and the Consultant prior to the removal of existing equipment. Provide documented confirmation of the completion of the precondition assessment, provided by a qualified contractor. Commencement of work on mechanical equipment implies acceptance of condition and responsibility of final mechanical equipment operations.
 - .2 Where existing roof drains are affected by the roof replacement, the Contractor is responsible for verifying the pipe hangers are in adequate condition to independently support distribution pipes, prior to the disconnection of any drains at roof level. Where deficiencies and/or concerns are observed, the Contractor is to bring such concerns to the attention of the Owner and Consultant.
 - .3 Provide documentation to confirm the completion of this precondition assessment.
 - .4 Where existing roof drains are concealed by interior drywall finishes, provide one 460mm x 460mm opening below each roof drain to perform the precondition assessment of the pipe hangers and to allow for the installation of drain access doors.
 - .5 The completed assembly is to be finished to match existing adjacent finishes.
- .11 De-mobilization and Close-out
 - .1 Complete a deficiency review with the Consultant prior to demobilization of access equipment from site.

- .2 Demobilize all equipment, tools and material from site.
- .3 Complete a final walk over of the site to identify damage caused in the course of construction.
- .4 Upon reinstallation of existing mechanical equipment, the contractor shall verify the condition and operation of existing mechanical equipment in order to return equipment to preconstruction condition as reported prior to construction.
- .5 Contractor to repair or replace damaged finishes and site elements where construction activities have caused the damage. The pre-construction photo log will determine original condition of elements in question.
- .6 Provide 2-year labour and materials warranty as well as any standard manufacturer warranties for products used.
- .7 Provide digital copy of as-built drawings in .pdf format.
- .8 Close-out any active permits related to the construction activities and provide written proof of such.

1.3 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction as required.
- .2 Complete all required work on site during the months of July and August as to limit interference to the school year.
- .3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .4 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .5 Maintain fire access and control.

END OF SECTION

1.1 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

1.2 USE OF SITE AND FACILITIES

- .1 The size and location of Work and site storage areas to be determined at the pre-bid site meeting.
- .2 Areas of Work and storage on site will be designated by the Owner before commencement of Work at the pre-bid meeting. The boundaries established thereby shall be strictly enforced.
- .3 The Contractor may request the Owner to relocate or expand the site storage area during the Execution of the Work.
- .4 The decision to make changes to the site storage areas will be at the discretion of the Owner or Consultant.
- .5 Do not unreasonably encumber the site with materials, stored products or equipment that will interfere with the daily operations of the Owner.
- .6 Prior to commencement of any Work, carefully inspect and determine the capability of set up and traffic areas to support anticipated loads without doing damage. Provide protection to protect all landscaping and paving, including but not limited to, installing heavy wood planking under kettles, tankers, dolly wheels, trailers and/or disposal bins, and completely over all areas used to hoist or remove debris from the site.
- .7 Prior to the commencement of any Work, inspect and provide an itemized list of existing property damage accompanied with photographs or video of site conditions and turn a copy over to the Consultant. This graphic information shall be used to resolve potential disputes, should they occur.
- .8 Commencement of Work by the Contractor is proof that the Contractor accepts the surfaces as satisfactory.
- .9 Clearance must be obtained from the Owner, or their assign, before gaining vehicular access during regular working hours.
- .10 All vehicles must exercise extreme care when frequenting the property; in particular, in areas near or adjacent to pedestrian traffic. Provide flag-person at front/rear of vehicles to protect the public and property from traffic during garbage removal, material/plant delivery or other such activities during working hours.
- .11 Locate equipment and materials at existing service roadways to provide minimal disruption to building occupants, pedestrians, staff and/or vehicular traffic.

- .12 When required, close off access routes by placing barricades or posting guards to prevent access to unauthorized personnel. Unauthorized personnel shall be defined as the public and/or anyone not directly involved with the execution, supervision or inspection of the Work.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Consultant to facilitate execution of work.
- .2 All M&E service modifications must be conducted by Contractors holding a prequalified status with LDSB.

1.4 EXISTING SERVICES

- .1 Notify Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Consultant 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 All gas line piping work shall be performed in compliance with TSSA regulations.
- .4 Construct barriers in accordance with Section 01 52 00 – Construction Facilities.
- .5 Provide for personnel, pedestrian and vehicular traffic.
- .6 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Ensure protection of the building and products that are sensitive to damage by moisture. Do not work during rain, snow, fog or periods of high humidity. Stop Work well before the onset of inclement weather or when inclement weather appears imminent.
- .2 As governed by design intent, apply each part of the roofing system only when surfaces and weather allow for a successful application and performance of completed Work.
- .3 Observe minimum temperature and weather conditions set out in manufacturer's printed recommendations. Proceed with Work when temperatures are below 5°C with the mutual documented agreement between the Contractor and material supplier that, with the material and method used, the specified installation under the conditions will be successfully achieved.

1.6 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

END OF SECTION

1.1 GENERAL

- .1 This section specifies general requirements and procedures for the approval and use of alternatives. Additional requirements may be specified in individual sections of the specifications.

1.2 ALTERNATIVES

- .1 Requests for “acceptance” of materials in addition to those presently established as “acceptable” by the Contract documents shall be submitted in writing to the Consultant at the following address:

Fishburn Sheridan Kingston Inc.
105-1020 Bayridge Drive
Kingston ON K7P 2S2
Attention: Douglas Ault
Email: douglas@fsaeng.com

- .2 Such a request shall be accomplished with a complete description of the alternative proposed including the advantages and cost savings that could be realized. In addition, provide the name of Manufacturer brand name, technical data and samples of both the specified and proposed substitute items.
- .3 Identify and allow for in the bid price, any submission of alternatives to products specified including any changes required in the related work and modifications surrounding work as required to complete the project under each alternative designated. A later claim by the Bidder for any addition to the Contract price, because of changes in work necessitated by use of alternatives shall not be considered.
- .4 In any case, where substitutions are permitted, the Contractor shall bear the cost to evaluate and test the equality of the materials and pay any design charges and costs to change the working drawings and specifications that occur due to their use.

END OF SECTION

1.1 GENERAL

- .1 This Section specifies general requirements and procedures for project meetings. Additional requirements may be specified in individual Sections of the specifications.

1.2 ADMINISTRATIVE

- .1 Consultant will administer the pre-construction meeting. The Contractor will administer the progress meetings.
- .2 Written notice will be distributed a minimum of 48-hours in advance of the meeting dates to the Owner, the Consultant and the Contractor, as required.
- .3 The Owner shall provide physical space and coordinate arrangements for meetings.
- .4 For the pre-construction meeting, the Consultant will reproduce and distribute copies of minutes and transmit them to meeting participants and affected parties not in attendance.
- .5 For the progress meetings, the Contractor will reproduce and distribute copies of minutes and transmit them to meeting participants and affected parties not in attendance.
- .6 Representatives of the Owner, the Contractor, the Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of the party each represents.

1.3 PRE-CONSTRUCTION MEETING

- .1 The Consultant will request a meeting of parties to the Contract to discuss and resolve administrative procedures and responsibilities. The Contractor's cost to attend this meeting shall be accounted for in their Base Bid submission.
- .2 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work.
 - .3 Schedule of submission of materials list, shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Site security, emergency response and protective measures shall be established.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

- .7 The Contractor is to provide for review, their photographic pre-start condition survey documents.
- .8 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, hold backs.
- .12 Appointment of inspection and testing agencies or firms.
- .13 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

- .1 During course of Work, scheduled progress meetings may be required until project completion. Timing and frequency will be determined at the pre-construction meeting.
- .2 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Pending changes as and substitutions.
 - .12 Review proposed changes for affect on construction schedule and on completion date.
 - .13 Other business.

END OF SECTION

1.1 GENERAL

- .1 This Section specifies general requirements and procedures for submittals. Additional requirements may be specified in individual Sections of the specifications.

1.2 ADMINISTRATIVE

- .1 Submit to Consultant submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .10 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.

- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 2 days for Consultant's review of each submission.
- .5 Adjustments made on shop drawings 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.
- .6 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified 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.
- .9 After Consultant's review, distribute copies.
- .10 Submit an electronic copy of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.
- .11 Submit an electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit an electronic copy of test reports for requirements requested in specification Sections and as requested by Consultant.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit an electronic copy of certificates for requirements requested in specification Sections and as requested by Consultant.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit an electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Consultant.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit an electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Consultant.

- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit an electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Consultant.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

1.4 SAMPLES

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Consultant's business address.
- .3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples 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.
- .6 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography, standard resolution monthly with progress statement and as directed by Consultant.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: 2 locations.
 - .1 Viewpoints and their location as determined by Consultant.

- .4 Frequency of photographic documentation: as directed by Consultant.
- .1 Upon completion of: excavation, foundation, framing and services before concealment of Work, and as directed by Consultant.

1.6 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

END OF SECTION

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2005.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS 2015).
 - .1 Safety Data Sheet (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to authority having jurisdiction, daily / weekly, Consultant.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS 2015 SDS - Safety Data Sheets.
- .7 Consultant will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 2 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 1 day after receipt of comments from Consultant.
- .8 Consultant's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location and not the entire complex. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award.
- .3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.4 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.5 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.6 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.7 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Contractor shall be the Principal Contractor as described in the Ontario Occupational Health and Safety Act for only their scope and areas of work as defined and described this project specification.
- .4 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.8 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.9 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.
- .2 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, advise Health and Safety co-ordinator / Safety Officer and follow procedures in accordance with Acts and Regulations of Province having jurisdiction and advise Consultant verbally and in writing.

1.10 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have site-related working experience specific to activities associated with roof replacement operations.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and be under direction of Registered Occupational Hygienist / Certified Industrial Hygienist / site supervisor.

1.11 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.

1.12 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant.
- .2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

1.13 POWDER ACTUATED DEVICES

- .1 Use powder actuated devices only after receipt of written permission from Consultant.

1.14 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

END OF SECTION

1.1 INFORMATION SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.2 FIRES

- .1 Fires and burning of rubbish on site is not permitted.

1.3 DRAINAGE

- .1 Provide temporary drainage and pumping required to keep site free from water.
- .2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.4 NOTIFICATION

- .1 Consultant will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits and other elements of Contractor's Environmental Protection Plan.
- .2 Contractor: after receipt of such notice, inform Consultant of proposed corrective action taken and take such action for approval by Consultant.
 - .1 Do not take action until after receipt of written approval by Consultant.
- .3 Consultant will issue stop work order until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

1.5 CLEANING

- .1 Clean in accordance with Section 01 74 00 – Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Municipal regulations.
- .3 Do not bury rubbish and waste materials on site.
- .4 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

END OF SECTION

1.1 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with National Building Code of Canada (NBC), Ontario Building Code (OBC), National Fire Code of Canada (NFCC) and National Plumbing Code of Canada (NPCC), including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code.
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.
 - .3 CRCA.
 - .4 Various CSA, CGSB and ASTM standards referenced to in the applicable Sections.
 - .5 Gas pipes and equipment to national or provincial gas utilization codes.
 - .6 Ontario Regulation 183/184 under the Power Corporation Act (Electrical Safety Code) and bulletins in force.
 - .7 Manufacturer's printed literature.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: Demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Consultant.
- .2 Mold: Stop work immediately when material resembling mold is encountered during demolition work. Notify Consultant.

1.3 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.

END OF SECTION

1.1 GENERAL

- .1 This Section specifies the general requirements and procedures for quality control. Additional requirements may be specified in individual Sections of the specifications.

1.2 INSPECTION

- .1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress, as required.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Consultant will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.5 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

- .3 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Consultant.

1.6 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to Consultant.

END OF SECTION

1.1 GENERAL

- .1 This Section specifies the general requirements and procedures for construction facilities. Additional requirements may be specified in individual Sections of the specifications.

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.

1.3 HOISTING

- .1 Provide, operate and maintain hoists or cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists and cranes to be operated by qualified operator.

1.4 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.5 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work, at locations designed by Owner.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

1.6 EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

- .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.

1.7 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.8 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Consultant.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Consultant.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, haul roads designated by Consultant.

1.9 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

END OF SECTION

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

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

1.3 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.4 WEATHER ENCLOSURES

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Design enclosures to withstand wind pressure and snow loading.

1.5 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.

1.6 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.7 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.

1.8 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.9 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.

1.10 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.

1.11 OVERHEAD PROTECTION

- .1 Provide, as required, at all entrance/egress locations, suitable overhead protection. Level of acceptance to include temporarily secured scaffold assembly with adequately attached plywood roof decking and appropriate signage.

END OF SECTION

1.1 REFERENCES

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.

1.2 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store sheet materials, lumber and roofing products on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .5 Remove and replace damaged products at own expense and to satisfaction of Consultant.
- .6 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.5 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.

1.6 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant will establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.8 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 CONCEALMENT

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Consultant if there is interference. Install as directed by Consultant.

1.10 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Consultant of conflicting installation. Install as directed.

1.12 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Consultant.

1.15 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work and/or building occupants and pedestrian and vehicular traffic.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

END OF SECTION

1.1 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
- .2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Consultant.

1.2 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Consultant of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.3 RECORDS

- .1 Record locations of maintained, re-routed and abandoned service lines.

1.4 SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

END OF SECTION

1.1 GENERAL

- .1 This Section specifies the general requirements and procedures for cleaning. Additional requirements may be specified in individual Sections of the specifications.

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .3 Clear snow and ice from work areas and bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site garbage bin containers for collection of waste materials and debris.
- .6 Dispose of waste materials and debris [at designated dumping areas off site.
- .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .10 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.

- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .11 Remove dirt and other disfiguration from exterior surfaces.
- .12 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .13 Sweep and wash clean paved areas.
- .14 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .15 Clean roofs, downspouts, and drainage systems.

END OF SECTION

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
 - .1 Notify Consultant in writing of satisfactory completion of Contractor's inspection and submit verification that corrections have been made.
 - .2 Request Consultant's inspection.
 - .2 Consultant's Inspection:
 - .1 Consultant and Contractor to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
 - .4 Work: complete and ready for final inspection.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Consultant, and Contractor.
 - .2 When Work incomplete according to Owner and Consultant, complete outstanding items and request re-inspection.
 - .5 Declaration of Substantial Performance: when Consultant considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
 - .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
 - .7 Final Payment:
 - .1 When Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .8 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.2 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1.1 GENERAL

- .1 This Section specifies the general requirements and procedures for closeout submittals. Additional requirements may be specified in individual Sections of the specifications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 1 week prior to Substantial Performance of the Work, submit to the Consultant, 2 final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.3 FORMAT

- .1 Organize data as instructional manual.
- .2 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .3 Arrange content with Table of Contents.

1.4 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site, one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Keep record documents and samples available for inspection by Consultant.

1.5 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record as-built information on set of opaque drawings, provided by Consultant, and return drawings to Consultant at Substantial Performance of the Work.
- .2 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.

- .3 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .4 Specifications: 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.
- .5 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .6 Provide digital photos, if requested, for site records.

1.6 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

1.7 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Consultant.
 - .2 Include approved listings in Maintenance Manual.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Consultant.

1.9 WARRANTIES AND BONDS

- .1 Submit 24-month labour warranty for materials workmanship, dated from the date of Substantial Performance.
- .2 Submit 10-year membrane material warranty.
- .3 Develop warranty management plan to contain information relevant to Warranties.
- .4 Submit warranty management plan to Consultant for approval.

- .5 Warranty management plan to include required actions and documents to assure that Consultant receives warranties to which it is entitled.
- .6 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .7 Submit, warranty information made available during construction phase, to Consultant for approval prior to each monthly pay estimate.
- .8 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Consultant to proceed with action against Contractor.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Definitions:
 - .1 Demolition: rapid destruction of building following removal of hazardous materials.
 - .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
- .2 Reference Standards:
 - .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS 2015)
 - .1 Safety Data Sheets (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Submit for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, where required by authorities having jurisdiction.
- .3 Hazardous Materials:
 - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

1.3 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.

.2 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 Consultant
- .2 Remove and store materials to be salvaged, in manner to prevent damage.
- .3 Store and protect in accordance with requirements for maximum preservation of material.
- .4 Handle salvaged materials as new materials.

1.5 SITE CONDITIONS

.1 Site Environmental Requirements.

- .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
- .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout the project.
- .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authorities.
- .6 If applicable, protect trees, plants and foliage on site and adjacent properties where indicated. Protect paving, sidewalks and all hard landscaping.

.2 Existing Conditions.

- .1 Remove contaminated or hazardous materials listed as hazardous from site, prior to start of demolition Work, and dispose of at designated disposal facilities in safe manner.
- .2 List of hazardous materials:
 - .1 Project specific, refer to DSR.

Part 2 Products

2.1 EQUIPMENT

- .1 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 PREPARATION

- .1 Inspect site with Consultant and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
- .3 Notify and obtain approval of utility companies before starting demolition.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.
- .3 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan and as instructed by Consultant.

3.4 REMOVAL FROM SITE

- .1 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

3.5 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use 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.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use 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.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.7 PROTECTION

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .2 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.2 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Amended Water: water with nonionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.
- .3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
- .4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.
- .5 Authorized Visitors: Owner, Consultant or designated representative, and representatives of regulatory agencies.
- .6 Competent worker in relation to specific work, means a worker who:
 - .1 Is qualified because of knowledge, training and experience to perform the work.
 - .2 Is familiar with the provincial laws and with the provisions of the regulations that apply to the work.
 - .3 Has knowledge of all potential or actual danger to health or safety in the work.
- .7 Friable material: means material that:
 - .1 When dry, can be crumbled, pulverized or powdered by hand pressure, or
 - .2 is crumbled, pulverized or powdered.
- .8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.
- .10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit proof satisfactory to Consultant that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Consultant necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.
- .6 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .7 Submit proof satisfactory to Consultant that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.
- .2 Health and Safety:
 - .1 Perform construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

- .2 Safety Requirements: worker protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
 - .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.
 - .2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibers. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibers from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.
 - .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
 - .3 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.
 - .4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.
 - .5 Ensure workers wash hands and face when leaving Asbestos Work Area.

- .6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .3 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.6 EXISTING CONDITIONS

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into this specification immediately after this Section.
- .2 Notify Consultant of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Consultant.

1.7 SCHEDULING

- .1 Hours of Work: schedule operations to approval of Consultant.

1.8 PERSONNEL TRAINING

- .1 Before beginning Work, provide Consultant satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, following minimum requirements:
 - .1 Fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by a competent, qualified person.

Part 2 Products

2.1 MATERIALS

- .1 Drop Sheets:
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fibre-reinforced fabric bonded both sides with polyethylene.
- .2 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.
- .3 Waste containers: Contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
 - .2 Outer container: Sealable metal or fiber type where there are sharp objects included in waste material; otherwise, outer container may be sealable metal or fiber type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: Affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.
- .4 Slow-drying sealer: Non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibers.
- .5 Tape: Fibreglass, reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

Part 3 Execution

3.1 PROCEDURES

- .1 Before beginning this Type 1 Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.
 - .1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
 - .2 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
 - .3 Do not use compressed air to clean up or remove dust from any surface.

- .2 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.
- .3 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low-velocity fine-mist sprayer.
 - .2 Perform Work to reduce dust creation to lowest levels practicable.
 - .3 Work will be subject to visual inspection.
 - .4 Contamination of surrounding areas indicated by visual inspection will require complete enclosure and clean-up of affected areas.
- .4 Frequently and at regular intervals during Work and immediately on completion of work:
 - .1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste container, and
 - .2 Drop sheets to be wetted and placed in a waste container as soon as practicable.
- .5 Cleanup:
 - .1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.
 - .2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.
 - .3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.
 - .4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CSA International
 - .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O141-05(R2009), Softwood Lumber.
 - .3 CSA O151-09, Canadian Softwood Plywood.
- .3 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S702-14, Standard for Mineral Fibre Thermal Insulation for Buildings.
 - .2 CAN/ULC-S702.2-10, Standard for Mineral Fibre Thermal Insulation for Buildings, Part 2: Application.

1.2 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.

1.3 PRECAUTIONS

- .1 Provide temporary protection, to the satisfaction of the Consultant, to render all wood blocking watertight, if for any reason permanent membrane protection cannot be provided within the same day. Ensure the base of any curbs are temporarily sealed to prevent water from entering below the curb assembly, or behind sheathing, should the roof assembly not be completed on the same day as the carpentry work.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and acceptance requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and handling requirements:
 - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 LUMBER MATERIAL

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
 - .1 S2S is acceptable for blocking and nailers.
 - .2 Board sizes: "standard" or better grade.
 - .3 Dimension sizes: "standard" light framing or better grade.
 - .4 Post and timbers sizes: "standard" or better grade.

2.2 PANEL MATERIALS

- .1 Fire-retardant-treated wood and plywood: to CAN/CSA-80 Series, impregnated with fire-retardant chemicals in solution under high pressure.
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
 - .1 Urea-formaldehyde free.
 - .2 CAN/CSA-Z809 or FSC or SFI certified.

2.3 FASTENERS

- .1 Wood to wood fasteners: Wood screw #12 or as indicated, galvanized flat head, of sufficient length to completely penetrate through base minimum 25 mm.
- .2 Plywood to concrete, brick or hollow masonry fasteners: 6 mm diameter screws. Length to provide minimum 32 mm and maximum 40 mm embedment into substrate as required. Type to be approved subject to results of pull tests.
 - .1 Standard of acceptance:
 - .1 Tapcon.
 - .2 Or accepted alternate.

- .3 Expansion fasteners for wood plates and steel to concrete deck: AISI Type 304 stainless steel, with stainless nuts and washers.
 - .1 Standard of acceptance:
 - .1 Hilti Kwik Bolt TZ.
 - .2 Or accepted alternate.
- .4 Exposed fasteners for metal to wood or masonry: Use #10 cadmium plated hex screws with neoprene and steel washers. Minimum length 38 mm. Use lead shields, as required for anchoring. Colour of screw head to meet approval of Consultant.
 - .1 Standard of acceptance:
 - .1 Atlas Bolt.
 - .2 Rawl.
 - .3 Or accepted alternate.
- .5 Nails, spikes and staples: To CSA B111.

2.4 ACCESSORIES

- .1 Interior gypsum board: To ASTM C1396/1396M-13, thickness 12.7 mm unless otherwise noted.

2.5 FINISHES

- .1 Galvanizing: To ASTM A653/A653M, use galvanized fasteners for all work.

Part 3 Execution

3.1 GENERAL INSTALLATION

- .1 Extend air/vapour barrier seals up vertical surfaces and curbs and onto the deck as shown on the Drawings, to provide continuity.
- .2 Slope the top of all wood blocking at the roof perimeter in towards the roof at a minimum of 5%, unless otherwise shown on the Drawings.
- .3 Comply with requirements of NBC, supplemented by the following paragraphs.
- .4 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .5 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .6 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .7 Install wood, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners.

- .8 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.

3.2 SECUREMENT OF WOOD BLOCKING

- .1 Comply with more stringent requirements as required by drawings or Ontario Building Code requirements. Increase number and spacing of all fasteners by 50% for 2400 mm from all outside roof corners.
- .2 Install fasteners to the design intent to hold all wood blocking permanently in place to prevent warping, deflection and to resist all wind and weather conditions.
- .3 Secure wood to concrete in a staggered pattern with each row spaced at minimum 600 mm c/c with specified fasteners. Drill holes 13 mm deeper than depth of fastener penetration.
- .4 Install fasteners in two rows in the direction of the grain, offset one to another in a staggered fashion by approximately 50%. All fasteners shall be placed minimum 10 mm from any edge of framing.
- .5 Unless specified otherwise, the number of fasteners shall be doubled at all outside parapet corners, for a distance of 3 m from the corner.
- .6 For any exposed fastening, provide touch-up paint as required to coat all exposed surfaces of screws damaged during the driving process.

3.3 SHEATHING INSTALLATION

- .1 Gypsum board:
 - .1 Install sheathing to curb interiors, as indicated on the drawings and details. Secure with specified fasteners at 200 mm c/c around perimeter of each board and at maximum 300 mm c/c spacing in the field of the board.
- .2 Plywood:
 - .1 Not less than 2 mm gaps shall be provided between sheets, to allow for material expansion.
 - .2 Unless otherwise indicated, fasten plywood with a minimum of thirty-six fasteners per 1200 mm x 2400 mm sheet.

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.
- .3 Bevel leading edge of wood panel products on vertical applications to facilitate membrane installation and as detailed on drawings.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 553-08, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 ASTM C 665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .3 ASTM C 1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-[05], Natural Gas and Propane Installation Code Handbook.
 - .2 CAN/CGA-B149.2-[05], Propane Storage and Handling Code.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .4 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-M91, Standard for Type A Chimneys.
 - .2 CAN/ULC-S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Collect and separate packaging materials for disposal in accordance with Waste Management Plan.

Part 2 PRODUCTS

2.1 INSULATION

- .1 Semi-rigid mineral fiber: cavity insulation to CAN/ULC S702.
 - .1 Thickness: as indicated and to suit stud thickness.
 - .2 Flame spread index = 10, to CAN/ULC S102.
 - .3 Smoke Developed = 25, to CAN/ULC S102.
 - .4 Acceptable material:
 - .1 ROCKWOOL Cavityrock as manufactured by Rockwool Inc.,
 - .2 Or approved equivalent.

2.2 ACCESSORIES

- .1 Insulation clips:
 - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.
- .2 Nails: galvanized steel, length to suit insulation plus 25mm, to CSA B111.
- .3 Staples: 12 mm minimum leg.
- .4 Tape: as recommended by manufacturer.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces, and where indicated.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.
- .4 Do not enclose insulation until it has been reviewed by Consultant.

3.3 CLEANING

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

- .1 ASTM International:
 - .1 ASTM E84-21a, Standard Test Method for Surface Burning Characteristics of Building Materials
 - .2 ASTM E96-00e1, Standard Test Methods for Water Vapor Transmission of Materials

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Limitations.
- .3 Quality assurance submittals:
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

1.3 QUALITY ASSURANCE

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06.
- .2 Mock-Ups:
 - .1 Submit mock-ups in accordance with Section 01 45 00.
 - .2 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.
 - .3 Mock-up will be used to judge workmanship, substrate preparation, and material application.
 - .4 Locate where directed by Consultant.
 - .5 Allow 48 hours for inspection of mock-up by Consultant.

- .3 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work, however, is to remain uncovered by subsequent work until necessary.

Part 2 PRODUCTS

2.1 SHEET AIR BARRIER

- .1 Self-adhered, vapour permeable air barrier membrane: self-adhering water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface.
 - .1 Thickness: 0.58 mm.
 - .2 Water Vapor Permeance to ASTM E96: 29 perms.
 - .3 Surface Burning Characteristics to ASTM E84:
 - .1 Flame Spread: Class A.
 - .2 Smoke Development: Class A.
 - .4 Acceptable material:
 - .1 Blueskin VP160 by Henry Company,
 - .2 Or approved equivalent.

2.2 ADHESIVE AND PRIMERS

- .1 Adhesives, termination sealant, flashing membranes and primers for self-adhering air barriers shall be compatible with selected membrane product as recommended by membrane manufacturer and to suit substrate and building conditions.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder where indicated to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.2 EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.3 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Install staples through lapped sheets at sealant bead into wood substrate.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.4 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Contractor to provide an original, complete insurance policy identifying specific coverage for torch applied systems.

1.2 RELATED SECTIONS

- .1 Section 02 41 13 – Selective Site Demolition.
- .2 Section 06 10 53 – Miscellaneous Rough Carpentry.
- .3 Section 07 52 10 – Modified Bituminous Membrane Roofing (Adhered)
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .5 Section 07 92 00 – Joint Sealants.
- .6 Section 22 05 11 – Plumbing and Drainage.

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CGA-8.1-M86 (R2011), Elastomeric Composite Hose and Couplings for Conducting Propane and Natural Gas.
 - .2 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt. (updated)
 - .3 CAN/CSA-A123.4-04 (R2013) - Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
 - .4 CSA A123.22-08(r2013), Self-Adhering Polymer Modified Bituminous Membrane Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .5 CSA A123.23-15 - Product specification for polymer-modified bitumen sheet, prefabricated and reinforced.
 - .6 CSA A231.1-14/A231.2-14, Precast Concrete Paving Slabs / Precast Concrete Pavers.
 - .7 CSA B149.1-10 (R2015), Natural Gas and Propane Installation Code
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint.
 - .2 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
- .4 Factory Mutual (FM Global)
 - .1 Hot Work Permit Form F2630.

- .2 FM 4450, Approval Standard for Class 1 Insulated Steel Roof Decks.
- .5 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S107-10, Standard Methods of Fire Tests of Roof Coverings.
 - .2 CAN/ULC-S126-06, Standard Method for Test for Fire Spread Under Roof Deck Assemblies.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .4 CAN/ULC-S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning roofing Work, with roofing contractor's representative and Consultant to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 COORDINATION

- .1 Coordinate work of this Section with related work specified in other Sections to ensure construction schedule is maintained and water tightness and protection of the building and finished work is maintained at all times.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 System summary:
 - .1 Provide a one page synopsis of each roof type that lists the assembly components in order from top to bottom.
- .3 Product Data:
 - .1 Provide two copies or an electronic copy of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations for all products to be incorporated in the new system.
 - .2 Provide two copies or an electronic copy of WHMIS 2015 Safety Data Sheets to Consultant for:
 - .1 Primers.
 - .2 Sealers.
 - .3 Liquid membrane.
 - .4 Adhesives.
- .4 Provide shop drawings:

- .1 Indicate sloped insulation layout and details.
- .2 Provide shop drawing or submittal indicating adhesive pattern specified by adhesive manufacturer for the required wind uplift pressures indicated on the Drawings.
- .5 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.7 QUALITY ASSURANCE

- .1 Installer qualifications: Company or person specializing in application of modified bituminous roofing systems with 5 years documented experience, approved by manufacturer.
- .2 Only certified applicators are permitted to use torch welding equipment.
- .3 Hold a pre-installation meeting prior to the start of roofing works, with the roofing contractor's representative and the Consultant, to review installation conditions particular to this project.
- .4 Roof membrane manufacturer shall delegate a representative to visit the work site at the start of roofing installation. Contractor shall engage membrane manufacturer's technical representative as required to provide technical guidance for and inspection of membrane application. The Contractor shall at all times enable and facilitate access to the worksite by this representative.

1.8 FIELD QUALITY CONTROL

- .1 Water Testing:
 - .1 In the event the Consultant deems any of the Work to be deficient, provide water test of all flashing, projections, equipment on roof and roofing system. Co-ordinate test with the Owner's operations personnel.
 - .2 Contractor is to assume all costs of testing and correction.
- .2 Adhesion Testing:
 - .1 If requested by the Consultant, at each roof drainage area, following installation of membrane base sheet, carry out adhesion tests to confirm adhesion of membrane to substrate and substrate layers to each other, down to first mechanically attached layer.
 - .2 Locations and timing of tests will be directed by Consultant. Provide labour and materials as required to assist Consultant in conducting tests.
 - .3 If inadequate adhesion is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the Consultant. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
 - .4 Contractor is to assume all costs of testing and correction.

.3 Sample Testing:

- .1 If requested by the Consultant, at each roof drainage area, following installation of membrane base sheet, carry out sample tests to confirm materials and installation of roof assembly components. Sample size to be 300 mm x 300 mm.
- .2 Locations and timing of tests will be directed by Consultant.
- .3 If inadequate construction is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the Consultant. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
- .4 Contractor is to assume all costs of testing and correction.

1.9 FIRE PROTECTION

.1 Fire Extinguishers:

- .1 Pressure rechargeable type with hose and shut-off nozzle,
- .2 ULC labeled for ABC class protection.
- .3 ULC labeled for A class protection, for wood, paper and fibreboard.
- .4 Size 14 kg.
- .5 Have one fully charged ABC extinguisher and one fully charged Type A extinguisher on roof per torch applicator, within 3 m of the propane source.

- .2 Maintain fire watch for 2 hours after each day's torching operations cease.

1.10 GENERAL REQUIREMENTS

- .1 Comply with the General Requirements, General Instructions and Supplementary Conditions.
- .2 Execute work in accordance with this Section and other related Sections, Drawings and Details.
- .3 Attach roofing to structure to meet requirements of insurance underwriter and authorities having jurisdiction.
- .4 Regard manufacturer's printed recommendations as minimum requirement for materials, methods and workmanship not otherwise specified.
- .5 Contact the Consultant if the specifications conflict with the manufacturer's recommendations. Otherwise it will be assumed that the Contractor and manufacturer are in agreement with procedures outlined.
- .6 Advise the Consultant of adjustments to specified roofing procedures caused by weather and site conditions. Make adjustment to specified procedures only after review with the Consultant.

- .7 Maintain equipment in good working order to ensure control of roofing operations and protection of work. Types of roofing equipment and laying techniques to be employed are to meet the approval of the Consultant.
- .8 Do not penetrate roof deck with any fastening devices that would do damage or impair the function of the assembly.
- .9 All temporary drains shall be connected with a mechanical connection (MJ coupling) or a U-flow connection, until new drains are installed.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage, and disposal of, sealing compounds, primers and caulking materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.
- .5 Ensure that shelf life of materials has not expired.
- .6 Remove damaged material from site and replace all rejected materials with new product.
- .7 Elevate on raised platform and store as to prevent deformation of materials.
- .8 Provide and maintain dry, off-ground weatherproof storage.
- .9 Store rolls of membrane in upright position. Store membrane rolls with selvage edge up.
- .10 Remove only in quantities required for same day use.
- .11 Place plywood runways over completed Work and over areas not in Contract, as required, to enable movement of material and other traffic.
- .12 Store sealants at +5°C minimum.
- .13 Protect insulation by slitting manufacturer's packaging and installing a waterproof UV-resistant tarp.
- .14 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.

- .15 Avoid stockpiling of materials or use of equipment on decks in a way which could cause overloading.

1.12 ENVIRONMENTAL REQUIREMENTS

- .1 Ensure protection of products that are sensitive to damage by moisture. Do not work during rain, snow or fog. Stop work and make watertight before the onset of inclement weather or when weather appears imminent.
- .2 Ensure protection of the building from weather at all times. If inclement weather is forecast or appears imminent, postpone work that would risk the building from moisture damage.
- .3 If it becomes apparent that work would threaten the building watertightness, the Owner has the right to stop work. Any additional expenses due to work stoppage or postponement of work will be at the Contractor's expense.
- .4 Ambient Conditions
 - .1 Do not install roofing when ambient temperature remains below -18°C for torch application.
 - .2 Minimum ambient temperature for solvent-based adhesive is -5°C.
- .5 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.13 COMPATIBILITY

- .1 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a complete assembly. Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.
- .2 Defective work resulting from work with incompatible materials will be considered the responsibility of the Contractor.
- .3 Repair all work that could result in damage or interfere with performance.

1.14 EXISTING SUBSTRATES

- .1 Following removal of existing material to the substrate, inspect the deck for soundness and notify the Consultant of any deck found unsound and not suitable for roofing. Do not commence work until conditions are documented and the Consultant rules on the acceptability of surfaces and/or corrective measures required. The cost of any delays due to postponement of work that results from investigating the site problem or obtaining a ruling will be at the Owner's expense.
- .2 The commencement of work is proof that the Contractor has accepted surfaces as satisfactory and accepts responsibility for appearance and performance of completed work.

- .3 Defective work resulting from application of material on unsatisfactory surfaces will be considered the responsibility of the Contractor.
- .4 The Contractor will be responsible for all repairs, costs and pay all cost and fees required to rectify damage or defective work. Use materials and finish to match the original preconstruction conditions.

1.15 DAILY OPERATIONS

- .1 Unless otherwise specified, complete the entire roofing operation up to line of termination of each day's work, as required by design intent, in order to safeguard and protect the work and building from damage and weather.

1.16 EXAMINATION

- .1 Before proceeding with roofing application, ensure that:
 - .1 All surfaces are clean and free of debris, snow, frost and moisture.
 - .2 The deck is clean and sufficiently dry to ensure specified adhesion will be obtained.
 - .3 Adjacent construction and installation of related work (i.e. curbs, drains, penetrations, wood nailers, etc.) incorporated with the roof are complete.
 - .4 Roof deck is sound, existing fasteners are tight and irregularities are corrected to provide a suitable surface for new roofing.
- .2 Ensure substrate is smooth. Remove sharp edges or protrusions that could impair the function of the roof assembly.
- .3 Inform Owner/Consultant in writing of any defects.

1.17 DRAINS AND DRAINAGE PLANE

- .1 Inspect surfaces and ensure that roof deck is level or sloped to drains in conforming to design intent.
- .2 Inspect surfaces and ensure that roof drains are set at a level to drain and are connected or capped.
- .3 Take spot levels to verify that pools of water in excess of 13 mm depth will not form.
- .4 Tabulate levels and submit to Consultant.
- .5 Ensure plumbing is accessible and work can be completed as specified.
- .6 Inspect roof drains to ensure they are open and working properly.
- .7 Where specified or shown for areas with only one drain, provide overflow scuppers or drains to detail and specified requirements.

1.18 EXAMINE UNDERSIDE OF DECK

- .1 Inspect the underside of deck to ensure fasteners will not damage the structure, affect interior surfaces or electrical and mechanical services.
- .2 For drain alterations and pipe hangers, coordinate with plumbing subtrade as per Section 22 05 11 – Plumbing and Drainage, prior to commencement of roofing operations.

1.19 HIDDEN SERVICES

- .1 Investigate the location of all known hidden services by reviewing interior conditions, plans, specifications and drawings for the original building, any subsequent alterations, completion of cut tests and interviewing those involved in the construction and maintenance of building services. These services include but are not limited to mechanical, electrical, cable, communication, computer, security or roof assembly. Ensure all services are located and will be protected from damage under the Contract. In some cases, services may be located over the roof deck and within the roof assembly. Notify Owner/Consultant in such occurrence and proceed with installation as directed.

1.20 EQUIPMENT

- .1 Inspect equipment affected by the work, including but not limited to rooftop equipment, curbs, existing drains and plumbing, mechanical, electrical and lightening protection services, to ensure they are in good repair and working order. Record any damage and advise the Consultant.
- .2 During re-roofing, ensure that all mechanical equipment, ducts, pipes, etc. are properly supported.
- .3 Notify Owner and/or Consultant of any equipment which is not operational or damaged prior to the commencement of work.

1.21 ADVISE CONSULTANT

- .1 Advise the Consultant of any unusual circumstances affecting the work. Notify the Consultant of any defective or malfunctioning equipment or drainage deficiencies. Do not commence work until defects and incorrect levels have been verified and rectified.

1.22 PROTECTION OF ROOFTOP EQUIPMENT

- .1 Remove any equipment and flashing intended for re-use and save from harm. Store in approved location and reset at project conclusion unless specified or shown to be removed.
- .2 Protect all openings, vents and stacks from weather and contamination from debris.

- .3 Provide temporary plumbers plugs to protect drains during roofing operations. Ensure that temporary protection is removed at completion of work period and/or at the end of each days work.

1.23 SERVICES

- .1 Services are to be left operational unless otherwise authorized by the Owner.
- .2 Unless otherwise specified, the Contractor will be responsible for disconnection, relocation, re-installation and extending all services required to facilitate work under this Contract. Co-ordinate work with the Owner and provide minimum of 48 hours notification if services are to be interrupted.
- .3 Contractor to verify location of services prior to commencement of work. Notify Owner/Consultant of any unusual conditions.
- .4 The Contractor and their employees must hold valid certificates for the work undertaken.
- .5 Complete work of this Section as required by local authorities having jurisdiction. Have work inspected and pay all fees relative to such inspection to ensure work meets with published standards and codes.
- .6 Submit Certificate or Letter of Approval by authority responsible for the work to the Owner and Consultant with final documentation.
- .7 All fans, air handling units, and any electrical equipment affected by the replacement of the roof sections under this Section, whether disconnected or extended must be inspected by an ESA representative to verify the integrity of the existing wiring and/or the new installation.

1.24 WARRANTY

- .1 Contractor's Warranty for Labour and Material:
 - .1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, and all associated roofing work, the 12 months warranty period is extended to 60 months.
 - .2 Make all necessary repairs and replacements within 48 hours of receipt of written notification.
 - .3 Nothing contained in this Article shall be construed as in any way restricting or limiting the liability in common law and statutory liability of the Contractor.
 - .4 Provide these written warranties, confirming above, issued on the corporate letterhead, signed and sealed by an authorized signing officer. The warranties will specifically reference the name of the Building, location and Owner.

- .2 Manufacturer's Warranty:
 - .1 Provide a 15-year full system warranty.
 - .2 The contractor is to ensure all materials selected for use on the project are in full compliance with the terms and conditions of the manufacturer's warranty requirements.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.

2.2 ROOF DECK SHEATHING MATERIALS

- .1 Glass mat gypsum sheathing: Glass mat faced treated core gypsum roof board, for installation over steel deck to ASTM C1177/C1177M. Boards to be 1.2 m x 2.4 m, thickness as indicated, with pre-primed surface where indicated.
 - .1 Standard of acceptance:
 - .1 DensDeck Roof Board by GP Gypsum.
 - .2 Securock by USG.
 - .3 Or accepted alternate.
- .2 Canadian softwood plywood (CSP): To CSA 0151, Urea-formaldehyde free.

2.3 PRIMERS

- .1 Asphalt Primer: To manufacturer's recommendations.
- .2 Self-adhesive membrane primer. As recommended by membrane manufacturer. Use low VOC, polymer emulsion-based primer, unless directed otherwise by Consultant on site.

2.4 AIR/VAPOUR BARRIER MEMBRANE

- .1 Styrene-butadiene-styrene (SBS) modified bitumen sheet with non-woven polyester reinforcement.
 - .1 Type A, B, or C.
 - .2 Grade 3.
 - .3 Thickness: 2.2 mm.
 - .4 Weight: 2.7 kg/m².
 - .5 Selvedge width: 75 mm.
 - .6 Top surface: Sanded.
 - .7 Bottom surface: Thermofusible film.
 - .8 Acceptable material: Elastophene SP 2.2 as manufactured by Soprema or Consultant approved alternative.

2.5 SELF-ADHERED MEMBRANE

- .1 To CSA A123.22, self-adhering membrane consisting of SBS rubberized asphalt compound laminated to a polyethylene film. Minimum thickness 1 mm.
 - .1 Standard of acceptance:
 - .1 Blueskin SA by Henry Bakor.
 - .2 GoldShield by IKO.
 - .3 Soprastick 1100 by Soprema.
 - .4 Vapour Barrier SA by Johns Manville.
 - .5 Or accepted alternate.

2.6 MEMBRANE AND MEMBRANE FLASHINGS

- .1 Acceptable membrane manufacturers:
 - .1 Soprema.
 - .2 IKO Industries Ltd.
 - .3 Henry Bakor.
 - .4 Johns Manville.
- .2 Base sheet membrane: To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer polyester or composite polyester/fibreglass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 2.
 - .4 Top and bottom surfaces:
 - .1 polyethylene/polyethylene.
- .3 Self-adhesive base sheet membrane flashing: To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer prefabricated sheet, polyester or composite polyester and glass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 2.
 - .4 Top and bottom surfaces:
 - .1 Polyethylene/release paper.
- .4 Cap sheet membrane and membrane flashing: To CSA A123.23.
 - .1 Styrene-butadiene-styrene (SBS) elastomeric polymer, prefabricated sheet, polyester or composite polyester/fibreglass reinforcement.
 - .2 Type B or Type C.
 - .3 Grade 1, granule surfaced.
 - .1 Colour for granular surface: Gray.
 - .4 Grade 1-standard service.
 - .5 Bottom surface polyethylene.

- .5 Fireguard tape:
 - .1 Modified bituminous membrane supplied in strips, 150 mm wide, 1.6 mm thick, glass fleece reinforced with self-adhesive underside.
 - .2 Provided by membrane manufacturer.

2.7 EXPANSION JOINT MEMBRANE

- .1 Provide flat, vulcanized waterproofing joint integral with the waterproofing membrane to accommodate movements up to ± 50 mm capable of 500% elongation at -40°C across its length and at all vulcanized points.
- .2 All details and connections are factory fabricated by means of vulcanization.
- .3 Property and test method results:
 - .1 Hardness: Shore A, to ASTM D-2240: 55 ± 5 .
 - .2 Lap joint strength: To ASTM D-816, same as base material.
 - .3 Low temperature flex: To ASTM D-746, -57°C .
 - .4 Maximum torching temperature: 870°C .
 - .5 Ultimate elongation: To ASTM D-412, 700%.
 - .6 Tensile strength: To ASTM D-624 (min.), 8.00 N/mm.
 - .7 Puncture test – cone: To CGSB 37.56 M, 44.5 N min.
 - .8 Water absorption: To ASTM D-570 (min.), $<0.001\%$.
 - .9 UV exposure: To ASTM G-53, 5000 hours, no cracks or crazing.
 - .10 Chemical resistance to acids, alkalis, polar solvents, saline solutions: No effect.
- .4 Standard of acceptance:
 - .1 FlamLINE 40 by SITURA INC.,
 - .2 or approved equivalent.

2.8 LIQUID MEMBRANE

- .1 Two-component methacrylate or one component polyurethane/bitumen resin, solid content 80% or greater, compatible with roof membrane.
 - .1 Standard of acceptance:
 - .1 Alsan Flashing by Soprema.
 - .2 MS Detail by IKO.
 - .3 PermaFlash by Johns Manville.
 - .4 Or accepted alternate.
- .2 Reinforcement mesh: As recommended by liquid membrane manufacturer.

2.9 ADHESIVES

- .1 Adhesive for securing overlay board and insulation: To be fully compatible with all materials in the roofing assembly. Applicability of use to adhere the different materials in the roofing assembly to be included in the manufacturer's literature.
 - .1 Standard of acceptance:
 - .1 Duotack by Soprema.
 - .2 Millenium by IKO.
 - .3 Fas-n-free by Tremco.
 - .4 Insta-Stick by Instafoam Inc.
 - .5 Roof Assembly Adhesive by Chemlink.
 - .6 Olybond 500 by OMG.
 - .7 2-Part UIA by Johns Manville.
 - .8 Or accepted alternate.

2.10 POLYISOCYANURATE INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S126, CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Fibre-reinforced **inorganic facers** on both major surfaces of the core foam.

2.11 TAPERED INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S-126, CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Fibre-reinforced **inorganic facers** on both major surfaces of the core foam.
- .2 Insulation slopes shall be as indicated on the detailed drawings and roof plans. Modules shall be factory cut to correct slopes.
- .3 Sloped insulation must terminate at 0 thickness. Supply an additional nosing piece if required, factory fabricated of compatible, flame-resistant sloped rigid insulation material, to smoothly terminate sloped insulation at 0 thickness.

2.12 OVERLAY BOARD

- .1 Overlay board: 6 mm thick asphalt based overlay board with non-woven glass facers, as recommended by the membrane manufacturer.

2.13 SEMI-RIGID MINERAL WOOL INSULATION

- .1 Semi-rigid mineral wool, rockwool, or slagwool boards, to CAN/ULC 702.2.

2.14 SEALERS

- .1 Plastic cement: Asphalt, to CAN/CGSB-37.5.
- .2 For sealants, mastic, adhesives or caulk, refer to Section 07 92 00 – Joint Sealants.

2.15 MEMBRANE FASTENING BAR

- .1 Galvanized sheet steel or extruded aluminum, thickness 1 mm (20 ga.), 38 mm width, supplied in minimum 2.4 m lengths, with pre-drilled 2 mm holes, secured with #14 stainless steel screws @ 150 mm c/c.

2.16 FASTENERS

- .1 Fasteners for gypsum board to steel deck: No. 12 flat head, self-tapping, Type A or AB, cadmium plated screws. Use fastener plates (see below).
- .2 Fastener plates: FM Global approved 75 mm hexagonal metal plates, 75 mm hexagonal plastic lock plates.
 - .1 Standard of acceptance:
 - .1 Dekfast.
 - .2 Or accepted alternate.
- .3 Fasteners for exposed metal flashing and cladding to wood or steel: Minimum 38 mm #10 cadmium plated hex head screws, colour matched, with neoprene and steel washers.
- .4 Fasteners for sheet metal into steel: Self-drilling, self-tapping screws, galvanized, #8 or larger size, Tekes or equivalent, head to suit application.
- .5 Fasteners for sheet metal and wood to wood: Corrosion resistant #10 wood screws or nails to suit application.
- .6 Structural fasteners into wood: Lag screws, 12.7 mm diameter hot dipped galvanized steel, length 125 mm.

2.17 PLUMBING VENTS

- .1 2-piece spun aluminum sleeve with integral flange, matching aluminum hood and perforated collar, premoulded urethane insulation liner and EPDM base seal. Size to be confirmed on site to match existing pipe sizes.
 - .1 Standard of acceptance:
 - .1 SJ-31 Vandal Proof Stack Jack, by Thaler.

2.18 ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage.

2.19 PREFABRICATED INSULATED ROOF CURB

- .1 Prefabricated roof curb to be manufactured of prime galvanized steel construction, 1.2 mm (18 ga.) steel thickness, meeting ASTM A653/653M, with welded corners and with seams joined by continuous water and airtight welds. Roof curb shall be internally reinforced with angles 600 mm on center and factory installed wood nailer. Internally insulated with 38 mm thick 0.53 kN/m³ (3 pcf) density rigid insulation. Heights to be as detailed to suit installed roof thickness. Top of all roof curbs shall be level, with pitch built into curb when deck slopes.

2.20 ROOF ACCESSORIES

- .1 Deck closure, for openings up to 300 mm maximum: 0.79 mm (22 ga.) galvanized steel. Size to suit opening.
- .2 Deck closure, for openings up to 600 mm maximum: 3.2 mm steel plate. Size to suit opening.
- .3 Deck closure, for openings up to 800 mm maximum: 6.4 mm steel. Size to suit plate opening.
- .4 Miscellaneous clamps: For extending gas piping services to CAN/CGA-8.1-M86.
- .5 Bituminous metal paint: To isolate metal from concrete and masonry surfaces, to CAN/CGSB-1.108-M89 Type II.
 - .1 Standard of acceptance:
 - .1 810-07 by Henry Inc.
 - .2 Or accepted alternate.

Part 3 Execution

3.1 QUALITY OF WORK

- .1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual.
- .2 Do priming in accordance with manufacturer's written recommendations.
- .3 Fit the interface of all walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.
- .4 Make assembly, component and material connections in consideration of appropriate design loads, with reversible mechanical attachments.
- .5 In the event that any product contains a manufacturing defect or anomaly, the Contractor shall notify the Consultant and manufacturer immediately and request direction.

3.2 REMOVAL OF EXISTING ROOFING

- .1 Remove all roofing, flashing and insulation materials down to deck. Leave existing blocking and parapet construction in place where indicated. Where a built-up air/vapour barrier is present, remove this from the deck unless agreement is otherwise obtained from the Consultant to leave in place.
- .2 Remove existing rooftop equipment where indicated.

3.3 EXAMINATION OF ROOF DECKS

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

3.4 MECHANICAL EQUIPMENT DISCONNECTION / MODIFICATION / RECONNECTION

- .1 Perform disconnection, extension, modification, and reconnection of mechanical equipment in accordance with drawings provided. Work shall be performed by a licensed trade sub-contractor. Obtain approval from Consultant prior to making adjustments not scheduled.
- .2 In general, Contractor is responsible for disconnection extension, modification, and reconnection of all operating HVAC equipment in work area. Owner is responsible for disconnection (at interior) of those mechanical items indicated for removal by Contractor.
- .3 All mechanical equipment must be properly tagged out of service (especially where gas is present). ESA certificates are required for all mechanical and electrical reconnections.

3.5 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover walls, walks and adjacent work where materials hoisted or used.

- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Protect roof from traffic and damage. Comply with precautions deemed necessary by Consultant.
- .4 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.
- .5 Metal connectors and decking will be treated with rust proofing or galvanization.
- .6 Fit the interface of the walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.

3.6 PRIMING

- .1 Unless otherwise indicated or directed by Consultant, prime all surfaces which will be in direct contact with bituminous materials at the rate of 0.15 L/m² to manufacturer's recommendations. For self-adhering membrane, install primer at a rate recommended by manufacturer. Ensure that surfaces are tack-free before proceeding.
- .2 Limit quantity of primer at deck openings and points of termination and provide supplemental protection to prevent bleedthrough to the building interior.
- .3 Roll primer into surface.
- .4 Re-prime all surfaces, including pre-primed surfaces, that become contaminated with dust or become marred due to their exposure to roof traffic or weather.

3.7 INSTALLATION OF GYPSUM BOARD SHEATHING

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Install boards as detailed and specified with primed or top side up.
- .3 Over steel deck, place with long axis of each sheet transverse to steel deck ribs with end joints staggered and fully supported on ribs.
- .4 Cut sheets as required to suit site conditions.
- .5 Butt joints tightly. Use maximum size pieces where possible to reduce joints.

3.8 MECHANICAL FASTENERS FOR SHEATHING (STEEL DECK)

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 In compliance with specified requirements, use mechanical fasteners to secure boards in place.

- .3 Inspect the underside of the deck to ensure fasteners will not be visible, damage the structure or interior surfaces, affect electrical and mechanical services. Fasteners to penetrate top flute of the deck maximum 20 mm.
- .4 Advise Consultant of any unusual circumstances affecting the work. Be responsible and correct all damage caused by work to match existing materials and finish.
- .5 Secure to top flute of steel deck with screws spaced in pattern specified. Use screw-type anti-backout corrosion resistant fasteners with 75 mm metal plates as generally approved or required by the fastener manufacturer.
- .6 Prime metal plates that will be covered with bitumen roofing. Ensure primer is tack-free before proceeding.

3.9 AIR SEALS

- .1 Install 0.56 mm (26 ga.) galvanized or 0.51 mm (26 ga.) pre-finished metal air seal where indicated. Mechanically secure metal to deck and extend as required to allow a minimum 100 mm tie-in with air/vapour barrier membrane. Lap and seal air/vapour barrier membrane onto air-seal.

3.10 TORCH-APPLIED AIR/VAPOUR BARRIER ON SHEATHING OR CONCRETE DECK

- .1 Ensure all surfaces to be covered with self-adhering membrane are complete and free of moisture and contaminants and surfaces are above 5°C (40°F). At temperatures below 5°C (40°F) heat materials to be covered with hot air gun. Store all materials in heated storage when temperatures fall below 5°C (40°F) and remove only as much material that can be used before cooling.
- .2 Prime all vertical surfaces to be covered with torch-applied membrane, and horizontal surfaces as required. Use roller application – no spray application permitted. Let primer tack dry and complete thumb test to test set-up.
- .3 Use fireguard tape or overlay board to protect all open joints in substrate and all combustible surfaces.
- .4 Working up slope from drain, install air/vapour barrier membrane using torch methods, true to line to completely cover the area intended to be protected to points shown on the drawing.
- .5 Membrane is to be installed without air blisters and wrinkles. Rework, repair or replace all poorly installed membrane. Do not stretch material that would result in pullback and deformity of the membrane at intersections.
- .6 Lap all side laps 75 mm and end laps 150 mm. Torch all seams to achieve bleedout. At nailable surfaces, secure all membrane on vertical surface at points of termination at 150 mm c/c, using large head roofing nails.

- .7 Turn up membrane 150 mm at edge where horizontal surface meets vertical planes. Lap onto existing surfaces as required to provide continuity of air/vapour barrier at terminations. Use fireguard tape or overlay board to protect all open joints in deck and all combustible surfaces
- .8 Seal all points of termination at horizontal planes and vertical surfaces with modified sealant. Tool sealant to consistent smooth and even surface.
- .9 Seal all perimeters and penetrations, and ensure drains are operational and prevent backflow, if air/vapour barrier is to be left exposed as an overnight temporary waterproofing.

3.11 INSULATION – ALL LAYERS – ADHESIVE ADHERED

- .1 Attach insulation as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Install base insulation layer over air/vapour barrier to specified design intent and thickness. Secure insulation laid with adhesive, in pattern as per adhesive manufacturer's directions and as indicated. Apply boards before adhesive cures, skims over or loses adhesive qualities.
- .3 For subsequent layers of insulation, secure insulation laid with adhesive, in pattern as per adhesive manufacturer's recommendations and as indicated.
- .4 Stagger all joints of insulation a minimum 300 mm.
- .5 Stagger both end and side joints between insulation layers.
- .6 Butt sheets of insulation with moderate contact. Do not force insulation into place. Cut neatly at projections and points of termination. Replace all broken, damaged or misfit boards as work progresses.
- .7 Where necessary, back-cut insulation to allow it to conform and stay bonded to irregular surfaces without bridging. Subsequent to placement, walk insulation into place to ensure positive bonding is achieved.

3.12 TAPERED INSULATION

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 At all locations of sloped insulation provide shop drawings from sloped insulation manufacturer for Consultant's review prior to installation.
- .3 At all new and existing drain locations, provide sloped polyisocyanurate insulation sump around drain to promote positive drainage. Total sump size to be as shown on drawings, with maximum depression of 25 mm, unless otherwise indicated.
- .4 Installation methods for sloped insulation to be same as for upper layers of base insulation, using adhesive as specified.

- .5 At the low termination of sloped insulation, when applying overlay board, Contractor shall increase adhesive application by adding 4 additional ribbons at 100 mm spacing at the 13 mm elevation change from tapered to flat insulation, to compensate for the 13 mm elevation change of tapered insulation.

3.13 OVERLAY BOARD

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Adhere overlay board to insulation with adhesive at the rate and pattern specified, as for insulation.
- .3 Place boards in parallel rows with end joints staggered. Tape joints in overlay board with fireguard membrane where combustible surfaces are directly below.
- .4 Where overlay board is specified on nailable vertical surfaces, secure overlay board using large-head roofing nails at 200 mm centres each direction and tape all joints with fireguard tape.

3.14 MODIFIED BITUMINOUS MEMBRANE - GENERAL APPLICATION

- .1 Inspect and seal all substrates to eliminate fire hazard. Use fireguard tape as required or recommended by manufacturer.
- .2 Mechanical spreaders are not permitted to install modified membranes.
- .3 Use only bitumen, sealants, adhesive or mastics as specified by membrane manufacturer. Provide written approval from manufacturer when proposing any alternatives or substitutions.
- .4 Lay out all sheets as to allow them to relax a minimum of 30 minutes. When temperatures are below 4.4°C keep and lay out rolls in heated storage. Install rolls before temperature fallback of the sheet occurs.
- .5 Roof membrane to be installed in one sheet if possible.
- .6 Lay all membrane starting at low point to ensure that seams do not face water flow. Roll all membrane into place, true to line, free of buckles, air pockets, fishmouths and tears.
- .7 Overlap all end laps minimum 150 mm and side laps 75 mm.
- .8 Offset all side laps between plies by 50%.
- .9 Offset all end laps between plies minimum 1200 mm.
- .10 At valley locations, run membrane continuously with the slope of the main roof. Lay out all sheets to ensure minimum side laps are maintained through valley area and short section of roof beyond. At these locations the side laps for the main roof will increase. Install membrane to details and Consultant's direction onsite.

- .11 Ensure that a watertight seal is achieved at all overlaps and points of termination.
- .12 Carry base sheet flashing over face of building as shown on the drawings.
- .13 Carry membrane up all vertical surfaces to point shown. Cut off corners at 45° at end laps to be covered by the next roll prior to installation of following sheet.
- .14 Verify procedure with Consultant on site. Seal fasteners through membrane immediately with Type 'A' sealant.
- .15 Do not walk on membrane during applications and until sufficient cooling has taken place as to allow for traffic without doing damage or marking surface.

3.15 BASE SHEET (TORCH APPLICATION)

- .1 Install 1-ply base sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to torching.
- .2 Fully torch in place base sheet membrane using proper application techniques as specified by membrane manufacturer.
- .3 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify Consultant and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced.
- .4 Ensure that a watertight seal of all membrane joints and points of termination is achieved with a torch and trowel.
- .5 Terminate base sheet up all verticals 50 mm, secure on vertical with membrane fastening bar and fasteners @ 150 mm c/c.
- .6 Review base membrane for low areas (ponding) and correct with additional base sheet membrane.

3.16 BASE SHEET FLASHINGS (SELF-ADHERED APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install gusset reinforcement pieces at all corner locations.
- .3 Ensure wall or eave surfaces are clean and dry, free of contaminants or other irregularities. Re-prime as necessary.
- .4 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Base sheet flashings to extend 100 mm onto roof surface and terminate as shown in drawings.

- .5 Place sheet into primer or adhesive and press into place using hand roller to ensure uniform adhesion. Use hot air welder on all seams and joints to ensure a waterproof seal on all points of termination. Apply flashings free of air pockets, voids, wrinkles or fishmouths.

3.17 CAP SHEET (TORCH APPLICATION)

- .1 Prior to installation, unroll the cap sheet and check for granular embedment width and alignment.
- .2 Layout membrane to ensure side lap of cap sheet does not occur within 150 mm of roof drain.
- .3 Install specified cap sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to torching. Offset cap sheet side laps 50% to base sheet side laps, ensure lap does not lie within 150 mm of a roof drain.
- .4 Install 1-ply cap sheet membrane full torched in place using proper application techniques as specified by the membrane manufacturer.
- .5 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membranes slowly into fluid bitumen ensuring consistent 3 mm to 6 mm flow protrudes each side of the roll.
- .6 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify Consultant and obtain his approval for proposed repair methods. Questionable areas will require to be cut out and replaced
- .7 Using a torch and trowel, embed granules at end laps and where required on surface of cap sheet to ensure proper bonding of membrane overlaps.

3.18 CAP SHEET FLASHINGS (TORCH APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install base sheet gusset reinforcement at all corner locations.
- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Cap sheet flashings to extend 150 mm onto roof surface and terminate as shown in drawings. At wall locations, unless otherwise specified, cap sheet flashings to extend up 50 mm higher than base sheet flashings.
- .4 Where required by Summary of Work and details, install 50 mm wide continuous strip of Type 'A' sealant to the tops of parapets or eaves to prevent bitumen spillage on the building exterior.

- .5 Install membrane by softening both contact surfaces simultaneously with recommended torching equipment. During application, unroll membrane slowly into fluid bitumen ensuring consistent 6 mm flow protrudes each side of the roll.
- .6 Unroll and work sheet into place using torch, trowel and wet sponge to ensure proper placement and adhesion.
- .7 Install membrane true to line and free of wrinkles, air pockets, voids, excessive bitumen flow or other irregularities. Ensure the membrane is not overheated at any location. Should any of these conditions occur, immediately stop membrane application and correct the deficiency before proceeding. Notify Consultant and obtain his approval for proposed repair methods. *Questionable* areas will require to be cut out and replaced.
- .8 Touch up bare spots, corners, scuffs and bleedout runs on cap sheet with granules matching membrane colour, immediately following installation. Use hot air welder, torch or Type 'A' sealant to adhere granules to sheet.

3.19 DRIP FLASHINGS

- .1 Follow manufacturer's recommendations as to whether pre-finished flashings built into the roof are to be primed. When primer is required, prime top and underside of all drip flashings to be incorporated with roofing prior to application. Primer must be compatible with both membrane and finishes on pre-finished flashing material. Use primer supplied by the membrane manufacturer. All primer to be dry before proceeding.
- .2 Fabricate and install metal drip flashings built into the roof at locations noted on the drawings as per detail and Section 07 62 00 - Sheet Metal Flashing and Trim. Join flashing with S-lock on face and overlap horizontal joints 50 mm. Mitre and seal inside and outside corners of roof flanges. Seal all overlaps, apply sealant Type 'B' as metal flashing is being installed and clean off any material exposed to view. Avoid contact between caulking and bitumen products.
- .3 Install drip flashing true to line set on top of completed base sheet membrane roofing in continuous strip of Type 'A' sealant. Secure flashings with roofing nails installed in a double staggered row at 100 mm centres. Locate nails no closer than 75 mm from face.
- .4 Install an additional piece of base sheet (minimum 150 mm X 150 mm) centered over joints and corners of drip flashing and carried to within 25 mm of edge. Review procedures with the Consultant before proceeding.
- .5 Install 1-ply of base to 25 mm from drip edge and continuing a minimum of 150 mm beyond flashing flange. Ensure positive bond to all metal as to provide a continuous permanent watertight seal.
- .6 Install cap sheet as specified and trim flush with outside face with hot roofing knife. Work underlying surfaces with broom, roller or wet sponge as required to obtain a positive continuous permanent watertight seal.

3.20 EXPANSION JOINT MEMBRANE

- .1 Install components of the system in accordance with the manufacturer's instructions. The system is to be wholly encapsulated between the plies of the modified bituminous membrane in a roofing/waterproofing by torching. The joint can be protected by means of an overlap membrane torched to one side of the joint, as per manufacturer's instructions.
- .2 Slit the modified bituminous base ply with a knife along the joint gap. Refer to the manufacturer's instructions for the preparations and torching of the expansion joint membrane. Torch the prepared expansion joint membrane to the substrate, making sure that the expansion joint membrane is firmly and uniformly set without voids. Torching is carried out by the liquefaction of the modified bituminous base sheet and the expansion joint membrane rolled into it. Flame can be directed at the expansion joint membrane material. At all times, observe the modified bituminous membrane manufacturer's recommendations and safety instructions. The expansion joint membrane must be completely encapsulated in the hot bitumen and a bitumen bead visible along the expansion joint membrane salvage edge.
- .3 Torch the modified bituminous membrane stripping plies until smooth and free of air pockets, wrinkles, fishmouths or tears. When torching, direct the flame away from the expansion joint membrane gland material. Use the torch and flop technique.
- .4 Install each stripping ply in shingle lap fashion onto the expansion joint membrane, firmly and uniformly, without voids. At all times, observe the modified bituminous membrane manufacturer's recommendations. The expansion joint membrane must be completely encapsulated in the melted bitumen and a bitumen bead visible along the expansion joint membrane salvage edge.

3.21 ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage for plumbing work.
- .2 Install self-adhered membrane air seal around drain and extend onto air/vapour barrier minimum 150 mm.
- .3 Unless otherwise specified or shown, provide prefabricated sump of sloped polyisocyanurate insulation 1200 mm each side of the centre of the drain. Reduce polyisocyanurate insulation thickness to minimum 19 mm at drain to provide positive roof drainage (make allowance for thickness of all flanges and clamps) and ensure water flow will not be impeded.
- .4 Complete roof membrane, installing additional 1 m x 1 m base sheet flashing centred over drain opening.
- .5 Fully coat drain flange to receive roofing with modified sealant and continue modified bitumen over flange. Neatly trim and work membrane to interior face and seal with Type 'A' sealant.

- .6 Set clamping ring in solid bed of Type 'A' sealant. Secure clamp ring and integral screen as dictated by drain design immediately after membrane is installed. Tighten bolts to ensure a permanent watertight compression seal.
- .7 Install and bolt strainers with heavy iron mechanical bracket to ensure the drain screen remains permanently in place to the Consultant's approval.
- .8 Install test plug, water test roof and repair leaks. Remove test plug once complete.
- .9 Restore interior finishes affected by work of this Contract to match original materials and finishes to Consultant's approval. Insulate rainwater leader pipes as required by Summary of Work in accordance with Section 22 05 11 – Plumbing and Drainage.

3.22 PLUMBING VENTS, B-VENTS, STACKS AND SLEEVES

- .1 Inspect and clean soil pipes of debris to ensure they are operational.
- .2 Protect exposed surface during roofing operation and clean surfaces free of bitumen before leaving site.
- .3 Make all penetrations air and watertight at air/vapour barrier by installing self-adhesive membrane flashings 150 mm onto air/vapour barrier and carry up and around projection. Clamp in place and caulk.
- .4 Trim base sheet at roof projections.
- .5 Adjust existing pipes to new flashing heights by either cutting down or extending pipes with matching materials attached with mechanical couplers. Ensure pipes are 38 mm higher than flashing to allow for sealing to prevent condensation.
- .6 Clear all projections free of contaminants and seal junction of base sheet and roof projections with trowel applications of sealant as shown on drawings.
- .7 Install all metal flanges to be built into the membrane before the installation of cap sheet. Insulate sleeves in accordance with drawings as specified. Where required, install telescoping caps to detail.
- .8 Prime topside and underside of all flanges to be incorporated with roofing prior to application. Use primer supplied by the membrane manufacturer. All primer to be dry before installation of membrane roofing or flashing.
- .9 Before installing flashings, install 1-ply base sheet extending to opening. Set flanges in bed of Type 'A' sealant prior to membrane installation, as per manufacturer's recommendations.
- .10 Install 1-ply of base sheet flashings thermofused to the flange to within 25 mm from upturn and continuing a minimum of 225 mm beyond flange. Continue cap sheet to metal upturn. Seal around upturn junction with sealant and touch up with matching granules, as per manufacturer's recommendations.

- .11 Install rain collars over sleeves and stacks as indicated to match adjoining materials and seal with sealant as indicated on drawings.

3.23 LIQUID MEMBRANE FLASHING

- .1 Using a slow-speed mechanical agitator, thoroughly mix the entire container of resin for two minutes before the addition of catalyst. Pour the resin into a second container if you make a batch mix. Add pre-measured catalyst to the resin component according to the amounts indicated in manufacturer's Catalyst Mixing Chart. Add catalyst only to the amount of material that can be used within 10 to 15 minutes. Stir again for two minutes before applying.
- .2 Apply the first resin layer to the substrate using rollers, brushes or notched squeegees provided for this purpose. The thickness of the first layer must be 1.3 mm to 1.5 mm when wet.
- .3 Lay out the polyester reinforcement on the resin to prevent the formation of wrinkles, swellings or fishmouths.
- .4 Use rollers, brushes or notched squeegees in order to fully saturate resin reinforcement and remove wrinkles and air bubbles under the reinforcement. The appearance of the reinforcement should be slightly opaque without any white trace. It is important to correct these defaults before the resin cures.
- .5 Apply the second resin layer on top of the reinforcement using rollers, brushes or notched squeegees provided for this purpose. The second layer thickness must be 0.6 mm to 0.7 mm when wet.
- .6 Excess resin which is not absorbed should be used to saturate adjacent reinforcement.
- .7 The final resin coating should be smooth and even.

3.24 CONCRETE PAVERS

- .1 Install concrete pavers at the top and bottom of all roof access ladders located within the area of work and at roof access doorways.
- .2 Set pavers on 50 mm XPS insulation, in turn on walkway membrane cap sheet.

3.25 CLEAN UP

- .1 At all times, keep the premises free from accumulation of waste materials or rubbish. Stock piling of debris on the roof will not be permitted.
- .2 Repair defects in surface and bitumen runs with granules to match existing to leave the roof in an even consistent finish.
- .3 Leave roof clear of debris and bitumen left by spills and machine tracking.
- .4 Leave grounds and building free of debris and bitumen spread by pedestrian traffic where applicable.

- .5 Clean surfaces and penetrations of all contaminants and touch up to the satisfaction of the Owner. Include rooftop equipment, curbs, soil stacks, sleeves, gas lines, vents, drains and ladders.
- .6 Check drains to ensure they are functional and where required remove all debris by vacuum.
- .7 At the completion of the work remove all rubbish, tools, equipment and surplus materials.
- .8 Be responsible to repair and pay all costs and fees required to rectify damage caused by work of the Contract with materials and finish to match original.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 Roofing Contractor to provide an original, complete insurance policy identifying specific coverage for roof application.

1.2 RELATED SECTIONS

- .1 Section 02 41 13 – Selective Site Demolition.
- .2 Section 06 10 53 – Miscellaneous Rough Carpentry.
- .3 Section 07 52 00 – Modified Bituminous Membrane Roofing
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .5 Section 07 92 00 – Joint Sealants.
- .6 Section 22 05 11 – Plumbing and Drainage.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA A123.22-08(r2013), Self-Adhering Polymer Modified Bituminous Membrane Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .2 CSA A123.23-15 - Product specification for polymer-modified bitumen sheet, prefabricated and reinforced.
 - .3 CSA A231.1-14/A231.2-14, Precast Concrete Paving Slabs / Precast Concrete Pavers.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint.
 - .2 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement.
 - .3 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .3 Factory Mutual (FM Global)
 - .1 FM 4450, Approval Standard for Class 1 Insulated Steel Roof Decks.
- .4 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S107-10, Standard Methods of Fire Tests of Roof Coverings.
 - .2 CAN/ULC-S126-06, Standard Method for Test for Fire Spread Under Roof Deck Assemblies.
 - .3 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .4 CAN/ULC-S702.2-03, Standard for Mineral Fibre Thermal Insulation for Buildings.

- .5 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .6 CAN/ULC-S705.1-01, Standard for Thermal Insulation – Spray-Applied Rigid Polyurethane Foam, Medium Density.
- .7 CAN/ULC-S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning roofing Work, with roofing contractor's representative and Consultant to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 COORDINATION

- .1 Coordinate work of this Section with related work specified in other Sections to ensure construction schedule is maintained and water tightness and protection of the building and finished work is maintained at all times.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 System summary:
 - .1 Provide a one-page synopsis of each roof type that lists the assembly components in order from top to bottom.
- .2 Product Data:
 - .1 Provide two copies or an electronic copy of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations for all products to be incorporated in the new system.
 - .2 Provide two copies or an electronic copy of WHMIS 2015 Safety Data Sheets to Consultant for:
 - .1 Primers.
 - .2 Sealers.
 - .3 Liquid membrane.
 - .4 Adhesives.
- .3 Provide shop drawings:
 - .1 Indicate sloped insulation layout and details.
 - .2 Provide shop drawing or submittal indicating adhesive pattern specified by adhesive manufacturer for the required wind uplift pressures indicated on the Drawings.

1.7 QUALITY ASSURANCE

- .1 Installer qualifications: Company or person specializing in application of modified bituminous roofing systems with 5 years documented experience, approved by manufacturer. Installer to be members of Ontario Industrial Roofing Contractors Association (OIRCA) and/or Canadian Roofing Contractors' Association (CRCA) in good standing.
- .2 Hold a pre-installation meeting prior to the start of roofing works, with the roofing contractor's representative and the Consultant, to review installation conditions particular to this project.

1.8 FIELD QUALITY CONTROL

- .1 Adhesion Testing:
 - .1 If requested by the Consultant, at each roof drainage area, following installation of membrane base sheet, carry out adhesion tests to confirm adhesion of membrane to substrate and substrate layers to each other, down to first mechanically attached layer.
 - .2 Locations and timing of tests will be directed by Consultant. Provide labour and materials as required to assist Consultant in conducting tests.
 - .3 If inadequate adhesion is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the Consultant. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
 - .4 General Contractor is to assume all costs of testing and correction.
- .2 Sample Testing:
 - .1 If requested by the Consultant, at each roof drainage area, following installation of membrane base sheet, carry out sample tests to confirm materials and installation of roof assembly components. Sample size to be 300 mm x 300 mm.
 - .2 Locations and timing of tests will be directed by Consultant.
 - .3 If inadequate construction is found, conduct further testing to determine the extent of the inadequate adhesion. Replace all defective areas to the satisfaction of the Consultant. Replace substrate materials as necessary with new materials, and patch cut tests with membrane patches extending at least 150 mm beyond the cut.
 - .4 General Contractor is to assume all costs of testing and correction.

1.9 FIRE PROTECTION

- .1 Fire Extinguishers:
 - .1 Pressure rechargeable type with hose and shut-off nozzle,
 - .2 ULC labeled for ABC class protection.
 - .3 ULC labeled for A class protection, for wood, paper and fibreboard.
 - .4 Size 14 kg.

- .5 Have one fully charged ABC extinguisher and one fully charged Type A extinguisher on roof per applicator, within 3 m of the propane source.
- .2 No torching to be executed onsite.

1.10 GENERAL REQUIREMENTS

- .1 Comply with the General Requirements, General Instructions and Supplementary Conditions.
- .2 Execute work in accordance with this Section and other related Sections, Drawings and Details.
- .3 Attach roofing to structure to meet requirements of insurance underwriter and authorities having jurisdiction.
- .4 Regard manufacturer's printed recommendations as minimum requirement for materials, methods and workmanship not otherwise specified.
- .5 Contact the Consultant if the specifications conflict with the manufacturer's recommendations. Otherwise it will be assumed that the Roofing Contractor and manufacturer are in agreement with procedures outlined.
- .6 Advise the Consultant of adjustments to specified roofing procedures caused by weather and site conditions. Make adjustment to specified procedures only after review with the Consultant.
- .7 Maintain equipment in good working order to ensure control of roofing operations and protection of work. Types of roofing equipment and laying techniques to be employed are to meet the approval of the Consultant.
- .8 Do not penetrate roof deck with any fastening devices that would do damage or impair the function of the assembly.
- .9 All temporary drains shall be connected with a mechanical connection (MJ coupling) or a U-flow connection, until new drains are installed.
- .10 Modified bitumen flashings to be adhered with asphalt or cold adhesive. Weld seams using hot air welder and heated trowel.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage, and disposal of, sealing compounds, primers and caulking materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.

- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.
- .5 Ensure that shelf life of materials has not expired.
- .6 Remove damaged material from site and replace all rejected materials with new product.
- .7 Elevate on raised platform and store as to prevent deformation of materials.
- .8 Provide and maintain dry, off-ground weatherproof storage.
- .9 Store rolls of membrane in upright position. Store membrane rolls with selvage edge up.
- .10 Remove only in quantities required for same day use.
- .11 Place plywood runways over completed Work and over areas not in Contract, as required, to enable movement of material and other traffic.
- .12 Store sealants at +5°C minimum.
- .13 Protect insulation by slitting manufacturer's packaging and installing a waterproof UV-resistant tarp.
- .14 Handle roofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.
- .15 Avoid stockpiling of materials or use of equipment on decks in a way which could cause overloading.

1.12 ENVIRONMENTAL REQUIREMENTS

- .1 Ensure protection of products that are sensitive to damage by moisture. Do not work during rain, snow or fog. Stop work and make watertight before the onset of inclement weather or when weather appears imminent.
- .2 Ensure protection of the building from weather at all times. If inclement weather is forecast or appears imminent, postpone work that would risk the building from moisture damage.
- .3 If it becomes apparent that work would threaten the building watertightness, the Owner has the right to stop work. Any additional expenses due to work stoppage or postponement of work will be at the General Contractor's expense.
- .4 Ambient Conditions
 - .1 Minimum ambient temperature for solvent-based adhesive is -5°C.
- .5 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.13 COMPATIBILITY

- .1 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a complete assembly. Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.
- .2 Defective work resulting from work with incompatible materials will be considered the responsibility of the Roofing Contractor.
- .3 Repair all work that could result in damage or interfere with performance.

1.14 EXISTING SUBSTRATES

- .1 Following removal of existing material to the proposed substrate, inspect the system/deck for soundness and notify the Consultant of any areas are found to be unsound and not suitable for roofing. Do not commence work until conditions are documented and the Consultant rules on the acceptability of surfaces and/or corrective measures required. The cost of any delays due to postponement of work that results from investigating the site problem or obtaining a ruling will be at the Owner's expense.
- .2 The commencement of work is proof that the General Contractor has accepted surfaces as satisfactory and accepts responsibility for appearance and performance of completed work.
- .3 Defective work resulting from application of material on unsatisfactory surfaces will be considered the responsibility of the General Contractor.
- .4 The General Contractor will be responsible for all repairs, costs and pay all cost and fees required to rectify damage or defective work. Use materials and finish to match the original preconstruction conditions.

1.15 DAILY OPERATIONS

- .1 Unless otherwise specified, complete the entire roofing operation up to line of termination of each day's work, as required by design intent, in order to safeguard and protect the work and building from damage and weather.

1.16 EXAMINATION

- .1 Before proceeding with roofing application, ensure that:
 - .1 All surfaces are clean and free of debris, snow, frost and moisture.
 - .2 The deck is clean and sufficiently dry to ensure specified adhesion will be obtained.
 - .3 Adjacent construction and installation of related work (i.e. curbs, drains, penetrations, wood nailers, etc.) incorporated with the roof are complete.
 - .4 Roof deck is sound, existing fasteners are tight and irregularities are corrected to provide a suitable surface for new roofing.

- .2 Ensure substrate is smooth. Remove sharp edges or protrusions that could impair the function of the roof assembly.
- .3 Inform Owner/Consultant in writing of any defects.

1.17 DRAINS AND DRAINAGE PLANE

- .1 Inspect surfaces and ensure that roof deck is level or sloped to drains/scuppers in conforming to design intent.
- .2 Inspect surfaces and ensure that roof drains are set at a level to drain and are connected or capped.
- .3 Take spot levels to verify that pools of water in excess of 13 mm depth will not form.
- .4 Tabulate levels and submit to Consultant.
- .5 Ensure plumbing is accessible and work can be completed as specified.
- .6 Inspect roof drains to ensure they are open and working properly.
- .7 Where specified or shown for areas with only one drain, provide overflow scuppers or drains to detail and specified requirements.

1.18 EXAMINE UNDERSIDE OF DECK

- .1 Inspect the underside of deck to ensure fasteners will not damage the structure, affect interior surfaces or electrical and mechanical services.
- .2 For drain alterations and pipe hangers, coordinate with plumbing subtrade as per Section 22 05 11 – Plumbing and Drainage, prior to commencement of roofing operations.

1.19 HIDDEN SERVICES

- .1 Investigate the location of all known hidden services by reviewing interior conditions, plans, specifications and drawings for the original building, any subsequent alterations, completion of cut tests and interviewing those involved in the construction and maintenance of building services. These services include but are not limited to mechanical, electrical, cable, communication, computer, security or roof assembly. Ensure all services are located and will be protected from damage under the Contract. In some cases, services may be located over the roof deck and within the roof assembly. Notify Owner/Consultant in such occurrence and proceed with installation as directed.

1.20 EQUIPMENT

- .1 Inspect equipment affected by the work, including but not limited to rooftop equipment, curbs, existing drains and plumbing, mechanical, electrical and lightning protection services, to ensure they are in good repair and working order. Record any damage and advise the Consultant.

- .2 During re-roofing, ensure that all mechanical equipment, ducts, pipes, etc. are properly supported.
- .3 Notify Owner and/or Consultant of any equipment which is not operational or damaged prior to the commencement of work.

1.21 ADVISE CONSULTANT

- .1 Advise the Consultant of any unusual circumstances affecting the work. Notify the Consultant of any defective or malfunctioning equipment or drainage deficiencies. Do not commence work until defects and incorrect levels have been verified and rectified.

1.22 PROTECTION OF ROOFTOP EQUIPMENT

- .1 Remove any equipment and flashing intended for re-use and save from harm. Store in approved location and reset at project conclusion unless specified or shown to be removed.
- .2 Protect all openings, vents and stacks from weather and contamination from debris.
- .3 Provide temporary plumbers plugs to protect drains during roofing operations. Ensure that temporary protection is removed at completion of work period and/or at the end of each days work.

1.23 SERVICES

- .1 Services are to be left operational unless otherwise authorized by the Owner.
- .2 Unless otherwise specified, the General Contractor will be responsible for disconnection, relocation, re-installation and extending all services required to facilitate work under this Contract. Co-ordinate work with the Owner and provide minimum of 48 hours notification if services are to be interrupted.
- .3 General Contractor to verify location of services prior to commencement of work. Notify Owner/Consultant of any unusual conditions.
- .4 The Roofing Contractor and their employees must hold valid certificates for the work undertaken.
- .5 Complete work of this Section as required by local authorities having jurisdiction. Have work inspected and pay all fees relative to such inspection to ensure work meets with published standards and codes.
- .6 Submit Certificate or Letter of Approval by authority responsible for the work to the Owner and Consultant with final documentation.
- .7 All fans, air handling units, and any electrical equipment affected by the replacement of the roof sections under this Section, whether disconnected or extended must be inspected by an ESA representative to verify the integrity of the existing wiring and/or the new installation.

1.24 WARRANTY

- .1 Contractor's Warranty for Labour and Material:
 - .1 For Work of this Section 07 52 00 - Modified Bituminous Membrane Roofing, 12 months warranty period is extended to 24 months, executed by OIRCA standard form of warranty.
 - .2 Make all necessary repairs and replacements within 48 hours of receipt of written notification.
 - .3 Nothing contained in this Article shall be construed as in any way restricting or limiting the liability in common law and statutory liability of the Contractor.
 - .4 Provide these written warranties, confirming above, issued on the corporate letterhead, signed and sealed by an authorized signing officer. The warranties will specifically reference the name of the Building, location and Owner.
- .2 Manufacturer's Warranty:
 - .1 Provide a manufacturers 20-year no dollar limit system warranty.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.
- .2 The scope of work of this project includes for the installation of a cold-applied fully adhered roof assembly in compliance with CSA A123.21 based on required, engineered wind uplift limitations. The products specified herein are based on an acceptable assembly of roofing materials supplied by Soprema. Alternative roof assemblies will be considered consisting of materials from the following manufacturers based on their combined performance meeting or exceeding the performance of the specified materials.
 - .1 IKO.
 - .2 Johns Manville.

- .3 The tested roof system shall consist of the following components installed in order:

- .1 Existing metal or concrete deck.
- .2 Adhesive Type 1.
- .3 Roof Deck Sheathing.
- .4 Adhesive Type 2.
- .5 Air/Vapour Barrier Membrane.
- .6 Adhesive Type 1.
- .7 Thermal and tapered insulation as detailed.
- .8 Adhesive Type 1.
- .9 Base sheet composite panels.
- .10 Adhesive Type 2.
- .11 Cap sheet membrane.

2.2 ROOF DECK SHEATHING

- .1 Glass mat gypsum sheathing: Glass mat faced treated core gypsum roof board, for installation over steel deck to ASTM C1177/C1177M. Boards to be 1.2 m x 2.4 m, thickness as indicated, with pre-primed surface where indicated.
- .1 Acceptable material: DensDeck Prime Roof Board by GP Gypsum or Consultant approved alternative.
- .2 Canadian softwood plywood (CSP): To CSA 0151, Urea-formaldehyde free.

2.3 PRIMERS

- .1 Asphalt Primer: To manufacturer's recommendations.
- .2 Self-adhesive membrane primer. As recommended by membrane manufacturer. Use low VOC, polymer emulsion-based primer, unless directed otherwise by Consultant on site.

2.4 AIR/VAPOUR BARRIER MEMBRANE

- .1 Styrene-butadiene-styrene (SBS) modified bitumen sheet with non-woven polyester reinforcement.
- .1 Type A, B, or C.
 - .2 Grade 3.
 - .3 Thickness: 2.2 mm.
 - .4 Weight: 2.7 kg/m².
 - .5 Selvedge width: 75 mm.
 - .6 Top surface: Sanded.
 - .7 Bottom surface: Thermofusible film.
 - .8 Acceptable material: Elastophene SP 2.2 as manufactured by Soprema or Consultant approved alternative.

2.5 BASE SHEET COMPOSITE PANEL

- .1 Composite base sheet and support panel comprised of Styrene-butadiene-styrene (SBS) modified bitumen sheet with non-woven polyester reinforcement factory laminated on a high-density polyisocyanurate insulation support panel.
 - .1 Thickness: 2.2 mm membrane thickness and 12.7 mm insulation support panel thickness for a total combined thickness of 14.9 mm.
 - .2 Weight: 4.15 kg/m².
 - .3 Selvedge width: 90 mm.
 - .4 Top surface: sanded.
 - .5 Bottom surface: inorganic insulating facer.
 - .6 Acceptable material: 2-1 Soprasmart ISO HD as manufactured by Soprema or Consultant approved alternative.

2.6 BASE SHEET FLASHING

- .1 Styrene-butadiene-styrene (SBS) elastomeric polymer prefabricated sheet, polyester or composite polyester and glass reinforcement.
 - .1 Type B or Type C.
 - .2 Grade 2.
 - .3 Top surface: sanded.
 - .4 Bottom surface: sanded.

2.7 CAP MEMBRANE AND MEMBRANE FLASHINGS

- .1 Cap sheet membrane and cap sheet membrane flashings.
 - .1 High-performance cap sheet styrene-butadiene-styrene (SBS) with composite reinforcement membrane.
 - .2 Thickness: 3.5 mm.
 - .3 Weight: 4.6 kg/m²
 - .4 Selvedge Width: 100 mm
 - .5 Bottom surface: Sanded.
 - .6 Top surface: Coloured granules.
 - .7 Acceptable material: Colply Traffic Cap as manufactured by Soprema or Consultant approved alternative.
- .2 For below 0°C applications, use cold weather grade applications, all membranes are to be as approved and rated by the manufacturer to suit the application conditions and to ensure compatibility with the specified roof system.

2.8 MEMBRANE ADHESIVE

- .1 Adhesive Type 1: low-rise, two component, polyurethane adhesive, fully compatible with all materials in the roofing assembly. Applicability of use to adhere the different materials in the roofing assembly to be included in the manufacturer's literature.

- .1 Acceptable material: Duotack as manufactured by Soprema or Consultant approved alternative.
- .2 Adhesive Type 2: odourless polyether based adhesive, fully compatible with all materials in the roofing assembly. Applicability of use to adhere the different materials in the roofing assembly to be included in the manufacturer's literature.
- .1 Acceptable material: Colply EF as manufactured by Soprema or Consultant approved alternative.

2.9 EXPANSION JOINT MEMBRANE

- .1 Provide flat, vulcanized waterproofing joint integral with the waterproofing membrane to accommodate movements up to ± 50 mm capable of 500% elongation at -40°C across its length and at all vulcanized points.
- .2 All details and connections are factory fabricated by means of vulcanization.
- .3 Property and test method results:
 - .1 Hardness: Shore A, to ASTM D-2240: 55 ± 5 .
 - .2 Lap joint strength: To ASTM D-816, same as base material.
 - .3 Low temperature flex: To ASTM D-746, -57°C .
 - .4 Maximum torching temperature: 870°C .
 - .5 Ultimate elongation: To ASTM D-412, 700%.
 - .6 Tensile strength: To ASTM D-624 (min.), 8.00 N/mm.
 - .7 Puncture test – cone: To CGSB 37.56 M, 44.5 N min.
 - .8 Water absorption: To ASTM D-570 (min.), $<0.001\%$.
 - .9 UV exposure: To ASTM G-53, 5000 hours, no cracks or crazing.
 - .10 Chemical resistance to acids, alkalis, polar solvents, saline solutions: No effect.
- .4 Standard of acceptance:
 - .1 FlamLINE 40 by SITURA INC.,
 - .2 or approved equivalent.

2.10 LIQUID MEMBRANE

- .1 Two-component methacrylate or one component polyurethane/bitumen resin, solid content 80% or greater, compatible with roof membrane.
 - .1 Acceptable material: Alsan Flashing as manufactured by Soprema or Consultant approved alternative.
- .2 Reinforcement mesh: As recommended by liquid membrane manufacturer.

2.11 POLYISOCYANURATE INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S-126, CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450

requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Glass reinforced **inorganic facers** on both major surfaces of the core foam.

- .2 Organic faced insulation will not be accepted.

2.12 TAPERED INSULATION (INORGANIC)

- .1 Conforming to CAN/ULC S704, rigid foam board, Class 2 or 3, Type 3. Manufactured with HC blowing agent meeting requirements of CAN/ULC S-126, CAN/ULC S107 and CAN/ULC S770 for LTTR values. Approved and listed by Factory Mutual Global for 1-60 and 1-90 wind classification and FM 4450 requirements for Class 1 fire. Thickness as specified or shown with maximum board size 1200 mm x 1200 mm. Glass reinforced inorganic facers on both major surfaces of the core foam.
- .2 Insulation slopes shall be as indicated on the detailed drawings and roof plans. Modules shall be factory cut to correct slopes.
- .3 Tapered insulation must terminate at 0 thickness. Supply an additional nosing piece if required, factory fabricated of compatible, flame-resistant sloped rigid insulation material, to smoothly terminate sloped insulation at 0 thickness.
- .4 Organic faced insulation will not be accepted.

2.13 SEMI-RIGID MINERAL WOOL INSULATION

- .1 Semi-rigid mineral wool, rockwool, or slagwool boards, to CAN/ULC 702.2.

2.14 SPRAYED POLYURETHANE INSULATION

- .1 Thickness as shown or specified to CAN/ULC S705.1 Materials and CAN/ULC S705.2 Application.

2.15 SEALERS

- .1 Plastic cement: Asphalt, to CAN/CGSB-37.5.
- .2 For sealants, mastic, adhesives or caulk, refer to Section 07 92 00 – Joint Sealants.

2.16 CONCRETE PAVERS

- .1 Concrete pavers: To CSA A231.1, 600 x 600 x 50 mm thick of sizes indicated natural, air entrained precast concrete paving slabs having non-slip finish with 51 mm plain margin around perimeter.

2.17 MEMBRANE FASTENING BAR

- .1 Galvanized sheet steel or extruded aluminum, thickness 1 mm (20 ga.), 38 mm width, supplied in minimum 2.4 m lengths, with pre-drilled 2 mm holes, secured with #14 stainless steel screws @ 150 mm c/c.

2.18 FASTENERS

- .1 Fasteners for gypsum board to steel deck: No. 12 flat head, self-tapping, Type A or AB, cadmium plated screws. Use fastener plates (see below).
- .2 Fastener plates: FM Global approved 75 mm hexagonal metal plates, 75 mm hexagonal plastic lock plates.
 - .1 Standard of acceptance:
 - .1 Dekfast.
 - .2 Or accepted alternate.
- .3 Fasteners for exposed metal flashing and cladding to wood or steel: Minimum 38 mm #10 cadmium plated hex head screws, colour matched, with neoprene and steel washers.
- .4 Fasteners for sheet metal into steel: Self-drilling, self-tapping screws, galvanized, #8 or larger size, Tekes or equivalent, head to suit application.
- .5 Fasteners for sheet metal and wood to wood: Corrosion resistant #10 wood screws or nails to suit application.
- .6 Structural fasteners into wood: Lag screws, 12.7 mm diameter hot dipped galvanized steel, length 125 mm.

2.19 PLUMBING VENTS

- .1 2-piece spun aluminum with integral flange, diameter to suit existing pipe size, equipped with vandal proof cap.
 - .1 Acceptance material: SJ-31 Vandal Proof Stack Jack by Thaler or Consultant approved alternative.

2.20 ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage.

2.21 PREFABRICATED INSULATED ROOF CURB

- .1 Prefabricated roof curb to be manufactured of prime galvanized steel construction, 1.2 mm (18 ga.) steel thickness, meeting ASTM A653/653M, with welded corners and with seams joined by continuous water and airtight welds. Roof curb shall be internally reinforced with angles 600 mm on center and factory installed wood nailer. Internally insulated with 38 mm thick 0.53 kN/m³ (3 pcf) density rigid insulation. Heights to be as detailed to suit installed roof thickness. Top of all roof curbs shall be level, with pitch built into curb when deck slopes.

2.22 ROOF ACCESSORIES

- .1 Deck closure, for openings up to 300 mm maximum: 0.79 mm (22 ga.) galvanized steel. Size to suit opening.

- .2 Deck closure, for openings up to 600 mm maximum: 3.2 mm steel plate. Size to suit opening.
- .3 Deck closure, for openings up to 800 mm maximum: 6.4 mm steel. Size to suit plate opening.
- .4 Miscellaneous clamps: For extending gas piping services to CAN/CGA-8.1-M86.
- .5 Bituminous metal paint: To isolate metal from concrete and masonry surfaces to CAN/CGSB-1.108-M89 Type II.
- .1 Acceptance material: 810-07 by Henry Inc. or Consultant approved alternative.

Part 3 Execution

3.1 QUALITY OF WORK

- .1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual and CRCA Roofing Specification Manual.
- .2 Do priming in accordance with manufacturer's written recommendations.
- .3 Fit the interface of all walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.
- .4 Make assembly, component and material connections in consideration of appropriate design loads, with reversible mechanical attachments.
- .5 In the event that any product contains a manufacturing defect or anomaly, the General Contractor shall notify the Consultant and manufacturer immediately and request direction.

3.2 REMOVAL OF EXISTING ROOFING

- .1 Remove all roofing, flashing and insulation materials down to deck. Leave existing blocking and parapet construction in place where indicated. Where a built-up air/vapour barrier is present, remove this from the deck unless agreement is otherwise obtained from the Consultant to leave in place.
- .2 Remove existing rooftop equipment where indicated.

3.3 EXAMINATION OF ROOF DECKS

- .1 Verification of Conditions:
 - .1 Inspect with Consultant deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.
- .2 Evaluation and Assessment:
 - .1 Prior to beginning of work ensure:

- .1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
 - .2 Curbs have been built.
 - .3 Roof drains have been installed at proper elevations relative to finished roof surface.
 - .4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.
- .3 Do not install roofing materials during rain or snowfall or when such weather is imminent.

3.4 MECHANICAL EQUIPMENT DISCONNECTION / MODIFICATION / RECONNECTION

- .1 Perform disconnection, extension, modification, and reconnection of mechanical equipment in accordance with drawings provided. Work shall be performed by a licensed trade sub-contractor. Obtain approval from Consultant prior to making adjustments not scheduled.
- .2 In general, Contractor is responsible for disconnection extension, modification, and reconnection of all operating HVAC equipment in work area. Owner is responsible for disconnection (at interior) of those mechanical items indicated for removal by Contractor.
- .3 All mechanical equipment must be properly tagged out of service (especially where gas is present). ESA certificates are required for all mechanical and electrical reconnections.

3.5 PROTECTION OF IN-PLACE CONDITIONS

- .1 Cover walls, walks and adjacent work where materials hoisted or used.
- .2 Use warning signs and barriers. Maintain in good order until completion of Work.
- .3 Protect roof from traffic and damage. Comply with precautions deemed necessary by Consultant.
- .4 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.
- .5 Metal connectors and decking will be treated with rust proofing or galvanization.
- .6 Fit the interface of the walls and roof assemblies with durable rigid material sheet metal or plywood providing connection point for continuity of air barrier.

3.6 PRIMING

- .1 Unless otherwise indicated or directed by Consultant, prime all surfaces which will be in direct contact with bituminous materials at the rate of 0.15 L/m² to manufacturer's recommendations. For self-adhering membrane, install primer at

a rate recommended by manufacturer. Ensure that surfaces are tack-free before proceeding.

- .2 Limit quantity of primer at deck openings and points of termination and provide supplemental protection to prevent bleedthrough to the building interior.
- .3 Roll primer into surface.
- .4 Re-prime all surfaces, including pre-primed surfaces, that become contaminated with dust or become marred due to their exposure to roof traffic or weather.

3.7 INSTALLATION OF GYPSUM BOARD SHEATHING

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 Install boards as detailed and specified with primed or top side up.
- .3 Over steel deck, place with long axis of each sheet transverse to steel deck ribs with end joints staggered and fully supported on ribs.
- .4 Cut sheets as required to suit site conditions.
- .5 Butt joints tightly. Use maximum size pieces where possible to reduce joints.

3.8 MECHANICAL FASTENERS FOR SHEATHING (STEEL DECK)

- .1 Attach boards as per the OBC Wind Uplift Attachment detail illustrated on the drawings.
- .2 In compliance with specified requirements, use mechanical fasteners to secure boards in place.
- .3 Inspect the underside of the deck to ensure fasteners will not be visible, damage the structure or interior surfaces, affect electrical and mechanical services. Fasteners to penetrate top flute of the deck maximum 20 mm.
- .4 Advise Consultant of any unusual circumstances affecting the work. Be responsible and correct all damage caused by work to match existing materials and finish.
- .5 Secure to top flute of steel deck with screws spaced in pattern specified. Use screw-type anti-backout corrosion resistant fasteners with 75 mm metal plates as generally approved or required by the fastener manufacturer.
- .6 Prime metal plates that will be covered with bitumen roofing. Ensure primer is tack-free before proceeding.

3.9 SELF-ADHESIVE AIR/VAPOUR BARRIER ON SHEATHING OR CONCRETE DECK

- .1 Ensure all surfaces to be covered with self-adhering membrane are complete and free of moisture and contaminants, and are above 5°C (40°F). At temperatures below 5°C (40°F) heat materials to be covered with hot air gun. Store all materials in heated storage when temperatures fall below 5°C (40°F) and remove only as much material that can be used before cooling.
- .2 Prime all vertical surfaces to be covered with self-adhering membrane and horizontal surfaces, as required. Use roller application – no spray application permitted. Let primer tack dry and complete thumb test to test set-up.
- .3 Working up slope from drain, remove paper backing and install membrane true to line to completely cover the area intended to be protected to points shown on the drawing.
- .4 Ensure end laps and side laps are fully supported and roll or work material into place by hand to ensure a positive bond.
- .5 Membrane is to be installed without air blisters and wrinkles. Rework, repair or replace all poorly installed membrane. Do not stretch material that would result in pull back and deformity of the membrane at intersections.
- .6 Lap all side laps 75 mm and end laps 150 mm.
- .7 Turn up membrane at edge where horizontal surface meets vertical planes, as shown on Drawings. Lap onto existing surfaces as required to provide continuity of air/vapour barrier at terminations.
- .8 Seal all points of termination at horizontal planes and vertical surfaces with sealant Type 'A'. Tool sealant to consistent smooth and even surface.

3.10 INSULATION – ALL LAYERS – ADHESIVE ADHERED

- .1 Attach insulation as per the manufacturers recommended adhesive patters unless otherwise indicated.
- .2 Install base insulation layer over air/vapour barrier to specified design intent and thickness. Secure insulation laid with adhesive, in pattern as per adhesive manufacturer's directions and as indicated. Apply boards before adhesive cures, skims over or loses adhesive qualities.
- .3 For subsequent layers of insulation, secure insulation laid with adhesive, in pattern as per adhesive manufacturer's recommendations and as indicated.
- .4 Stagger all joints of insulation a minimum 300 mm.
- .5 Stagger both end and side joints between insulation layers.

- .6 Butt sheets of insulation with moderate contact. Do not force insulation into place. Cut neatly at projections and points of termination. Replace all broken, damaged or misfit boards as work progresses.
- .7 Where necessary, back-cut insulation to allow it to conform and stay bonded to irregular surfaces without bridging. Subsequent to placement, walk insulation into place to ensure positive bonding is achieved.

3.11 TAPERED INSULATION

- .1 Attach insulation as per the manufacturers recommended adhesive patterns unless otherwise indicated.
- .2 At all locations of sloped insulation provide shop drawings from sloped insulation manufacturer for Consultant's review prior to installation.
- .3 At all new and existing drain locations, provide sloped polyisocyanurate insulation sump around drain to promote positive drainage. Total sump size to be as shown on drawings, with maximum depression of 25 mm, unless otherwise indicated.
- .4 Installation methods for sloped insulation to be same as for upper layers of base insulation, using adhesive as specified.
- .5 At the low termination of sloped insulation, when applying overlay board, Roofing Contractor shall increase adhesive application by adding 4 additional ribbons at 100 mm spacing at the 13 mm elevation change from tapered to flat insulation, to compensate for the 13 mm elevation change of tapered insulation.

3.12 BASE SHEET COMPOSITE PANELS

- .1 Adhere base sheet composite panels as per the manufacturers recommended adhesive patterns and rate of application.
- .2 Place boards in parallel rows with end joints staggered.

3.13 MODIFIED BITUMINOUS MEMBRANE - GENERAL APPLICATION

- .1 Inspect and seal all substrates to eliminate exposure. Use fireguard tape as required or recommended by manufacturer.
- .2 Mechanical spreaders are not permitted to install modified membranes.
- .3 Use only bitumen, sealants, adhesive or mastics as specified by membrane manufacturer. Provide written approval from manufacturer when proposing any alternatives or substitutions.
- .4 Lay out all sheets as to allow them to relax a minimum of 30 minutes. When temperatures are below 4.4°C keep and lay out rolls in heated storage. Install rolls before temperature fallback of the sheet occurs.
- .5 Roof membrane to be installed in one sheet if possible.

- .6 Lay all membrane starting at low point to ensure that seams do not face water flow. Roll all membrane into place, true to line, free of buckles, air pockets, fishmouths and tears.
- .7 Overlap all end laps minimum 150 mm and side laps 75 mm.
- .8 Offset all side laps between plies by 50%.
- .9 Offset all end laps between plies minimum 1200 mm.
- .10 At valley locations, run membrane continuously with the slope of the main roof. Lay out all sheets to ensure minimum side laps are maintained through valley area and short section of roof beyond. At these locations the side laps for the main roof will increase. Install membrane to details and Consultant's direction onsite.
- .11 Ensure that a watertight seal is achieved at all overlaps and points of termination.
- .12 Carry base sheet flashing over face of building as shown on the drawings.
- .13 Carry membrane up all vertical surfaces to point shown. Cut off corners at 45° at end laps to be covered by the next roll prior to installation of following sheet.
- .14 Verify procedure with Consultant on site. Seal fasteners through membrane immediately with bitumen sealant.
- .15 Do not walk on membrane during applications and until sufficient curing has taken place as to allow for traffic without doing damage or marking surface.

3.14 MEMBRANE APPLICATION

- .1 In accordance with drawings and details, install new membrane and flashings system.
- .2 Install all membrane in strict accordance with manufacturer's latest printed instructions and application methods.

3.15 BASE SHEET FLASHINGS (COLD ADHESIVE APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install gusset reinforcement pieces at all corner locations.
- .3 Ensure wall or eave surfaces are clean and dry, free of contaminants or other irregularities. Re-prime as necessary.
- .4 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Base sheet flashings to extend 100 mm onto roof surface and terminate as shown in drawings.

- .5 Place sheet into adhesive and press into place using hand roller to ensure uniform adhesion. Seal seams and joints to ensure a waterproof seal on all points of termination in accordance with manufacturer's instructions. Apply flashings free of air pockets, voids, wrinkles or fishmouths.

3.16 CAP SHEET (COLD ADHESIVE APPLICATION)

- .1 Install specified cap sheet membrane running with the roof slope, starting at the low point. Layout roll in place to verify alignment and proper overlap and re-roll prior to mopping. Offset cap sheet side laps 50% to base sheet side laps, ensuring the lap does not lie within 150 mm of a roof drain.
- .2 Install cap sheet membrane into full application of specified adhesive using notched squeegee as per manufacturer's recommendations. Install adhesive at rate not less than 0.7 L/m² in continuous application including underlapping side and end laps.
- .3 Use broom or squeegee during membrane application to ensure complete bitumen embedment – free of wrinkles, air pockets or voids. Adhesive to flow continuously 7 mm beyond both sides of the roll. Immediately provide granules to cover adhesive flow at side and end laps.
- .4 Ensure that a watertight seal of all joints and points of termination is achieved.

3.17 CAP SHEET FLASHINGS (COLD ADHESIVE APPLICATION)

- .1 All flashings to be cut across the roll in 1 m sections. Cut off corners at end laps to be covered by next flashing piece.
- .2 Provide chalk lines and install all membrane true to line. Install base sheet gusset reinforcement pieces at all corner locations.
- .3 Commence flashings from the drain or low points and overlap all side laps minimum 75 mm. Cap sheet flashings to extend 150 mm onto roof surface and terminate as shown in drawings. At wall locations, unless otherwise specified, cap sheet flashings to extend up to 50 mm higher than base sheet flashings.
- .4 Place sheet in adhesive and press into place to ensure uniform adhesion and 13 mm bitumen flow each side of the roll. Apply flashings free of air pockets, voids, wrinkles or fishmouths.
- .5 Take care to avoid excessive adhesive spillage on finished roof surface. Use a hot air welder where required for touch-ups or detail work in corner locations or as necessary.

3.18 DRIP FLASHINGS

- .1 Follow manufacturer's recommendations as to whether pre-finished flashings built into the roof are to be primed. When primer is required, prime top and underside of all drip flashings to be incorporated with roofing prior to application. Primer must be compatible with both membrane and finishes on pre-finished

flashing material. Use primer supplied by the membrane manufacturer. All primer to be dry before proceeding.

- .2 Fabricate and install metal drip flashings built into the roof at locations noted on the drawings as per detail and Section 07 62 00 - Sheet Metal Flashing and Trim. Join flashing with S-lock on face and overlap horizontal joints 50 mm. Mitre and seal inside and outside corners of roof flanges. Seal all overlaps, apply sealant Type 'B' as metal flashing is being installed and clean off any material exposed to view. Avoid contact between caulking and bitumen products.
- .3 Install drip flashing true to line set on top of completed base sheet membrane roofing in continuous strip of Type 'A' sealant. Secure flashings with roofing nails installed in a double staggered row at 100 mm centres. Locate nails no closer than 75 mm from face.
- .4 Install an additional piece of base sheet (minimum 150 mm X 150 mm) centered over joints and corners of drip flashing and carried to within 25 mm of edge. Review procedures with the Consultant before proceeding.
- .5 Install 1-ply of base to 25 mm from drip edge and continuing a minimum of 150 mm beyond flashing flange. Ensure positive bond to all metal as to provide a continuous permanent watertight seal.
- .6 Install cap sheet as specified and trim flush with outside face with hot roofing knife. Work underlying surfaces with broom, roller or wet sponge as required to obtain a positive continuous permanent watertight seal.

3.19 EXPANSION JOINT MEMBRANE

- .1 Install components of the system in accordance with the manufacturer's instructions. The system is to be wholly encapsulated between the plies of the modified bituminous membrane in a roofing/waterproofing by torching. The joint can be protected by means of an overlap membrane torched to one side of the joint, as per manufacturer's instructions.
- .2 Slit the modified bituminous base ply with a knife along the joint gap. Refer to the manufacturer's instructions for the preparations and torching of the expansion joint membrane. Torch the prepared expansion joint membrane to the substrate, making sure that the expansion joint membrane is firmly and uniformly set without voids. Torching is carried out by the liquefaction of the modified bituminous base sheet and the expansion joint membrane rolled into it. Flame can be directed at the expansion joint membrane material. At all times, observe the modified bituminous membrane manufacturer's recommendations and safety instructions. The expansion joint membrane must be completely encapsulated in the hot bitumen and a bitumen bead visible along the expansion joint membrane salvage edge.
- .3 Torch the modified bituminous membrane stripping plies until smooth and free of air pockets, wrinkles, fishmouths or tears. When torching, direct the flame away from the expansion joint membrane gland material. Use the torch and flop technique.

- .4 Install each stripping ply in shingle lap fashion onto the expansion joint membrane, firmly and uniformly, without voids. At all times, observe the modified bituminous membrane manufacturer's recommendations. The expansion joint membrane must be completely encapsulated in the melted bitumen and a bitumen bead visible along the expansion joint membrane salvage edge.

3.20 ROOF DRAINS

- .1 See Section 22 05 11 – Plumbing and Drainage for plumbing work.
- .2 Install self-adhered membrane air seal around drain and extend onto air/vapour barrier minimum 150 mm.
- .3 Unless otherwise specified or shown, provide prefabricated sump of sloped polyisocyanurate insulation 1200 mm each side of the centre of the drain. Reduce polyisocyanurate insulation thickness to minimum 19 mm at drain to provide positive roof drainage (make allowance for thickness of all flanges and clamps) and ensure water flow will not be impeded.
- .4 Complete roof membrane, installing additional 1 m x 1 m base sheet flashing centred over drain opening.
- .5 Fully coat drain flange to receive roofing with modified sealant and continue modified bitumen over flange. Neatly trim and work membrane to interior face and seal with Type 'A' sealant.
- .6 Set clamping ring in solid bed of Type 'A' sealant. Secure clamp ring and integral screen as dictated by drain design immediately after membrane is installed. Tighten bolts to ensure a permanent watertight compression seal.
- .7 Install and bolt strainers with heavy iron mechanical bracket to ensure the drain screen remains permanently in place to the Consultant's approval.
- .8 Install test plug, water test roof and repair leaks. Remove test plug once complete.
- .9 Restore interior finishes affected by work of this Contract to match original materials and finishes to Consultant's approval. Insulate rainwater leader pipes as required by Summary of Work in accordance with Section 22 05 11 – Plumbing and Drainage.

3.21 PLUMBING VENTS, B-VENTS, STACKS AND SLEEVES

- .1 Inspect and clean soil pipes of debris to ensure they are operational.
- .2 Protect exposed surface during roofing operation and clean surfaces free of bitumen before leaving site.
- .3 Make all penetrations air and watertight at air/vapour barrier by installing self-adhesive membrane flashings 150 mm onto air/vapour barrier and carry up and around projection. Clamp in place and caulk.

- .4 Trim base sheet at roof projections.
- .5 Adjust existing pipes to new flashing heights by either cutting down or extending pipes with matching materials attached with mechanical couplers. Ensure pipes are 38 mm higher than flashing to allow for sealing to prevent condensation.
- .6 Clear all projections free of contaminants and seal junction of base sheet and roof projections with trowel applications of sealant as shown on drawings.
- .7 Install all metal flanges to be built into the membrane before the installation of cap sheet. Insulate sleeves in accordance with drawings as specified. Where required, install telescoping caps to detail.
- .8 Prime topside and underside of all flanges to be incorporated with roofing prior to application. Use primer supplied by the membrane manufacturer. All primer to be dry before installation of membrane roofing or flashing.
- .9 Before installing flashings, install 1-ply base sheet extending to opening. Set flanges in bed of Type 'A' sealant prior to membrane installation, as per manufacturer's recommendations.
- .10 Install 1-ply of base sheet flashings thermofused to the flange to within 25 mm from upturn and continuing a minimum of 225 mm beyond flange. Continue cap sheet to metal upturn. Seal around upturn junction with sealant and touch up with matching granules, as per manufacturer's recommendations.
- .11 Install rain collars over sleeves and stacks as indicated to match adjoining materials and seal with sealant as indicated on drawings.

3.22 CONCRETE PAVERS

- .1 Install concrete pavers at the top and bottom of all roof access ladders located within the area of work and at roof access doorways.
- .2 Set pavers on 50 mm XPS insulation, in turn on walkway membrane cap sheet.

3.23 LIQUID MEMBRANE FLASHING

- .1 Using a slow-speed mechanical agitator, thoroughly mix the entire container of resin for two minutes before the addition of catalyst. Pour the resin into a second container if you make a batch mix. Add pre-measured catalyst to the resin component according to the amounts indicated in manufacturer's Catalyst Mixing Chart. Add catalyst only to the amount of material that can be used within 10 to 15 minutes. Stir again for two minutes before applying.
- .2 Apply the first resin layer to the substrate using rollers, brushes or notched squeegees provided for this purpose. The thickness of the first layer must be 1.3 mm to 1.5 mm when wet.
- .3 Lay out the polyester reinforcement on the resin to prevent the formation of wrinkles, swellings or fishmouths.

- .4 Use rollers, brushes or notched squeegees in order to fully saturate resin reinforcement and remove wrinkles and air bubbles under the reinforcement. The appearance of the reinforcement should be slightly opaque without any white trace. It is important to correct these defaults before the resin cures.
- .5 Apply the second resin layer on top of the reinforcement using rollers, brushes or notched squeegees provided for this purpose. The second layer thickness must be 0.6 mm to 0.7 mm when wet.
- .6 Excess resin which is not absorbed should be used to saturate adjacent reinforcement.
- .7 The final resin coating should be smooth and even.
- .8 Each reinforcement shall overlap the previous one by 50 mm laterally and by 100 mm at the ends.

3.24 CLEAN UP

- .1 At all times, keep the premises free from accumulation of waste materials or rubbish. Stock piling of debris on the roof will not be permitted.
- .2 Repair defects in surface and bitumen runs with granules to match existing to leave the roof in an even consistent finish.
- .3 Leave roof clear of debris and bitumen left by spills and machine tracking.
- .4 Leave grounds and building free of debris and bitumen spread by pedestrian traffic where applicable.
- .5 Clean surfaces and penetrations of all contaminants and touch up to the satisfaction of the Owner. Include rooftop equipment, curbs, soil stacks, sleeves, gas lines, vents, drains and ladders.
- .6 Check drains to ensure they are functional and where required remove all debris by vacuum.
- .7 At the completion of the work remove all rubbish, tools, equipment and surplus materials.
- .8 Be responsible to repair and pay all costs and fees required to rectify damage caused by work of the Contract with materials and finish to match original.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian Roofing Contractors Association (CRCA), Roofing Specifications Manual 2012.
- .3 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA), Architectural Sheet Metal Manual – 2012.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit to the Consultant a list of materials intended for use before they are ordered. Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitation.
 - .2 Submit copies of WHMIS 2015 SDS - Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit shop drawings for all sheet metal fabrications.
 - .2 Indicate sheet thickness, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement.
 - .3 Submit manufacturer's catalogue cut sheets for manufactured items.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

1.3 COORDINATION

- .1 Coordinate work of this Section with Related Work specified in other Sections to ensure construction schedule is maintained and watertightness and protection of the building and finished work is maintained at all times.

1.4 EXAMINATION

- .1 Do not commence work until surface to be covered has been inspected.

- .2 Inspect work and advise the Consultant of conditions that would adversely affect the work of this trade.
- .3 Commencement of work is proof that the Contractor has accepted surfaces as satisfactory for intended operations and accepts responsibility for appearances and performance of completed work.
- .4 Repair damaged and inferior work caused by work of this Contract with materials and finish to match original to the Consultant's approval.

1.5 MOCK-UPS

- .1 Submit shop drawings and provide mock-up in accordance with Section 01 33 00 – Submittal Procedures. Before installing materials, provide a 1200 mm mock-up for each profile before fabrication. Cost of mock-up to be included in the Contractor's base bid.
- .2 Mock-up samples to indicate type, colour, size, method of joints, seam, expansion provisions, stiffeners, cleat fasteners and method of sealing joints. Fit mock-up to each applicable roof profile or edge.
- .3 Review mock-up with drawings to ensure design intent can be achieved. Verify all elevations including those with matching materials and sections. Verify that continuity of air seals can be achieved. Verify attachments, methods for securing and strengths to ensure that work can support the anticipated loads and will remain in place against all wind, weather and service condition without warping or deforming.
- .4 Make adjustments to the work that results from a review of the mock-up without additional cost.
- .5 Acceptable mock-ups may be left in place as part of the final product.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage, and disposal of materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.
- .2 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a completed assembly.

2.2 PREFINISHED SHEET METAL FLASHING

- .1 Pre-finished metal flashings: As shown on drawings, fabricate from 0.65 mm (24 ga.) steel to ASTM A653 Grade 230 with G90 zinc coating. Surface with Perspectra Series baked enamel finish. Colour to match existing from manufacturer's standard colour range.

2.3 REGLETS AND SCUPPERS

- .1 Form reglet and scupper flashings from same material as other metal flashings, unless otherwise indicated.
- .2 Scupper to have minimum 125 mm roof flange and gravel guard to Consultant's approval. Make all seams continuous and watertight by soldering or heat welding.
- .3 Scupper to have a minimum width of 200 mm to allow proper drainage.

2.4 ACCESSORIES

- .1 Metal cleat: same material as metal flashings, 50 mm wide @ 600 mm c/c.
- .2 Continuous metal starter strip: 0.71 mm (24 ga.) galvanized steel, secured at 400 mm c/c.
- .3 Use galvanized, copper, aluminum or stainless steel nails or screws as most compatible with materials and preservatives being utilized.
- .4 Nails: Annular threaded nails of length to penetrate into bases minimum 25 mm. No. 8 screws to penetrate wood 19 mm at 600 mm c/c.
- .5 Masonry fasteners: Tapcon, Permagrip or Tapgrip or Rawl. Spike sized to penetrate concrete 38 mm minimum as specified or shown.
- .6 Exposed fasteners: Where exposed fasteners are specified or as shown, use #10 screws with metal and neoprene washers pre-finished to match colour of flashing. Alternatively, use screws with colour match nylon caps where shown or approved by the Consultant.
- .7 Screws for starter strips and fascia: #8 @ 400 mm c/c.
- .8 Wedges: Rolled plumber sheet lead.

- .9 Sealant: Refer to Drawings and Section 07 92 00 – Joint Sealants.
- .10 Touch-up paint: As recommended by prefinished material manufacturer.

2.5 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable details, as indicated. Where not indicated, follow applicable CRCA 'FL' series details and SMACNA architectural details.
- .2 Metal shall be formed on a bending brake, shaping trimmed and hard seaming shall be done on bench, as far as practicable, with proper sheet metal working tools. Angles of bends and folds for interlocking metal shall be made with full regard to expansion and contraction to avoid buckling and to avoid damaging metal surfaces.
- .3 Fabricate all possible work in shop in maximum 2400 mm lengths by brake forming, bench cutting, drilling and shaping. Match existing profiles where metal flashing is to be repaired.
- .4 Hem exposed edges on underside 13 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Dry joints are to be tight but not dented so as to permit slight adjustments of sheets and yet remain watertight.
- .7 Lock seams at all corners.
- .8 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .9 Supply all accessories required for installation of sheet metal work of this Section. Fabricate accessories of same material to which they will be used.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 SHEET METAL FLASHING INSTALLATION

- .1 Install sheet metal flashings at copings, walls, expansion joints, roof openings and other components required to protect the membrane flashings as shown on the drawings or otherwise required. Where not indicated, follow applicable CRCA 'FL' series details.

- .2 Install continuous concealed starter strips at all exterior faces. Install cleats between lock joints and as indicated to permanently hold flashing in place. Install hook strip fasteners with 2 fasteners per cleat.
- .3 Sheet metal work shall be installed to cover the entire area it protects and shall be watertight under all service and weather conditions. Install in a uniform manner, true to line, free of dents, warping and distortion.
- .4 Back-paint sheet metal that comes into contact with another kind of metal, masonry or concrete with bituminous paint at the rate of 0.15 L/m².
- .5 Install sheet metal with concealed fasteners at lock joints. Exposed fastening will only be permitted with the approval of the Consultant. When exposed fasteners are shown, space all fasteners evenly in an approved manner. Use lead plugs and screws with neoprene washers where fasteners are exposed, otherwise use concrete drive fasteners where metal flashings are installed over concrete masonry.
- .6 Install weather barrier membrane under sheet metal where indicated.
- .7 Self-Adhered Membrane:
 - .1 Install 1-ply of self-adhered membrane to detail under sheet metal on horizontal or vertical surfaces that are not otherwise covered by membrane flashings.
 - .2 Ensure all surfaces to be covered with self-adhered membrane are complete and free of moisture and contaminants. At temperatures below 5°C (40°F) heat materials to be covered with hot air gun. Store all materials in heated storage above 5°C (40°F) and remove only as much material as can be used before cooling.
 - .3 Prime all surfaces to be covered with self-adhered membrane. Let primer tack dry and complete thumb test to ensure.
 - .4 Remove paper backing and install membrane true to line to completely cover the area intended to be protected to points shown on the drawing.
 - .5 Roll or work material into place by hand to ensure a positive bond.
 - .6 Membrane to be installed without air blisters and wrinkles. Rework, repair or replace all poorly installed membrane. Do not stretch material that would result in pull back and deformity of the membrane at intersections.
 - .7 Lap all side laps 75 mm and end laps 150 mm. Secure all membrane on vertical surface at points of termination at 150 mm c/c.
 - .8 Turn up membrane 150 mm at edge where horizontal surface meets vertical planes.
 - .9 Seal all points of termination at horizontal planes and vertical surfaces with modified sealant. Tool sealant to consistent smooth and even surface.
 - .10 It is recommended that all self-adhering membrane be installed by a team of two workmen. Avoid working in windy conditions or weather that would result in inferior product.

- .8 Join sheet metal by "S" lock seams, to permit thermal movement. Seal all fasteners and completely fill all joints with Type 'B' sealant as flashing is being installed. Clean off all excessive visible material subsequent to installation.
- .9 When flashing is being installed in more than one piece, offset joints in adjacent flashings by approximately 50%.
- .10 Form inside and outside corners by means of locked seams. Do not use pop rivets unless accepted by Consultant.
- .11 Slope all metal to interior of roof area to maintain slope, unless otherwise indicated. Do not form open joints or pockets that fail to drain water.
- .12 Where existing reglets are to be re-used, remove existing sealant and re-cut to conform to the size requirements specified herein.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment. Remove and replace all sheet metal sections that received surface damage or scratches during fabrication, delivery or installation.
- .3 For scratches and scuffs to be retained in the new installation, use touch up paint recommended by the metal material supplier.
- .4 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.108-M89, Bituminous Solvent Type Paint.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2012.
- .4 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual – 2012.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit to the Consultant a list of materials intended for use before they are ordered. Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitation.
- .3 Shop Drawings:
 - .1 Submit shop drawings for all sheet metal fabrications.
 - .2 Indicate sheet thickness, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement. Indicate all sheet metal profiles to be installed on site, including sizes and configurations.
 - .3 Submit manufacturer's catalogue cut sheets for manufactured items.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 mm samples of each type of sheet metal material, finishes and colours.

1.3 COORDINATION

- .1 Coordinate work of this Section with Related Work specified in other Sections to ensure construction schedule is maintained and watertightness and protection of the building and finished work is maintained at all times.

1.4 EXAMINATION

- .1 Do not commence work until surface to be covered has been inspected.
- .2 Inspect work and advise the Consultant of conditions that would adversely affect the work of this trade.
- .3 Commencement of work is proof that the Contractor has accepted surfaces as satisfactory for intended operations and accepts responsibility for appearances and performance of completed work.
- .4 Repair damaged and inferior work caused by work of this Contract with materials and finish to match original to the Consultant's approval.

1.5 MOCK-UPS

- .1 Submit shop drawings and provide mock-up in accordance with Section 01 33 00 – Submittal Procedures. Before installing materials, provide a 1200 mm mock-up for each profile before fabrication. Cost of mock-up to be included in the Contractor's base bid.
- .2 Mock-up samples to indicate type, colour, size, method of joints, seam, expansion provisions, stiffeners, cleat fasteners and method of sealing joints. Fit mock-up to each applicable roof profile or edge.
- .3 Review mock-up with drawings to ensure design intent can be achieved. Verify all elevations including those with matching materials and sections. Verify that continuity of air seals can be achieved. Verify attachments, methods for securing and strengths to ensure that work can support the anticipated loads and will remain in place against all wind, weather and service condition without warping or deforming.
- .4 Make adjustments to the work that results from a review of the mock-up without additional cost.
- .5 Acceptable mock-ups may be left in place as part of the final product.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS 2015) regarding use, handling, storage, and disposal of materials.
- .3 Manufacturer's recommendations for handling and storing products are to be considered a minimum requirement.
- .4 Materials shall be delivered to the site, undamaged and in their original packages, with manufacturer's labels visible, attesting to their conformity to specific standards.

Part 2 Products

2.1 GENERAL

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.
- .2 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a completed assembly.

2.2 PREFINISHED SHEET METAL CLADDING

- .1 Pre-finished steel cladding: Same material as metal flashings, profile to match existing.
- .2 Pre-finished steel cladding: fabricate from 0.65 mm (22 ga.) steel to ASTM A653 Grade 230 with G90 zinc coating. Surface with Perspectra Series baked enamel finish. Colour to be selected by Consultant and Owner from Manufacturer's full range.
 - .1 Acceptable products:
 - .1 Commercial Rib, as manufactured by Ideal Roofing.
 - .2 Diamond Rib, as manufactured by Agway Metals.
 - .3 GrandRib, as manufactured by Vicwest.
 - .4 Consultant approved equivalent.
 - .3 Cladding sections shall be provided in full length panels to eliminate the number of field end laps.

2.3 ACCESSORIES

- .1 Z-girts: Preformed or break-formed profiles, commercial quality galvanized steel, 1.01 mm thick (20 ga.).
- .2 Use nails or screws as most compatible with materials and preservatives being utilized.
- .3 Exposed fasteners: Where exposed fasteners are specified or as shown, use #10 screws with metal and neoprene washers pre-finished to match colour of flashing. Alternatively, use screws with colour match nylon caps where shown or approved by the Consultant.
- .4 Sealant to Section 07 92 00 – Joint Sealants.
- .5 Bitumen paint: To CAN/CGSB-1.108 Type II. Gilsonite asphalt paint.
 - .1 Acceptable product: 810-07 by Henry or approved equivalent.
- .6 Touch-up paint: As recommended by prefinished material manufacturer.

2.4 FABRICATION

- .1 Fabricate sheet metal work in accordance with applicable details, as indicated. Where not indicated, follow applicable CRCA 'FL' series details and SMACNA architectural details.
- .2 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .3 Dry joints are to be tight but not dented to permit slight adjustments of sheets and yet remain watertight.
- .4 Supply all accessories required for installation of sheet metal work of this Section. Fabricate accessories of same material to which they will be used.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 SHEET METAL CLADDING INSTALLATION

- .1 Provide all required accessories to complete the installation at all corners, terminations and projections. Ribs shall be installed vertically, and metal sections shall overlap as recommended by manufacturer. Use the full length to eliminate end joints.
- .2 Secure Z-girts to existing substrate horizontally. Install one Z-girt at the wall head and one at the wall base and at a maximum spacing indicated to provide suitable substrate for cladding and flashing anchorage. Anchor Z-girt to substrate at 300 mm maximum c/c.
- .3 Siding to be secured to Z-girts with self-taping screws complete with neoprene washers. Colour to match siding. Fasteners shall be installed between each rib and at a consistent elevation.
- .4 Install siding in accordance with design intent and as indicated on shop drawings.
- .5 All perimeters shall be covered with specified sheet metal flashing and caulked at termination. Include for all J-trim, U-trim and closures at penetrations and drip edges at base.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment. Remove and replace

all sheet metal sections that received surface damage or scratches during fabrication, delivery or installation.

- .3 For scratches and scuffs to be retained in the new installation, use touch up paint recommended by the metal material supplier.
- .4 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

PART 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .2 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .3 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .2 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Manufacturer's product to describe:
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .3 Submit 2 copies of WHMIS 2015 SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.
- .3 Manufacturer's Instructions: Submit instructions to include installation instructions for each product used.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.4 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4°C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
 - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

PART 2 Products

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

- .2 Modified bitumen sealant (Sealant Type 'A'):
 - .1 For penetration and terminations of bituminous and modified bituminous membrane: To CAN/CGSB-37.5. As recommended by membrane manufacturer.
 - .2 Standard of acceptance:
 - .1 Sopramastic 200 by Soprema.
 - .2 AquaBarrier Mastic by IKO.
 - .3 Polybitume 570-05 by Henry.
 - .4 Or accepted alternate.
- .3 Urethanes one part (Sealant Type 'B'):
 - .1 For concealed movement joints in cladding and masonry.
 - .2 Non-sag: To CAN/CGSB-19.13, Type 2, MCG-2-25, colour to match surfaces.
 - .3 Standard of acceptance:
 - .1 Dymonic 100 by Tremco Commercial Sealants and Waterproofing.
 - .2 MasterSeal NP1 by BASF.
 - .3 Or accepted alternate.
- .4 High temperature sealant (Sealant Type 'C'):
 - .1 One component, low modulus, gun grade, non-sag, moisture-cure polyurethane sealant with UV resistance, designed to cure into a fire rated, elastic weatherproof seal. Sealant shall comply with AS1530 Part 4-1997 (Fire Resistance Test of Elements of Building Construction) and AS4072 Part 1-1992 (Service penetrations and control joints). Tested by BRANZ.
 - .2 Standard of acceptance:
 - .1 Dow Corning 736 Silicone.
 - .2 Or accepted alternate.
- .5 Siliconized acrylic latex sealant for interior finishes (Sealant Type 'E'):
 - .1 Single-component, paintable, suitable for interior wood, painted gypsum board, aluminum and steel surfaces.
 - .2 For use on interior surfaces only.
 - .3 Standard of acceptance:
 - .1 Alex Pus Acrylic Latex Caulk Plus Silicone by DAP.
 - .2 Tremflex 834 by Tremco.
 - .3 133 Siliconized Latex by Mulco.
 - .4 AC-20 Plus Silicone by Pecora.
 - .5 Or accepted alternate.

- .6 Silicones one part (Sealant Type 'F'):
 - .1 For exterior application at window and door perimeters, cladding junctions and transitions, and where indicated on the project drawings:
 - .2 Type S, Grade NS, Class 35, Use NT, M, A, and O.
 - .3 Standard of Acceptance:
 - .1 Dowsil CWS by Dow
 - .2 Tremsil 400 by Tremco Commercial Sealants and Waterproofing
 - .3 Or approved alternative.
- .7 Thermoplastic sealant for joints to be coated with thermoplastic roof coating (Sealant Type 'G'):
 - .1 Single component thermoplastic sealant approved by roof coating manufacturer for compatibility with coating materials.
- .8 Preformed compressible and non-compressible back-up materials:
 - .1 Pre-compressed, self-expanding polyurethane foam joint sealant:
 - .1 Willseal 150 by Tremco Commercial Sealants and Waterproofing
 - .2 Backerseal by EMSEAL
 - .3 Or approved alternative
 - .2 Backer rod:
 - .1 Polyethylene, urethane, neoprene or vinyl foam closed cell, oversized 30 to 50 %, Shore 'A' hardness 20, tensile strength 140 to 210 kPa.
 - .3 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 JOINT CLEANER

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

2.4 PRIMER

- .1 As recommended by sealant manufacturer for specific substrate adhesion.

PART 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 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.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

3.3 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.4 BACKUP MATERIAL

- .1 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.5 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 exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Sealant Type 'A':
 - .1 Install sealant Type 'A' to the top of membrane flashings where required or as shown on drawings. Modified sealant to be installed around finished flashings at all protrusions including soil stacks, sleeves, pitch boxes and fasteners securing membrane to walls.
 - .2 Apply sealant Type 'A' with hand trowel to achieve a 25 mm width and minimum 3 mm thickness.
 - .3 Apply sealant Type 'A' immediately after flashings have been installed and are still warm. No membrane flashings shall be left uncovered at the end of any work period. *(Non-compliance with this mandate may result in rejection, removal and replacement of the membrane flashings to the affected area).*
 - .4 Trowel sealant Type 'A' in two directions to ensure proper adhesion to substrate and that all surface irregularities are filled. Tool surface of modified sealant to smooth finish.
 - .5 Install sealant Type 'A' at the underside of drains, metal sleeves and other location where specified on drawings.
- .3 Install sealant Type 'B' at exterior perimeter or window and door frames.
- .4 Install sealant Type 'E' at all interior edges of exterior windows and doors.
- .5 All sealants shall be installed in accordance with manufacturer's instructions and requirements for joint depth to width ratio, with minimum 6 mm contact on both sides.
- .6 Curing:
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day. Clean adjacent surfaces immediately.
 - .2 Remove excess and droppings, using recommended cleaners as work progresses.
 - .3 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

3.7 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCE STANDARDS

- .1 Conform with applicable requirements of the Ministry of Labour, and the Occupational Health and Safety Act and regulations for construction projects.
- .2 Complete installation in accordance with the following:
 - .1 Ontario Building Code (OBC);
 - .2 Natural Gas and Propane Installation Code (gas code);
 - .3 ASHRAE;
 - .4 SMACNA;
 - .5 NFPA;
 - .6 All other relevant codes and standards, as applicable.
- .3 Obtain all permits required for the installation of mechanical trades work, arrange for inspections and tests, and pay all fees and costs for the permits, inspections and fees. Obtain permits immediately after notification of award of contract.
- .4 Provide three copies of complete operating and maintenance instructions for equipment furnished under this contract. Bind instructions in 3-ring binders. Include the following:
 - .1 Schematic diagram of electrical systems.
 - .2 Control shop drawings and operating sequence including wiring of components.
 - .3 Wiring diagram of control panels.
 - .4 Operating instructions, including start-up and shut-down procedure.
 - .5 Maintenance instructions including preventive maintenance instructions for Components of the equipment.
 - .6 Complete parts list of assemblies and their component parts, showing manufacturer's name, catalogue number, and nearest replacement source.
 - .7 List of recommended spare parts and quantity of each item to be stocked.
 - .8 Manufacturers' warranties and guarantees.
- .5 Clean all mechanical systems at project completion.
- .6 Complete as-built drawings showing all changes as work progresses.

1.2 CONTRACTOR QUALIFICATIONS

- .1 All work to be carried out in accordance with the "Trade Qualification and Apprenticeship Act" and applicable regulations, by persons who hold the following certificates of qualification (as applicable):
 - .1 Plumber;
 - .2 Sheet metal worker;
 - .3 Refrigeration & Air Conditioning Systems Mechanic.

- .2 All fuels-related work to be carried out in accordance with TSSA requirements and Ontario.
- .3 Regulation 215/01, "Fuel Industry Certificates" by persons who hold the appropriate certificates for the work being performed.

1.3 EXISTING FACILITIES AND DEMOLITION

- .1 Locate and protect all existing exterior site services.
- .2 Retain and protect all existing interior services and building fabric. Make good any and all damage resulting from this work.
- .3 Connections to existing services shall be coordinated with the Owner.
- .4 Execute work with least possible interference or disturbance to normal use of the existing building.

1.4 DESIGNATED SUBSTANCES

- .1 Designated substances shall be treated in accordance with the requirements of the Occupational Health and Safety Act and applicable regulations.
- .2 Should any designated substances be encountered in the area of construction, all work shall stop immediately, and the Owner and Consultant shall be notified immediately.
- .3 If applicable, asbestos removal shall be completed in accordance with the Occupational Health and Safety Act and Ontario Regulation 278 "Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations".

1.5 FIXTURES AND EQUIPMENT

- .1 Submit Shop Drawings and Product Data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Provide shop drawings and product data for all mechanical fixtures and equipment for approval, prior to procurement.
- .3 Install all mechanical fixtures and equipment in accordance with manufacturer's instructions.
- .4 Locate all equipment with clearances, as required by the manufacturer, the fuel codes, and all other codes and regulations, including the following clearances:
 - .1 To permit proper equipment operation;
 - .2 To permit sufficient airflow around equipment;
 - .3 For equipment service;
 - .4 With sufficient vent clearances;
 - .5 Sufficient distance from roof edges or other hazards.

1.6 EQUIPMENT SUPPLIED BY OTHERS

- .1 Make all mechanical service connections to equipment supplied by others.

- .2 Confirm all service connections with manufacturer and supplier, prior to installation. This shall include all connection sizes, locations and details, and shall take into account equipment clearances and installation requirements.

1.7 PIPE INSULATION

- .1 Install in accordance with Thermal Insulation Association of Canada (TIAC) standards.
- .2 Maximum Flame Spread Rating: 25, Maximum Smoke developed rating: 50.
- .3 Roof Drains:
- .4 1" rigid moulded mineral fibre with vapour retarder jacket.
- .5 Insulate all storm piping above ground.
- .6 Outer jacket:
 - .1 Concealed locations: all service jacket.
 - .2 Exposed locations: PVC jacket.
 - .3 Mechanical/service rooms: PVC jacket.

1.8 NATURAL GAS PIPING

- .1 Steel pipe, schedule 40, seamless, welded or screwed fittings (as required by code).
- .2 Slope piping down in direction of flow to low points.
- .3 Test system in accordance with Natural Gas and Propane Installation Code and provide Owner and Consultant with a copy of test reports.

1.9 DUCTWORK

- .1 Rectangular duct:
 - .1 Rigid galvanized steel, lock forming quality to ASTM A653/A653M.
 - .2 Thickness, fabrication, reinforcement and support/attachment for interior and exterior application in accordance with ASHRAE or SMACNA.
- .2 Seal classification:
 - .1 Class A longitudinal seams, transverse joints, duct wall penetrations and connections.
 - .2 Made airtight with sealant and tape.
- .3 All duct and seal materials to have a Flame-Spread Rating of less than 25 and a Smoke Developed Classification of less than 50.

1.10 DUCT INSULATION

- .1 Ductwork required to be insulated shall be as indicated.

- .2 Install in accordance with Thermal Insulation Association of Canada (TIAC) national standards.
 - .1 Maximum Flame-Spread rating: 25.
 - .2 Maximum Smoke Developed Classification: 50.
- .3 Thermal insulation - rectangular duct:
 - .1 1" (R4.3) rigid mineral fibreboard with vapour retarder jacket.
 - .2 Aluminum jacket with moisture barrier.

1.11 MECHANICAL FIRE PROTECTION

- .1 All mechanical materials used within ceiling return air plenums shall Flame-Spread rating not more than 25 and Smoke Developed Classification not more than 50 per CAN/ULC-S102.2.

1.12 EARTHQUAKE LOAD

- .1 All mechanical work shall be completed in accordance with the earthquake load and effects required by the Ontario Building Code.
- .2 Mechanical elements and components (equipment, pipes, ducts, etc.), and their connections to the building shall be constructed in accordance with the SMACNA/ANSI Seismic Restraint Manual or other guideline referenced in the Ontario Building code.
- .3 Provide shop drawings for support, connections and seismic restraint of all mechanical equipment, pipes and ducts.
- .4 These shop drawings shall be designed and sealed by a Professional Engineer in the Province of Ontario, with experience in seismic engineering.
- .5 Following project completion, seismic engineer shall provide a letter of final site review.
- .6 Contractor shall carry the cost of the seismic engineering, including site reviews, design and shop drawing preparation.

1.13 EQUIPMENT AND MATERIALS SUPPORT

- .1 All mechanical equipment, piping, ductwork, and related items shall be securely supported, attached and fastened to building structure.
- .2 Pipe hangers and supports shall be fabricated and installed in accordance with MSS standard SP-58, pipe hangers and supports – materials, design, manufacture, selection, application, and installation.

1.14 COORDINATION

- .1 Information involving accurate dimensioning of the building shall be taken from site by the Contractor.
- .2 Drawings are in diagrammatic form, intended to convey the scope of work and general arrangement for equipment. Coordinate physical location of all equipment with other trades and allow for any additional piping, ducting, fittings, supports, etc., in order to avoid interference and facilitate the work.

- .3 Contractor to make any necessary modifications or additions, without charge, to accommodate site conditions and coordination.
- .4 Coordinate all mechanical equipment wiring, including low voltage control wiring, with electrical trades.

1.15 START-UP, COMMISSIONING AND TRAINING

- .1 Commissioning:
 - .1 Start-up and commission all systems that have been altered.
 - .2 Perform systematic tests, procedures and checks on systems, as follows:
 - .1 To ensure appropriate documentation is provided;
 - .2 To effectively train building operational staff.
 - .3 Systems are to be operated at full capacity, with correction of all deficiencies and adjustments to meet optimum performance.
 - .4 Provide written report at end of commissioning outlining equipment operational conditions and parameters.
- .2 Testing, adjusting and balancing:
 - .1 Test, adjust and balance (TAB) all existing equipment to be removed and reinstalled as part of the work and equipment servicing areas affected by the work that does not require to be removed and reinstalled.
 - .2 Tab procedure shall be completed in accordance with ASHRAE standard 111,
 - .3 Measurement, testing, adjusting and balancing of building HVAC systems.
 - .4 Provide detailed report at end of TAB, in accordance with the reporting procedures of ASHRAE Standard 111.
 - .5 Phase 1 - existing system conditions:
 - .1 Phase 1 shall be performed prior to commencing any equipment removals in order to determine existing airflow and to document installation and condition of existing equipment.
 - .2 No system adjustment or balancing shall occur in Phase 1.
 - .3 Supply and install all labour, equipment and materials for the following:
 - .1 Verify all existing rooftop air unit supply and return airflows;
 - .2 Verify all existing exhaust fan airflows and static pressure.
 - .6 Phase 2 – final adjusting and balancing:
 - .1 Phase 2 shall be performed to upon the completion of installation of new or existing equipment to test, adjust and balance the system for proper operation.
 - .2 Phase 2 shall only occur after submission and review of the phase 1 report.
 - .3 Perform a complete air testing, adjusting and balancing in accordance with ASHRAE Standard 111, Part 9.

- .7 Demonstration and training:
 - .1 Demonstrate operation and maintenance of equipment and systems to owner's personnel one week prior to date of final inspection to verify operation in accordance with contract documents, design criteria and intent, and manufacturer's requirements;
 - .2 Prior to demonstration and training, ensure that equipment has been inspected and put into operation, including completion of commissioning and testing, adjusting, and balancing.
 - .3 Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, and maintenance of each item of equipment.
 - .4 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction. Review contents of manual in detail to explain aspects of operation and maintenance.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C547-12. Standard Specification for Mineral Fiber Pipe Insulation.
- .2 Cast Iron Soil Pipe Institute (CISPI)
 - .1 CISPI 310-12, Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA B1800-11, Thermoplastic Nonpressure Piping Compendium.

1.2 SUBMITTAL / APPROVAL

- .1 Do not commence work until satisfactory installation of related work has been completed and approved.
- .2 Inspect work and advise Consultant of conditions that would adversely affect the work of this trade.
- .3 Commencement of work is proof that the Contractor has accepted surfaces as satisfactory for intended operations and accepted responsibility for appearance and performance of completed work.
- .4 Defective work resulting from work on unsatisfactory surfaces will be considered the responsibility of those performing the work of this Section.
- .5 Repair damage and inferior work caused by the work of this Contract with materials and finish to match the original to Consultant's approval.
- .6 Submit to the Consultant a list of materials intended for use before they are ordered.
- .7 Provide samples of material without additional cost, to the Consultant for review as requested.

1.3 QUALITY ASSURANCE

- .1 All drain installations, including insert type drains, shall be completed by plumbing subtrades licensed to undertake plumbing work in Ontario.
- .2 Equipment and materials must be new and free of imperfections.

Part 2 Products

2.1 MATERIALS

- .1 All standards, regulations and specifications listed herein are considered to be the latest available edition.
- .2 Compatibility between materials is essential. Use only materials that are known to be compatible when incorporated in a completed assembly.
- .3 Copper roof drains: Soldered copper body with flat hub. Provide appropriate bearing pans, under deck clamping and hardware, as required.
 - .1 At existing drain locations with existing plumbing: Insert type drain with soldered copper leader and large flange, internal clamping ring, depressed receiving area, and copper or aluminum basket. Diameter to suit existing drain leader.
 - .1 Standard of acceptance:
 - .1 Model RD-4C-RR by Thaler Metal Industries Inc.
 - .2 Or accepted alternate.
 - .2 Drain connector:
 - .1 Connection to be a mechanically tightened expanding rubber anti-backflow connector.
 - .2 Standard of acceptance:
 - .1 U-Flow Connector by U-Flow Inc.
 - .2 Or accepted alternate.
- .4 Pipe: minimum 76 mm PVC drain waste and vent pipe and pipe fittings to CAN/CSA B1800.
- .5 Pipe hangers: Adjustable type wrought iron design to allow pipe movement and insulation to pass unbroken through hanger.
- .6 Mechanical joints for drain pipe: Neoprene or butyl rubber gasket with stainless steel clamp type joint to CISPI 310-12.
- .7 Rubber gasket joints: For cast iron and ductile-iron pressure pipe for water piping shall conform to ANSI/AWWA C111/A21.11. For connection of copper drain pipe to cast iron drain pipe use 975 mm x 100 mm rubber gasket.
- .8 Downpipe clamp: 1.21 mm (18 ga.) galvanized 2-hole clamp. Profile to suit pipe and size.
- .9 Insulation for pipes: 25 mm thick performed type mineral fibre insulation to ASTM C547.
 - .1 Standard of acceptance:
 - .1 Roxul Techton 1200 or SSL II Fiberglas by Owens Corning.
 - .2 Or accepted alternate.

- .10 Insulation for underside of drain: 2-component, 1 kg density polyurethane foam as detailed.
- .11 Insulation covering:
 - .1 Cover pipe insulation with canvas membrane wrap and paint.
 - .2 Where exposed, use preformed PVC.
- .12 Firestop sealant: Approved by manufacturer for use in fire-rated firestop assembly.
 - .1 Standard of acceptance:
 - .1 A/D Firebarrier Silicone.
 - .2 3M Fire Barrier.
 - .3 Or accepted alternate.
- .13 Firestop insulation: Mineral wool approved by manufacturer for use in fire-rated firestop assembly.
 - .1 Standard of acceptance:
 - .1 Roxul 'Safe'.
 - .2 AD Firebarrier.
 - .3 Or accepted alternate.
- .14 Steel deck reinforcement: 0.79 mm (22 ga.) galvanized steel to cover opening in deck at drain removal locations. Steel plate to extend a minimum of 300 mm from edge of opening on all sides, as per detail.

2.2 DRAIN ACCESS DOOR

- .1 New access panels shall be of galvanized steel construction with hinged openings and a decorative flange to cover the ceiling cut edges. Units shall have a factory applied white paint finish. Minimum steel thickness shall be 0.7 mm and have self-locking access.

Part 3 Execution

3.1 PREPARATION

- .1 Inspect surfaces and ensure that:
 - .1 Roof deck is level or sloped to provide proper and complete drainage from the roofing system in conformity to design intent.
 - .2 Existing pipe hangers are in adequate condition to independently support distribution pipes, prior to disconnection of any drains at roof level.
 - .3 Roof drains are set at a level to allow for positive drainage and are connected or capped.
 - .4 Plumbing is accessible and work can be completed as specified. Notify Consultant of any adverse conditions.
 - .5 Existing roof drains are open and functioning properly.

- .6 For costing and practical purposes, location of new drains and plumbing are approximate and should be considered accurate within 3 m. Advise Consultant of variances and adjust locations as required to facilitate installation without additional cost, to the Consultant's approval.
- .2 Contractor shall advise Consultant in the event that the existing system or materials do not meet current code requirements.
- .3 Unless indicated otherwise, the plumbing sub-trade shall be responsible for the removal and reinstatement of furniture, plants and interior equipment, excluding computers, monitors, copiers and the like.
- .4 Contractor to provide interior protection to all areas where plumbing work is being completed. Provide sufficient dust and debris protection for the temporary removal of ceiling tiles, and include for any supplemental clean up to return interiors to pre-construction conditions.
- .5 Remove all ceiling panels and plaster finish to provide access to the work. Re-install and make good all existing finishes to match original materials and conditions. Repainting of surfaces shall include all ceiling all wall areas up to a break in plane, unless otherwise indicated on drawings.
- .6 Remove and discard all existing drains and plumbing not designated for re-use. Notify Owner of any hazardous materials encountered.
- .7 In poured concrete decks, scan roof deck for presence of reinforcing steel or cast-in conduits, prior to coring.

3.2 INSERT ROOF DRAINS AT EXISTING DRAIN LOCATIONS

- .1 Install new insert drains at existing drain locations to requirements of Summary of Work, drawings and details. Drains to be connected as shown. Size drains to properly fit existing rainwater leader.
- .2 Remove or cut existing drains to deck level ensuring existing drainage pipe, interior insulation and surfaces are not disturbed or damaged during installation.
- .3 Remove bitumen or other debris from surfaces that could interfere with installation and advise Consultant of any abnormalities.
- .4 Repair any damaged or disturbed surfaces as required to match existing materials and finishes.
- .5 Subsequent to installation, tighten mechanical coupling to manufacturer's requirements to provide a permanent gas and watertight seal.

3.3 DRAIN ACCESS DOOR

- .1 Cut access opening in existing finished ceiling in most optimum location to access new drain/piping or as indicated on drawings. Cut edges neatly and install hatch, ensuring that door opening is in the direction of the larger area of ceiling space to facilitate ease of future ladder use. Install hatch plumb level with decorative flange flush with ceiling and anchor in position in accordance with manufacturers printed instructions.

3.4 PLUMBING VENT MODIFICATIONS

- .1 Cut down or extend existing soil stacks to a minimum height of 300 mm above finished roof surface. Extensions to match existing material and connections to be made with mechanical joint couplings.

3.5 PIPING TEST

- .1 Perform water tests before restoring interior ceilings and finishes.
- .2 Install plumbing line plugs below the level of connection and water test new plumbing installation. Correct all leaks.
- .3 Make leaks watertight while systems are still under test. If this is impossible, remove and refit defective parts. Caulking of threaded joints will not be permitted.
- .4 After leaks have been repaired, repeat tests as often as necessary to obtain approval and to ensure watertightness of each system.
- .5 Correct level of drains or pipes, if roof or pipes hold water.

3.6 FINISH

- .1 Reset existing ceiling finishes removed to execute work of this Contract.
- .2 Restore and repair all existing surfaces affected by the work to match existing materials and finish.
- .3 Re-paint entire ceiling or walls where it is required to make patching work undisguisable with existing surfaces.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Conform with applicable requirements of the ministry of labour, and the occupational health and safety act and regulations for construction projects. Complete installation in accordance with the following:
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for Electrical Safety Authority necessary number of drawings and specifications for approval prior to commencement of work.
- .3 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 If changes are required, notify Consultant of these changes before they are made.
- .4 Certificates:
 - .1 Provide CSA certified equipment.
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with General Conditions of contract.
 - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant.
- .5 Ground complete system in accordance with the OESC C22.1 ON- and Electrical Safety Authority requirements.

1.3 IDENTIFICATION AND LABELLING:

- .1 Provide typewritten panel directories for changes to electrical system.

1.4 CLOSEOUT DOCUMENTATION

- .1 Provide project closeout documentation in accordance with Section 01 78 00 – Closeout Submittals.

- .2 Provide three copies of complete operating and maintenance instructions for equipment furnished under this contract. Bind instructions in 3-ring binders. Include the following:
 - .1 Schematic diagram of electrical systems.
 - .2 Control shop drawings and operating sequence including wiring of components.
 - .3 Wiring diagram of control panels.
 - .4 Operating instructions, including start-up and shut-down procedure.
 - .5 Maintenance instructions including preventive maintenance instructions for
 - .6 Components of the equipment.
 - .7 Complete parts list of assemblies and their component parts, showing manufacturer's Name, catalogue number, and nearest replacement source.
 - .8 List of recommended spare parts and quantity of each item to be stocked.
 - .9 Manufacturers' warranties and guarantees.
- .3 Clean all electrical systems at project completion.
- .4 Complete as-built drawings showing all changes as work progresses.

1.5 CONTRACTOR QUALIFICATIONS

- .1 All work to be carried out in accordance with the "trades qualification and apprenticeship Act" and regulations, by persons who hold the following certificates of qualification (as Applicable):
 - .1 Electrician: construction & maintenance.

1.6 EXISTING FACILITIES AND DEMOLITION

- .1 Locate and protect all existing exterior site services.
- .2 Retain and protect all existing interior services and building fabric. Make good any and all damage resulting from this work.
- .3 Connections to existing services shall be coordinated with the owner.
- .4 Execute work with least possible interference or disturbance to normal use of the existing building.

- .5 Designated substances:
 - .1 Designated substances shall be treated in accordance with the requirements of the Occupational Health and Safety Act.
 - .2 Should any designated substances be encountered in the area of construction, all work shall stop immediately, and the owner and consultant shall be notified immediately.
 - .3 If applicable, asbestos removal shall be completed in accordance with the occupational Health and Safety Act and Ontario Regulation 278 "designated substance – asbestos on Construction projects and in buildings and repair operations".

1.7 FIXTURES AND EQUIPMENT

- .1 Provide shop drawings and product data in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit shop drawings and product data for all electrical fixtures and equipment for approval, prior to procurement.
- .3 Install all electrical fixtures and equipment in accordance with manufacturer's instructions.
- .4 Equipment and material to be CSA Certified. Where there is no alternative to supplying equipment which is not CSA Certified, obtain special approval from Electrical Safety Authority.

1.8 EQUIPMENT SUPPLIED BY OTHERS

- .1 Make all electrical service connections to equipment supplied by others.
- .2 Confirm all service connections with manufacturer and supplier, prior to installation. This shall include all connection sizes, locations and details, and shall take into account equipment clearances and installation requirements.

1.9 CONDUITS

- .1 Rigid galvanized steel, with threaded fittings, where subject to mechanical injury, in service areas only.
- .2 Electrical metallic tubing (EMT), hot dipped galvanized steel, with threaded connectors and couplings, where not subject to mechanical injury, in service areas only.
- .3 Rigid PVC conduit below floor and in corrosive areas.
- .4 All conduit that will be exposed in final assembly shall be painted to match adjacent finishes.

1.10 WIRES AND CABLE

- .1 Voltage Drop: branch circuit conductors shall be sized for a maximum voltage drop of 3% at design load.
- .2 Building wires in conduit systems to be stranded copper conductors for 10 AWG and larger, minimum size 12 AWG, type RW90.

- .3 Building wires in concealed locations to be copper, minimum size 12 AWG, type AC90.
- .4 All wiring shall be concealed in walls and ceilings, unless otherwise noted or approved. Surface-mounted wiring is permitted only with the express approval of the Consultant and Owner.

1.11 FIRE PROTECTION

- .1 All cabling and conduit shall be tightly fitted and sealed with firestopping material at all walls and ceilings.
- .2 Plenums (Ontario Building Code (OBC) 3.6.4.3): All materials within the plenum shall a Flame-Spread rating not more than 25 and a Smoke Developed classification not more than 50.

1.12 SEISMIC RESTRAINT

- .1 All electrical work shall be completed in accordance with CSA S832-06 Seismic Risk Reduction of Operational and Functional Components and Part 4 requirements of the OBC.
- .2 Following project completion, structural engineer shall provide a letter of final site review.
- .3 Contractor shall carry the cost of the seismic engineering, including site reviews, design and Shop Drawing preparation.

1.13 EQUIPMENT SUPPORT

- .1 All electrical equipment, conduit, wiring, lighting, devices, and related items shall be securely supported, attached and fastened to building structure.
- .2 Hangers and supports shall be fabricated and installed in accordance with ANSI/MSS SP-58 Pipe hangers and supports – materials, design, manufacture, selection, application, and Installation and CSA S832-06 requirements.

1.14 COORDINATION

- .1 Information involving accurate dimensioning of the building shall be taken from site by Contractor.
- .2 Drawings are in diagrammatic form, intended to convey the scope of work and general arrangement for equipment. Coordinate physical location of all equipment with other trades
- .3 And allow for any additional conduit, wiring, fittings, supports, etc., in order to avoid interference and facilitate the work.
- .4 The Contractor to make any necessary modifications or additions, without charge, to accommodate site conditions and coordination.
- .5 Coordinate and verify all electrical branch circuit requirements for equipment supplied by others, prior to material procurement or installation.
- .6 Provide all wiring to all mechanical equipment, including wiring below 50v. Coordinate all mechanical equipment wiring with mechanical trades.

- .7 All device and outlet locations shall be carefully coordinated with the Contractor or Owner, to accommodate all building features.

1.15 START-UP, COMMISSIONING AND TRAINING

- .1 Start-up and commission all systems installed, modified or reinstalled as part of the work.
- .2 Perform systematic tests, procedures and check systems as follows:
 - .1 To verify correct operation in accordance with Contract Documents, design criteria and intent, and manufacturer's requirements.
 - .2 To ensure appropriate documentation is provided;
 - .3 To effectively train building operational staff.
- .3 Systems are to be operated at full capacity, with correction of all deficiencies and adjustments to meet optimum performance.
- .4 Provide written report at end of commissioning outlining equipment operational conditions and parameters.

END OF SECTION

