TECHNICAL SPECIFICATIONS FOR

TORONTO DISTRICT SCHOOL BOARD

Windows Replacement and Exterior Restorations at Garden Ave Junior Public School

225 Garden Ave, Toronto, Ontario
M6R 1H9

TDSB PROJECT NO.: TR-18-0636
EAI Project No.: 219119

DATE: Issued for Tender: November 25th, 2019

ARCHITECTURAL CONSULTANT
ETUDE ARCHITECTS INC.

STRUCTURAL
NCK ENGINEERING

MECHANICAL/ELECTRICAL CONSULTANT
TWA ENGINEERING INC.

SET NUMBER

Windows Replacement and Exterior Restorations at Garden Ave Junior Public School

DOCUMENT 0 - INTRODUCTORY INFORMATION
BIDDING REQUIREMENTS, CONTRACT REQUIREMENTS

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DIVISION 2 - SITE CONSTRUCTION

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DIVISION 4 – MASONRY

DIVISION 5 - METALS

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STRUCTURAL DRAWINGS

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END OF DOCUMENT

1. General

1.1 Provide public way and overhead protection at all building entrances and public ways exits in accordance with applicable Acts and Regulations. Overhead protection on private property shall meet the same requirements as public way protection. A covered way shall be capable of supporting any load likely to be applied to it. As a minimum, the covered way shall be capable of supporting a load of at least 2.4kN/m². Submit overhead protection drawings, signed and sealed by a Professional Engineer licensed to practice in the Work location and having the appropriate Building Code certification. The overhead protection drawings shall include a comment confirming the overhead protection's capability to withstand likely impact loads.

1.2 Prior to the start of the work, submit written confirmation that the installation has been completed in accordance with the drawings submitted, signed by a Professional Engineer licensed to practice in the Work location.

2. Access Design

2.1 Scaffolding shall be designed by a Professional Engineer Registered in the location of the Work as required by applicable construction safety regulations. As a minimum, this shall be required for scaffolding over 15m high or 10m in height if constructed of a tube and clamp system. Submit stamped shop drawings for consultant review a minimum of one week prior to erection of scaffold.

2.2 Drawings shall indicate all materials to be used and fastening mechanisms.

2.3 Prior to the start of the work, submit written confirmation that the installation has been completed in accordance with the drawings, signed by a Professional Engineer licensed to practice in the Work location.

2.4 Prior to the start of the work, submit a work plan as per CSA Standard Z91, Health and Safety Code for Suspended Equipment Operations.

END OF SECTION

1 GENERAL

1.1 The requirements of the Articles of Agreement, Conditions of the Contract, Division 1 apply to and form all Sections of the Contract Documents and the Work.

1.2 Work in this Specification is divided into descriptive sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and their Subcontractors. The Contractor is responsible for organizing division of labour and supply of materials essential to complete the Contract.

1.3 It is intended that Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Including materials not herein mentioned, but which may be found necessary to complete or perfect any portion of Work in accordance with the Contract Documents.

1.4 Work designated as “N.I.C.” is not included in this Contract.

1.5 Specifications, Schedules and Drawings are complementary and items mentioned or indicated on one may not be mentioned or indicated on the others.

1.6 Mention in the specifications or indication on the drawings of materials, Products, operations, or methods, requires that the Contractor Provide each item mentioned or indicated of the quality or subject to the qualifications noted; perform according to the conditions stated each operation prescribed; and provide labour, materials, Products, equipment and services to complete the Work.

1.7 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.

1.8 The terms “approved”, “review”, “acceptance”, “acceptable”, “satisfactory”, “selected”, “directed”, “required”, “submit”, or similar words or phases are used in standards or elsewhere in Contract Documents, it shall be understood, that words “by (to) the Consultant” follow, unless context provides otherwise.

1.9 The terms “exposed” or “exposed to view” refers to surfaces that are within the line of vision of persons from any accessible viewpoint, both within and without the building. Where any part of a surface is exposed to view, all other portions of that surface shall also be considered as exposed to view.

1.10 Refer to TDSB General Requirements and shall take precedence in the case of any discrepancies.

2 EXISTING SITE CONDITIONS

2.1 Make a careful examination of the site, and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken, as to the means of access and egress thereto and therefrom, as to the obstacles to be met with, as to the extent of the Work to be performed and any and all matters which are referred to in the Contract Documents.

2.2 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to the Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant.

2.3 Before commencing the Work of any Section or trade, carefully examine the Work of other Sections and trades upon which it may depend, examine substrate surfaces, and report in writing to the Consultant, defects which might affect new Work. Commencement of Work shall constitute acceptance of conditions and Work of other sections, trades, and Other Contractors upon which the new Work depends. If repair of surfaces is required after commencement of specific work it shall be included in the work of the trade providing the specific system or finish.

2.4 Record pre-existing site conditions in accordance with TDSB General Requirements.

3 USE OF SITE

3.1 Accept full responsibility for assigned work areas from the time of Contract award until Substantial Performance of the Work.

3.2 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances of exits. Direct construction traffic and locate access to site as directed by municipality.

3.3 Where encroachment beyond property limits is necessary make arrangements with respective property owners.

4 ACCESS/PROPERTY CONSTRAINTS

4.1 The building will remain occupied throughout construction and will require hoarding and access routes to be maintained during normal hours of operation. Areas of the Work in existing buildings shall be carried on at all times so that there will be a minimum of interference with the normal function of the facility.

4.2 Provide and maintain access facilities as may be required for access to the Work.

4.3 Minimize disruption, noise and dust to the functions of existing operational areas of existing buildings. Times of entry, routes of access and time required to complete the Work shall be arranged and scheduled in cooperation with the Owner.

4.4 Confine Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.

4.5 Organize delivery of materials/equipment to and removal of debris and equipment from place of Work to permit continual progress of work and suitable for restricted site conditions.

4.6 Contractor to receive all construction deliveries and endeavour to avoid such deliveries interrupting the school office. School staff shall not sign for any construction related deliveries.

4.7 Determine and make arrangement as required for loading and unloading of equipment and Products at times that will not affect public traffic flow and that will be permitted by the City of Toronto. Conform to City by-laws with regard to parking restrictions and other conditions.

4.8 Make provisions and arrangements and provide allowances if times for loading and unloading allowed by the City of Toronto are other than regular working hours.

4.9 All Products, materials and equipment required on Site shall be portable and/or size suitable for access and movement on Site and without causing damage to buildings.

4.10 Workers shall not enter existing building beyond construction areas except where required for connection or modification to existing services or other such work. Arrange such requirements with Owner prior to entering existing occupied areas.

4.11 Provide locked doors in barriers, permit access by Owner and Consultant to Work areas and to areas Contractor is responsible for.

4.12 Personnel access and material deliveries to the Site shall be only by routes designated by the Owner. Coordinate delivery times with the Owner to be as permitted by the Owner.

Owner's equipment such as trucks, bins, dollies, and other such equipment/facilities shall not be used by Contractors. Arrangements for handling items weighty or bulky enough to require special treatment must be made and reviewed with the Owner.

4.13 Advise the Owner 48 hours in advance of large or cumbersome item deliveries. Give particulars of item size and weight, protection to existing surfaces to be provided and safety precautions during movement.

5 ACCESS TO AND DRIVING IN SCHOOL YARDS

5.1 Access to School Yard: Vehicles shall not enter or be parked in school yards without first obtaining the authorization of the school principal or his/her designate, usually the Chief Caretaker.

5.2 Driving in School Yards: When a vehicle is being driven on the school grounds, the driver shall observe normal safe driving practices consistent with proximity to school zones, and escorted by a designated “flagman” on foot.

5.3 No vehicle shall be left unsupervised with keys in the ignition, nor with its engine running.

6 SECURITY

6.1 Be responsible for security of all areas affected by Work of this Contract until taken over by Owner. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause.

6.2 Provide suitable surveillance equipment and/or employ guard services, as required to adequately protect the work in accordance with TDSB General Requirements.

6.3 Make provisions to permit Owner's security personnel to view areas where all Work is being performed.

6.4 Take acceptable precautions to guard Work site, premises, materials and the public during and after working hours due to the Work of this Contract.

6.5 Any security service provided by the Owner is for the protection of the Owner's interest in the Work on the Site and shall not relieve the Contractor of the responsibility to protect the Site and the Work of the Contract.

7 SCHOOL SAFETY

7.1 Contractor shall understand, and ensure that all Trades understand that student safety is the first priority in all instances.

7.2 The building shall remain secure from intrusion at all times. Buildings which have a surveillance system shall have the surveillance system operational at all times. In such cases where the surveillance system must be shut down by the Contractor to effect repairs or other alterations of any description the Contractor shall be to protect the premises outside the school's normal hours of operation.

7.3 All personal injury incidents and property damage, no matter how minor, which occur on school property, shall be reported immediately to the school principal.

8 CONTINUITY OF EXISTING SERVICES

8.1 Contractor must organize work at the school in cooperation with the Principal, through the Consultant, so that the academic programme of the school is not disrupted.

8.2 Shutdowns and planning of operations that may affect Owner's use of services shall be coordinated with and in accordance with the Owner's written directions. Provide notice for all required interruptions to utility, heating, cooling, mechanical, electrical, and life safety systems.

8.3 Coordinate and provide necessary services, access, exiting and other facilities as required.

8.4 Make written requests for shutdown at least 5 working days in advance, unless specifically stated herein or as otherwise instructed by the Owner.

8.5 Shutdowns shall be scheduled in advance with Owner and shutdown period shall be minimized to Owner's convenience. Facilities in existing adjacent areas will be occupied during the Work.

8.6 Major shutdowns shall take place on weekends or at night by prior arrangement with and at no additional cost to the Owner.

8.7 Tag and mark switches and valves used by the Contractor to isolate services with name of Contractor, tradesman's name, date and time of shut-off, and date and time to be turned back on.

8.8 Arrange work so that physical access to existing adjacent facilities is not unduly interrupted at any one time except as provided otherwise.

8.9 Protect existing work to remain at the commencement of each work shift in occupied areas, as completely as possible to hold the replacing of damaged work to a minimum. Provide covering and other protection material. Include protection for access routes and temporary storage areas. Make good damage to existing surfaces caused by lack of adequate protection. Protection in such areas shall be removed at the end of each work shift.

8.10 All areas shall be cleaned and left in condition suitable for use by Owner and building operations before commencement of their work day.

8.11 Minimize disruption, vibration, noise and dust to the function if existing building. Machine tools which are set up in fixed locations shall be so located as to minimize noise and suitable sound deflectors shall be used if directed by the Consultant. Air compressors and pneumatic hammers shall be used only with the express authorization of the Consultant. Gasoline welding machines or gasoline driven compressors shall not be used. The Contractor may be requested from time to time to suspend noisy or otherwise objectionable operations during certain functions, should such operations cause undue interference with the said functions. The Contractor will be expected to extend the fullest co-operation and courtesy in such cases.

8.12 These requirements are for security reasons and for the consideration of the Owner. Requirements shall not be construed as cause for elimination or restriction of Contractor's working schedule, claims for delay or work, nor additional cost.

9 **ASBESTOS (ACM's)**

9.1 No products, materials or equipment containing asbestos in any form will be permitted to be used on the project.

9.2 Prior to any work being done, the Contractor shall review the Asbestos Management Program Manual of each school and the Hazardous Materials Report in this specification with the Head Caretaker and determine whether ACM's will be disturbed by project work.

9.3 If it is determined by the Contractor that ACM's will be disturbed, the Contractor shall notify the Owner of their findings. The Owner shall arrange for appropriate remedial action prior to commencement of the project work.

9.4 If the Contractor encounters "unexpected" ACM's during the course of demolition of work, the Contractor shall temporarily cease such work at once, immediately inform Head Caretaker for fan shutdown, and report to the Consultant.

10 **WASTE AUDIT/PLANS FOR WASTE REDUCTION**

10.1 Comply with requirements of authorities having jurisdiction.

10.2 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.

10.3 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.

10.4 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.

END OF SECTION

1 GENERAL

1.1 Allowances included in the Tender Price Schedule are for items of Work which could not be fully quantified prior to Bidding.

1.2 Expend each allowance as directed by the Consultant in writing. Work covered by allowances shall be performed for such amounts and by such persons as directed by Consultant.

1.3 Each allowance will be adjusted to actual cost as defined hereunder and the Contract Price will be amended accordingly by Contract Change Order.

1.4 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in Conditions of the Contract.

1.5 A schedule shall be prepared jointly by the Consultant and Contractor to show when items called for under allowances must be authorized by the Consultant for ordering purposes so that the progress of the Work will not be delayed.

1.6 Where a Cash Allowance is for work performed under a Subcontract, the Contractor or Consultant shall Bid the work involved and submit the Bids received, with the Contractor's recommendations, for approval.

1.7 Refer to TDSB Supplementary Articles Definitions and Conditions.

2 CASH ALLOWANCES

2.1 Cash allowances, unless otherwise specified, cover the net cost to the Contractor of services, Products, construction machinery and equipment, freight, handling, unloading, storage, installation where indicated, and other authorized expenses incurred in performing the Work. Cash allowances shall not be included by a Subcontractor in the amount for their Subcontract work.

2.2 Overhead and Profit for cash allowances may only be charged against sum total of all cash allowances. Refer to TDSB Supplementary Articles, Definitions and Conditions. Overhead and profit for cash allowances shall be included in base bid price identified in the Bid Form.

2.3 Supply only allowances shall include:
- .1 Net cost of Products.
- .2 Delivery to Site.
- .3 Applicable taxes and duties, excluding HST.

2.4 Supply and install allowances shall include:
- .1 Net cost of Products.
- .2 Delivery to Site.
- .3 Unloading, storing, handling or Products on Site.
- .4 Installation, finishing and commissioning of Products.
- .5 Applicable taxes and duties, excluding HST.

2.5 Inspection and testing allowances shall include:
- .1 Net cost of inspection and testing services.
- .2 Applicable taxes and duties, excluding HST.

2.6 Other costs related to work covered by cash allowances are not covered by the allowance but shall be included in the Contract Price.

2.7 Where costs under a cash allowance exceeds the amount of the allowance, the Consultant will re-allocate other unexpended allowances to cover the difference. Refer to TDSB Supplementary Articles, Definitions and Conditions.

2.8 Progress payments on accounts of work authorized under cash allowances shall be included in the monthly certificate for payment.

2.9 Submit, before application for final payment, copies of all invoices and statements from suppliers and Subcontractors for work which has been paid from cash allowances.

END OF SECTION

1 GENERAL

1.1 Coordination of the Work of all Sections of the specifications as required to complete the Project is the responsibility of the Contractor.

1.2 Cooperate and coordinate with Other Contractors including Other Contractor's employed by Owner. Ensure that Subcontractors and trades cooperate and coordinate their work to have the Work performed expeditiously and to be satisfactory in all respects at completion. Ensure cooperation of workers in laying out and performing Work. Maintain efficient and continuous supervision.

1.3 Ensure that Subcontractors and trades cooperate with other subcontractors and trades whose work attaches to or is affected by their own work. Ensure that minor adjustments are made to make adjustable work fit fixed work.

1.4 Allow access of Owner's and Other Contractors on site and to areas of Work. Cooperate and coordinate with such Other Contractors. Schedule work to complement work of such Other Contractors.

1.5 Entry by the Owner's own forces and by Other Contractors shall not mean acceptance of the Work and shall not relieve the Contractor of their responsibility to complete the Contract.

1.6 Placing, installation, application and connection of work by the Owner’s own forces or by Other Contractors on and to the Contractor's Work shall not relieve the Contractor of his responsibility to provide and maintain the specified warranties.

1.7 Coordinate with removals/installations specified in other Divisions and Other Contracts.

1.8 Coordinate the work of this Contract with work of designated substance removal work and demolition work under separate contract. No allowance shall be made subsequently by the Owner or Consultant for lack of coordination and no claim will be considered for circumstances and omissions which could have been coordinated, prevented or included for had these procedures been followed.

1.9 Coordination of the installation of systems specified in Divisions 15 and 16, including the interrelating operation and functioning between components of a system and between systems, is the responsibility of those performing the work of those Divisions, with final coordination the responsibility of the Contractor.

1.10 Coordinate relocation of existing mechanical and electrical items with work specified in Divisions 15, and 16.

1.11 Existing equipment shall remain in present locations unless designated otherwise. Protect from damage. Remove, store and reinstall existing fixed equipment, fixtures and components which interfere with construction and which are scheduled for relocation.

1.12 Pay particular attention to types of ceiling construction and clearances throughout, especially where recessed fixtures are required. Coordinate work with Other Contractors and Subcontractors wherever ventilation ducts or piping installations occur to ensure that conflicts are avoided.

1.13 Install ceiling mounted components in accordance with final ceiling plans. Inform Consultant of conflicting installations. Install as directed.

1.14 Install and arrange ducts, piping, tubing, conduit, equipment, fixtures, materials and product to conserve headroom and space with minimum interference and in neat, orderly and tidy arrangement. Run pipes, ducts, tubing and conduit, vertical, horizontal and square with building grid unless otherwise indicated. Install piping, ducts, and conduit as close to underside of structure as possible unless shown otherwise.

1.15 Make provision for unrestricted relocation of light fixtures to replace ceiling panels at grid spaces of the same size, without interference or restriction by items located within the ceiling space.

1.16 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Have cutting, drilling and other remedial work, and the subsequent patching or other work required for failing to comply with this requirement, performed at a later date at no additional Cost to Owner.

1.17 Properly coordinate the work of the various Sections and trades, taking into account the existing installations to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to the Consultant for review before the commencement of work.

1.18 Coordinate with mechanical and electrical trades to ensure protecting supporting, disconnecting, cutting off, capping, diverting, relocating or removing of existing services in areas of Work before commencement of alteration work.

1.19 Execute Work at times to ensure a minimum of disturbance to building occupants and in compliance with the Tenant Leasehold Improvement Manual.

1.20 In case of damage to active services on utilities, notify Consultant and respective authorities immediately and make all required repairs under direction of Consultant and respective authorities. Carry out repairs to such damaged services and utilities continuously to completion, including working beyond regular working hours.

1.21 Existing areas shall remain in use except where alteration work is actually in progress. Confine effects of Work to areas indicated on Drawings unless otherwise approved by Owner.

2 METRIC DIMENSIONS

2.1 Measurements are expressed in metric (SI) units and depending on the progress made in the various sectors of the industry are either hard or soft converted units.

2.2 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.

2.3 It is the Contractor's responsibility to check and verify with manufacturers and suppliers on the availability of materials and products in either metric or imperial sizes. Be responsible for coordinating products supplied in metric (SI) and imperial units into the overall layout.

2.4 Where both metric and imperial sizes or dimensions are shown, the metric size or dimension shall govern.

3 BUILDING DIMENSIONS

3.1 Take necessary job dimensions for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.

3.2 Verify that work, as it proceeds, is executed in accordance with dimensions and positions indicated which maintain levels and clearances to adjacent work, as set out by requirements of the Drawings, and ensure that work installed in error is rectified before construction resumes.

3.3 Check and verify dimensions referring to the work and the interfacing of services.

3.4 Do not scale directly from the Drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Changes through the disregarding of this clause shall be the responsibility of the Contractor.

3.5 All details and measurements of any work which is to fit or to conform with work installed shall be taken at the building.

3.6 Advise Consultant of discrepancies and if there are omissions on Drawings, particularly reflected ceiling plans and jointing patterns for surfaces finishes, which affect aesthetics, or which interfere with services, equipment or surfaces. Do not proceed with work affected by such items without direction from the Consultant.

3.7 Provide written requirements for site conditions and surfaces necessary for the execution of respective work, and provide setting drawings, templates and all other information necessary for the location and installation of material, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels. Inform respective contractors whose work is affected by these requirements and preparatory work.

4 INTERFERENCE AND COORDINATION DRAWINGS

4.1 Coordinate placement of equipment to ensure that components will be properly accommodated within the spaces provided prior to commencement of work.

4.2 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided. Provide copies of interference drawings to Consultant when requested by Consultant.

4.3 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.

4.4 Take complete responsibility for any remedial work that results from failure to coordinate any aspect of the Work prior to its fabrication/installation.

4.5 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are provided in the layout of equipment and services.

5 SLEEVING AND INSERT DRAWINGS AND TEMPLATES

5.1 Prepare sleeving drawings for work of Divisions 15, and 16, showing size and location of all penetrations through load bearing elements. Submit sleeving drawings in the form of one transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.

5.2 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings in the form of a transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.

5.3 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, fixtures, equipment, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires cooperative location and installation by other Sections, and that such information is communicated to the applicable installer. Have cutting, fixing and making good to the work of Other Contractors, Subcontractors and trades required for, and make up time lost as result of, failure to comply with this requirement, at no additional cost to Owner.

END OF DOCUMENT

1 PRE CONSTRUCTION MEETING

1.1 Attend a pre-construction meeting, arranged and conducted by the Consultant.

1.2 Co-ordinate and organize attendance by representatives of major Subcontractors and parties in contract with the Contractor.

1.3 Consultant will arrange attendance of other interested parties not responsible to the Contractor.

1.4 Consultant will distribute copies of Agenda prior to meeting.

1.5 Agenda will include but not be limited to the following topics as are pertinent to the Contract.

.1 Review project communications procedures.

.2 Review contract administration requirements including submittals, payment, and change order procedures.

.3 Identify all critical points on construction schedule for positive action.

.4 Identify any product availability problems and substitution requests.

.5 Establish site arrangements and temporary facilities.

.6 Review Consultants's inspection requirements.

.7 Review any points which, in Owner's, Consultants, and Contractor's opinion, require clarification.

1.6 Be prepared to provide specific information relative to agenda items as they are pertinent to the Contract.

2 PROGRESS MEETINGS

2.1 Attend regularly scheduled progress meetings to be held on Site at times and dates that are mutually agreed to by the Owner, Consultant, and Contractor.

2.2 Co-ordinate and organize attendance of individual Subcontractors and material suppliers when requested. Relationships and discussions between Subcontractor participants are not the responsibility of the Consultant and do not form part of the meetings content.

2.3 Ensure that Contractor representatives in attendance at meetings have required authority to commit Contractor to actions agreed upon. Assign same persons to attend such meetings throughout the contract period.

2.4 Inform the Consultant in advance of meetings regarding all items to be added to the agenda.

2.5 Be prepared to provide specific information relative to agenda items at each meeting as they are pertinent to the Contract.

2.6 Agenda will include but not be limited to the following topics as are pertinent to the Contract.

.1 Review and agreement of previous minutes.

.2 Construction safety.

.3 Status of submittals.

.4 Quality control.

.5 Co-ordination.

.6 Contract Schedule

.7 Work plan up to next scheduled meeting.

.8 Requests for information/clarification.

.9 Contemplated changes.

2.7 Record minutes of meeting and distribute type written copies to all participants and other interested parties, within one week of meeting date.

END OF SECTION

1 **GENERAL**

1.1 Be responsible for planning and scheduling of the Work. As a minimum, prepare and update the following schedules:

.1 Contract Schedule.

.2 Detailed Construction Schedule.

1.2 Be responsible for ensuring that Subcontractors plan and schedule their respective portions of the Work. Subcontractor's schedules shall form part of the above mentioned schedules.

2 **CONTRACT SCHEDULE**

2.1 Prepare and submit the Contract Schedule within 5 days following award of Contract. This schedule, once it is reviewed by the Consultant and if it meets the Consultant's project requirements, will become contractual.

2.2 The Contract Schedule shall be developed using a logic network technique for planning and scheduling.

2.3 The Contract Schedule shall be submitted for approval in its optimum levelled form. This presentation may be in either a time scaled network or a bar chart form. It shall be subdivided into either work areas or systems as applicable.

2.4 The Contract Schedule shall include the following information:

.1 Starting and ending dates of each activity including the float periods;

.2 Manpower requirements for each activity;

.3 Order and delivery dates for major or critical equipment.

.4 Interdependency with activities of other Contractors;

.5 Dates specified in the Contract Documents;

.6 Dates on which specific data will be required for submittal, i.e., Vendor data, shop drawings, samples, etc.

2.5 This schedule shall be reviewed and updated monthly by the Contractor so as to reflect any Contract changes as well as major changes to the schedule.

3 DETAILED CONSTRUCTION SCHEDULE

3.1 Prepare and submit a detailed construction schedule within 14 days of final review and acceptance of the Contract Schedule. This schedule, once it is reviewed and accepted by the Consultant, will be updated and submitted monthly with the Contract Schedule and weekly once the Contractor starts on Site.

3.2 This schedule shall cover the construction period. It will show, in detail, activities on a daily basis indicating durations, manpower and constraints. The activities shown on this schedule shall further clarify or detail the activities shown on the Contract Schedule.

3.3 The detailed construction schedule shall be presented in a bar chart form.

END OF SECTION

1 **GENERAL**

1.1 Provide labour, Products, equipment, services tools and supervision necessary for submittals. Make submittals specified in this Section to Consultant unless otherwise specified.

.1 Verify accuracy and completeness of submittals prior to submission.

.2 Verify field measurements, field construction criteria, catalogue numbers and similar data.

.3 Co-ordinate each submittal with requirements of the Work and the Contract Documents.

.4 Notify Consultant in writing at time of submission, of any deviation in submittals from requirements of the Contract Documents.

1.2 Submit in accordance with dates established under Section 01 33 00 for shop drawings, fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.

1.3 Accompany each submittal with a letter of transmittal in duplicate containing all pertinent information required for identification and checking of submittals including but not limited to the following:

.1 Date of initial submission and date of each subsequent submission if required.

.2 Project title and Consultant’s project number.

.3 Names of: .1 Contractor. .2 Subcontractor. .3 Supplier/manufacturer as applicable.

.4 Specification section numbers to which submission is related.

.5 Countersigned stamp of Contractor certifying that they have reviewed the submission.

1.4 Allow two week for the Consultant's review of each submission.

1.5 When submittals are resubmitted, transmit under a new letter of transmission.

1.6 Do not carry out Work until Consultants review of submittals has been completed.

1.7 Be responsible for payment of charges for delivery of submissions and resubmission to Consultant.

2 PRODUCT DATA

2.1 Before delivery of Products to the Site, submit Product data as specified in each section or as requested by the Consultant.

2.2 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable standards.

3 SAMPLES

3.1 Before delivery of Products to the Site, submit samples of Products as specified or as requested by the Consultant. Label samples as to origin and intended use in the Work and in accordance with the requirements of the Specification Sections. Samples must represent physical examples to illustrate materials, equipment or work quality and to establish standards by which completed Work is judged.

3.2 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:

.1 The quality and functional characteristics of Products, with integrally related parts and attachment devices.

.2 Full range of colours available.

3.3 Notify the Consultant in writing, at time of submission, of any deviations in samples from requirements of the Contract Documents, and state the reasons for such deviations.

3.4 Identify samples with Project name, Contract number, date, Contractor's name, number and description.

3.5 If samples are not acceptable, both samples will be returned. If samples are acceptable, one sample will be so indicated and returned. Be responsible for the cost of samples that are not accepted and for resubmission of samples.

3.6 Acceptable samples shall serve as a model against which the products incorporated in the work shall be judged.

3.7 Each Product incorporated in the Work shall be precisely the same in all details as the acceptable sample.

3.8 Should there be any change to the accepted sample, submit in writing for approval of the revised characteristics and resubmit samples of the Product for approval if requested.

3.9 When samples are very large, require assembly, or require evaluation at the Site, they may be delivered to the Site, but only with approval and as directed.

4 SHOP DRAWINGS

4.1 Arrange for the preparation of shop drawings as called for in the Contract Documents or as may be reasonably requested by the Consultant. The Contractor and each Subcontractor shall operate as experts in their respective fields and all shop drawings and samples shall conform to the requirements of the Contract Documents.

4.2 The term “shop drawings” means drawings, diagrams, schematics, illustrations, schedules, performance charts, brochures and other data which are required to illustrate details of the Work.

4.3 In addition to shop drawings specified in the specification sections, submit shop drawings required by jurisdictional authorities in accordance with their requirements.

4.4 Shop drawings for openings, sleeving and conduit

.1 Prior to preparation of shop drawings, coordinate sizes of all structural openings and sleeves with respective fabricators for mechanical ducting. Adjustments to the opening sizes indicated on the Contract Drawings shall not be made without the approval of the Consultant.

.2 Prior to detailing structural reinforcement on shop drawings, arrange for the Engineer of structure to review formed holes, recesses and sleeving. Completely dimension openings, recesses and sleeves and relate to suitable grid lines and elevation.

.3 Prior to forming of the structure, arrange for the preparation of shop drawings for review by the Consultant showing embedded conduit to be cast within the structure. Shop drawings shall include conduit from all sources.

4.5 Shop drawings shall indicate the following minimum criteria and any additional criteria indicated in the individual specification sections requiring shop drawings:

.1 Clear and obvious notes of any proposed changes from the Contract Documents.

.2 Fabrication and erection dimension.

.3 Provisions for allowable construction tolerances and deflections provided for live loading.

.4 Details to indicate construction arrangements of the parts and their connections, and interconnections with other work.

.5 Location and type of anchors and exposed fastenings.

.6 Materials, physical dimensions including thicknesses, and finishes.

.7 Descriptive names of equipment.

.8 Mechanical and electrical characteristics when applicable.

.9 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnection work.

.10 Assumed design loadings, and dimensions and material specifications for load-bearing members.

4.6 Include in shop drawing submissions detailed information, templates, and installation instructions required for incorporation and connection of the Work.

4.7 Before submitting to the Consultant, review all shop drawings to verify that the Products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers and similar data and that it has checked and coordinated each shop drawing with the requirements of the Work and of the Contract Documents. The Contractor's review of each shop drawing shall be indicated by stamp, date and signature of a qualified and responsible person possessing the appropriate authorization.

4.8 Be responsible for dimensions to be confirmed and correlated at the Site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the Work of all subtrades.

4.9 Submit shop drawings for the Consultant's review with reasonable promptness and in orderly sequence so as to cause no delay in the Work nor in the work of Other Contractors. At the time of submission, notify the Consultant in writing of any deviations in the shop drawings from the requirements of the Contract Documents. The Contractor will be held responsible for changes made from the Contract Documents which are not indicated or otherwise communicated in writing with the submission.

4.10 Drawings submitted by the Contractor as required herein are the property of the Owner who may use and duplicate such drawings where required in association with the Work.

4.11 Submit shop drawings, as indicated in each section of the Work, signed and sealed by a licensed Professional Engineer registered in the place of the Work.

4.12 Shop drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints and also facilitate microfilming and reduced reproduction.

4.13 Submit six (6) copies of shop drawings. Any shop drawing submitted electronically must be followed up by hard copies. All drawings exceeding 8-1/2" x 11" format shall have a reproducible copy submitted along with 3 prints. However, in instances where catalogue items are specified, three clean copies of the manufacturer's catalogue may be submitted.

4.14 Shop drawings shall contain the following identification:

.1 Project name and Contract number.

.2 Applicable 5-digit Contract Specification number describing the item.

.3 Location (unit, level, room number, etc.).

.4 Name of equipment or Product.

.5 Name of Subcontractor or supplier.

.6 Signature of Contractor certifying that Shop drawing is in conformance with Contract Documents.

.7 On submissions subsequent to the first, the following additional identification:

.1 The revision number.

.2 Identification of the item(s) revised.

4.15 Dimensions and designations of elements shall be shown in the same system of measurement used on the applicable Contract Drawings.

4.16 The Consultant reserves the right to refuse acceptance of drawing submissions not meeting the above requirements.

4.17 The Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the shop drawings has been approved in writing by the Consultant.

4.18 The Contractor shall make any changes in shop drawings which the Consultant may require consistent with the Contract Documents and re-submit unless otherwise directed by the Consultant. When re-submitting the shop drawings, the Contractor shall notify the Consultant in writing of any revisions other than those requested by the Consultant.

4.19 Only drawings noted for revision and resubmission need be resubmitted.

4.20 File one copy of each submitted shop drawing at the Site.

5 **CERTIFICATES**

5.1 Submit certificates that are required by authorities having jurisdiction or that are requested in the specification sections.

5.2 Clearly show on each certification the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery and name of certifying company.

5.3 Certificates shall verify that Products and/or methods meet the specified requirements and shall include test reports of acceptable testing laboratories to validate certificates.

5.4 Submit certificates in duplicate and signed by an authorized representative of the certifying company.

6 CERTIFICATION OF TRADESMEN

6.1 Provide certificates, at the request of the Consultant, to establish qualifications of personnel employed on the Work where such certification is required by authorities having jurisdiction, by the Consultant or by the Contract Documents.

7 WARRANTIES

7.1 Submit extended warranties as requested in sections of the Specifications showing title and address of Contract, warranty commencement date and duration of warranty.

7.2 Extended warranties shall commence on termination of the standard warranty specified in the conditions of the contract and shall be an extension of these provisions. Clearly indicate what is being warranted and what remedial action is to be taken under the warranty. Ensure warranty bears the signature and seal of the Contractor.

7.3 Submit each extended warranty on a form that is acceptable to the Owner and Consultant.

8 INSPECTION AND TEST REPORTS

8.1 Submit inspection and test reports as specified in the Sections of the specifications for “Source Quality Control” and “Field Quality Control” within 3 working days of inspection or testing. If immediate action is required by the Contractor or Consultant inform the Consultant immediately and submit inspection and testing report within one working day.

8.2 Submit 3 copies of reports submitted with certificates of compliance indicating but not limited to the following:

.1 Project name and number.

.2 Date of inspection or test and date report is issued.

.3 Name and address of inspection and testing company.

.4 Name and signature of inspector or tester.

.5 Identification of Product and Specification Section covering inspected or tested work.

.6 Specified requirements for which the inspection or testing was performed and results of inspections or tests.

.7 Location of inspection or from which tested material was derived.

.8 Overview of inspection and testing methods and procedures.

.9 Remarks and observations on compliance with Contract Documents.

8.3 Inspection and test reports shall be signed by a responsible officer of the inspection and testing company.

9 PROGRESS PHOTOGRAPHS

9.1 Contractor to record progress with digital photographs and must be ready to submit photos of progress as requested.

10 PROGRESS REPORTS

10.1 Prepare a monthly progress report current to the last Friday of each month. The report shall indicate the period covered and include but not be limited to the following:

.1 Executive Summary.

.2 Areas of Concern/Action Required.

.3 Work Accomplished This Period.

.4 Work Planned Next Period.

.5 Schedule Status.

.6 Budget Status.

.7 Status of Submittals.

.8 Quality Control.

.9 Contract Changes.

.10 Outstanding Actions.

10.2 Submit the monthly progress report such that it is received by the Consultant no later than the Wednesday following the last Friday of the month, regardless of whether or not the Monday is a public holiday.

11 OPERATION AND MAINTENANCE MANUALS

11.1 Refer to TDSB General Requirements Section and submit Operation and Maintenance Manuals in accordance with Section 01730.

12 RECORD DOCUMENTS

12.1 Refer to TDSB General Requirements Section and submit record documents in accordance with Section 01720.

END OF SECTION

1 GENERAL

.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.

.2 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections.

.3 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

2 INSPECTION AND TESTING BY THE OWNER

.1 The Owner may appoint an independent inspection and testing company to carry out inspection and testing of the Work for conformance to the Contract Documents. Such costs for inspection and testing will be paid by the Owner. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.

.2 Inspections and testing by the Owner will be promptly made. Uncover for examination any Work covered up prior to inspection or without approval of the Consultant. Make good such Work at no cost to the Owner.

.3 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.

3 INSPECTION AND TESTING

.1 Source and Field Quality Control specified in Other Sections:

.1 This Section includes requirements for performance of inspection and testing specified under Source Quality Control and Field Quality Control in other Sections of the specifications.

.2 Do not include in work of this Section responsibilities and procedures that relate solely to an inspection and testing company's functions that are specified in another Section which is paid for directly by the Owner. Such information is included in this Section for Contractor's information only.

.2 Do not limit responsibility for ensuring that products and execution of the work meet Contract requirements, and inspection and testing required to this end, to specified inspection and testing.

.3 Arrange for inspection of all work by authorities having jurisdiction. Submit final unconditional certificate of approval by inspecting authorities.

.1 Provide Consultant and Owner’s Representative 24 hour notice of date

when tests will occur.

.2 Do not conceal work until tested and approved.

.3 Re-testing and re-inspections of work found deficient, and costs of making good, shall be paid for by the Contractor.

4 QUALIFICATIONS OF INSPECTION AND TESTING COMPANIES

.1 Inspection and testing companies to be certified by the Standards Council of Canada.

.2 Companies engaged for inspection and testing shall provide equipment, methods of recoding and evaluation, and knowledgeable personnel to conduct tests precisely as specified in reference standards.

.3 If requested, submit affidavits and copies of certificates of calibration made by an accredited calibrator to verify that testing equipment was calibrated and its accuracy ensured within the previous twelve months.

5 **RESPONSIBILITIES OF THE CONTRACTOR**

.1 Be responsible for quality control methods and procedures to ensure performance of the work in accordance with the Contract Documents.

6 **RESPONSIBILITIES OF INSPECTION AND TESTING COMPANIES**

.1 Determine from specifications and Drawings the extent of inspection and testing required for Work of the Contract. Subcontractors shall notify Consultant of any omissions or discrepancies in the work inspected and/or tested.

.2 Perform applicable inspection and testing described in the Specifications and as may be additionally directed.

.3 Provide competent inspection and testing personnel when notified by the Contractor that applicable work is proceeding. Inspection personnel shall cooperate with the Consultant and Contractor to expedite the Work.

.4 Subcontractors shall notify the Consultant and Contractor of deficiencies and irregularities in the Work immediately when they are observed in the course of inspection and testing.

.5 Inspection and testing companies shall not perform or supervise any of the Contractor's work, and shall not authorize:

.1 Performance of work that is not in strict accordance with the Contract Documents.

.2 Approval or acceptance of any part of the Work.

7 **INSPECTION AND TESTING PROCEDURES**

.1 Perform specified inspection and testing only in accordance with specified reference standards, or as otherwise approved.

.2 Observe and report on compliance of the Work to requirements of Contract Documents.

.3 Ensure that inspectors are on site or at fabricator's operations for full duration of

critical operations, and as otherwise required to determine that the Work is being performed in accordance with the contract Documents.

.4 Identify samples and sources of materials.

.5 Review and report on progress of the work. Report on count of units fabricated and inspected at fabricator's operations.

.6 Observe and report on conditions of significance to work in progress at time of inspection or at fabricator's operations. Include where applicable and if critical to the work in progress:

.1 Time and date of inspection.

.2 Temperature of air, materials, and adjacent surfaces.

.3 Humidity of air, and moisture content of materials and adjacent materials.

.4 Presence of sunlight, wind, rain, snow and other weather conditions.

.7 Include in reports all information critical to inspection and testing.

.8 Ensure that only materials from the work and intended for use therein are tested.

.9 Determine locations for work to be tested

8 TOLERANCES FOR INSTALLATION OF WORK

.1 Unless specifically indicated otherwise, work shall be installed plumb, level, square and straight.

.2 Unless acceptable tolerances are otherwise specified in specification sections or are otherwise required for proper functioning of equipment, site services, and mechanical and electrical systems:

.1 "Plumb and level" shall mean plumb or level within 1 mm in 1 m.

.2 "Square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.

.3 "Straight" shall mean within 1 mm under a 1 m long straightedge.

.4 "Flush" shall mean within:

.1 6 mm for exterior concrete, masonry, and paving materials.

.2 1 mm for interior concrete, masonry, tile and similar surfaces.

.3 0.05 mm for other interior surfaces.

.3 Allowable tolerances shall not be cumulative.

9 REFERENCE STANDARDS

.1 Perform inspection and testing in accordance with Standards quoted and as required by procedures described in specified reference standards that are applicable to the work being inspected and tested.

10 DEFECTS

.1 Defective products, materials and workmanship found at any time prior to

Contract Completion will be rejected regardless of previous inspections, testing, and reviews of the Work. Inspections, testing, and reviews shall not relieve the Contractor from their responsibility, but are a precaution against oversight or error. Remove and replace defective and rejected products, materials, systems, and workmanship. Be responsible for delays and expenses caused by rejection.

11 MOCK UPS

.1 Where required by Contract Documents construction, unless indicated herein, mock-ups of work on Site, in size and at location directed by Consultant.

.2 Construct mock-ups prior to start of affected work. Allow sufficient time for Consultant's review. Work affected by mock-ups may not commence prior to acceptance of mock-ups.

.3 Construct mock-ups to include all related specified materials and workmanship. Make revisions as directed by Consultant, in accordance with the intent of the Contract Documents, until mock-ups are acceptable.

.4 Mock-ups, reviewed and accepted by Consultant, shall become the standard of quality against which installed work will be measured.

.5 Mock-ups, by prior arrangement, may be incorporated into finished work if approved by Consultant only.

12 DOCUMENTS ON SITE

.1 Maintain at job site, one copy of each of the following:

.1 Contract Documents including Drawings, Specifications, Addenda, and other modifications to the Contract.

.2 'Review' or 'Reviewed as Modified' Shop Drawings.

.3 Project Construction and Shop Drawing Schedules.

.4 Site Instructions and Change Orders.

.5 Field Test Reports.

.6 Reports by Authorities having Jurisdiction.

.7 Building and other applicable permits.

.8 Daily log including:

.1 Weather conditions.

.2 Excavation conditions.

.3 Start and finish date of each Trade Contractor.

.4 Erection and removal dates of formwork.

.5 Date, quantities and particulars of each concrete pour.

.6 Dates and quantities roofing and waterproofing work.

.7 Visits to the Site by Owner, Consultants, Jurisdictional Authorities, Testing and Inspection companies, and material and equipment supplier representatives.

.9 Material Safety Data Sheet pursuant to WHMIS (Occupational Health & Safety Act.).

.10 As-built drawings recording as-built conditions, instructions, changes for structure, equipment, wiring, plumbing, etc., as called for in Section 01 72 00 and division 15 and 16, prior to being concealed.

.11 Copies of applicable codes.

.12 The above material shall be made available to the Consultant at their request.

13 BUILDING ENVELOPE

.1 Requirements specified herein apply to all elements of the exterior building envelope.

.2 Continuity of air barrier/vapour retarder and insulation components is critical and must be maintained at all locations. Where different systems meet, ensure proper interface and continuity between adjacent components by implementing suitable construction sequences and by using compatible materials only.

.3 Maximum air leakage shall be 0.10L/(sAm^2) when measured with a warm-side relative humidty of 27-55% at 21^{o}C and a measured aire pressure difference of 75Pa.

.4 Anchor exterior cladding components to structure in manner suitable to accommodate structural deflection and creep and to withstand loads from expected temperature gradients. Design anchorage to withstand expected wind loads, positive and negative, in accordance with applicable regulations.

.5 Ensure that air spaces within exterior building components are firestopped in accordance with applicable regulations.

.6 Ensure the air spaces on the outside of vertical air barrier/vapour retarder (walls), window systems, and curtain wall systems are constructed with adequate drainage provisions to the exterior.

.7 Owner may complete a thermographic scan upon completion of the building envelope. Contractor will be responsible to correct identified thermal anomalies.

14 DRAINAGE

.1 Layout and construct work to ensure that positive drainage is provided to floor drains, ditches, site drains and catch basins, as set in their final position, preventing undrained areas and ponding.

.2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.

.3 Report to Consultant in writing prior to executing work affected, in case adequate drainage cannot be provided.

END OF SECTION

1 GENERAL

1.1 Provide Labour, Products, equipment, services, tools and Supervision to ensure that Work complies with minimum acceptable standards of materials and performance of Work in accordance with codes and standards referenced in the Specification.

1.2 Consider contract forms, codes, Specifications, standards, manuals, and installation and application instructions referred to in these specifications to be the latest published editions at the date of submission of the bid unless otherwise stated in the Specifications or otherwise required by the authorities having jurisdiction.

2 BY-LAWS, PERMITS, AND FEES

2.1 The Building Code - Ontario Regulation 350/06, including all amendments, shall govern the construction of the Work.

2.2 Comply with all By-Laws and regulations of authorities having jurisdiction. These codes and regulations constitute an integral part of the Contract Documents.

2.3 Pay for construction damage deposit required by authorities having jurisdiction.

2.4 Where permits, licenses, and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by particular subtrade responsible for that work.

2.5 Arrange for inspection, testing of Work and acceptance required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay all costs.

2.6 Be responsible for ensuring that no work is undertaken which is conditional on permits, approvals, reviews, licences, fees, until all applicable conditions are met. No time extension will be allowed for delay in obtaining necessary permits.

2.7 Obtain permit required to work on Municipal rights of way. Obtain damage deposits for sidewalks, roads and services work, as applicable.

2.8 Give notice of completion of project prior to occupancy, as required by applicable legislation.

3 EXISTING PUBLIC SERVICE LINES

3.1 Where existing public services are indicated to be removed and/or relocated, perform Work in compliance with authorities having jurisdiction.

3.2 Make good public roads, walkways and curbs soiled or damaged due to construction to the requirements of local authorities.

4 CODES

4.1 Reference is made to standards in the specifications to establish minimum acceptable standards of materials, products and workmanship. Ensure that materials, products and workmanship meet or exceed requirements of the reference standards specified.

4.2 In the event of conflict between documents specified herein, execute the Work in accordance with the most stringent requirements.

5 STANDARDS

5.1 Where a material or product is specified in conjunction with a referenced standard, do not supply the material or product if it does not meet the requirements of the standard. Supply another specified material or product, or an acceptable material or product of other approved manufacture which does meet the requirements of the standard, at no additional cost to the Owner.

5.2 Where no standard is referred to, provide materials, products and workmanship which meet requirements of the applicable standards of the Canadian Standards Association, Canadian General Standards Board, Standards Council of Canada, Ontario Provincial standard specifications (OPSS), Ontario Provincial Standard Drawings (OPSD) and the applicable building code. References to "Measurement for Payment" and "Basis of payment" in OPSS standard documents are not applicable to this Contract.

5.3 If there is question as to whether a material, product or system is in conformance with applicable standards, the Consultant reserves the right to have such materials, products or systems tested to prove or disprove conformance. The cost for such testing will be paid by the Owner in the event of conformance with contract Documents or by the Contractor in the event of non-conformance.

5.4 Where application, installation and workmanship standards are cited, it is intended that referenced standards form the basis for minimum requirements of the specified item and specifications supplement the standards unless specified otherwise.

5.5 Matters may be dealt with in part by these specifications which are also dealt with, under the same or similar headings in cited standard. It is not intended that these specifications take the place of the standards but supplement them, unless specified otherwise.

5.6 Where reference is made to manufacturer’s directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

Where standards, specifications, associations, and regulatory bodies are listed in the Specifications by their abbreviated designations. These are but not limited to the following:

AA	The Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturer's Association
AIEE	American Institute of Electrical Engineers
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association
AMEU	Association of Municipal Electric Utilities
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASA	American Standards Association
ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWMAC	Architectural Woodwork Manufacturers Association of Canada
AWWA	American Water Works Association
CEMA	Canadian Electrical Manufacturer's Association
CGA	Canadian Gas Association
CGSB	Canadian General Standards Board
CISC	Canadian Institute of Steel Construction
CMHC	Canadian Mortgage and Housing Corporation
CMPA	Canadian Paint Manufacturers Association
COFI	Council of Forest Industries of British Columbia
CRCA	Canadian Roofing Contractors Association
CSA	Canadian Standards Association
CSSBI	Canadian Sheet Steel Building Institute
CWB	Canadian Welding Bureau
CWC	Canadian Wood Council
EEMAC	Electrical and Electronic Manufacturers Association Canada
FM	Factory Mutual
IEEE	Institute of Electrical and Electronic Engineers
MFMA	Maple Flooring Manufacturers Association
MIL	Military Standards
MSS	Manufacturer's Standardization Society
MTO	Ministry of Transportation Ontario
NAAMM	National Association of Architectural Metal Manufacturers
NFPA	National Fire Protection Association
NEMA	National Electrical Manufacturer's Association (U.S.A.)
NLGA	National Lumber Grades Authority
NRC	National Research Council of Canada
OCBA	Ontario Concrete Block Association
OHESC	Ontario Hydro Electrical Safety Code

OPSS Ontario Provincial Standard Specification
PEI Porcelain Enamel Institute
PDI Plumbing Drainage Institute
PHA Public Health Act
SMACNA Sheet Metal and Air Conditioning Contractors National Association
SSPC Steel Structures Painting Council
TEMA Tubular Exchange Manufacturer's Association
TTMAC Terrazzo, Tile and Marble Association of Canada
UL Underwriters Laboratories Inc. (U.S.)
ULC Underwriters Laboratories of Canada

6 **FIRE RATINGS, ASSEMBLIES AND SEPARATIONS**

6.1 Where a material, component, assembly, or separation is required to be fire rated, the fire rating shall be as determined or listed by one of the following testing authorities acceptable to the authorities having jurisdiction:

1. Underwriters' Laboratories of Canada.
2. Underwriters' Laboratories Inc.
3. Factory Mutual Laboratories.
4. The National Research Council of Canada.
5. The National Board of Fire Underwriters.
6. Intertek Testing Services.

6.2 Where reference is made to only one testing authority an equivalent fire rating as determined or listed by another of the aforementioned testing authorities is acceptable if approved by authorities having jurisdiction. Obtain and submit such approval of authorities, in writing when requesting acceptance of a proposed equivalent rating or test design.

6.3 Fire rated door assemblies shall include doors, frame, anchors, and hardware and shall bear label of fire rating authority showing opening classification and rating.

6.4 Material having a fire hazard classification shall be applied or installed in accordance with fire rating authorities printed instructions.

6.5 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.

6.6 Construct fire separations as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.

6.7 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are non-combustible and are tightly fitted and sealed with a ULC approved sealant for the assembly being sealed.

6.8 Construction that abuts on or is supported by a non-combustible fire separation shall be constructed so that its collapse under fire conditions will not cause the collapse of the fire separation.

6.9 Do not use combustible members, fastenings, attachments and similar items to anchor electrical, mechanical or other fixtures to fire separations.

6.10 At penetration through fire rated walls, ceilings or floors, completely seal voids with ULC approved firestopping material; full thickness of the construction element. In locations that require a smoke seal, provide appropriate ULC approved system installed in accordance with the manufacturer's recommendations.

7 DRAWINGS REQUIRED BY AUTHORITIES

7.1 Supply copies of detail drawings for various building components if requested by the Municipal Building Departments, Provincial Agencies and the Local Fire Department.

END OF SECTION

1 TEMPORARY CONTROLS

1.1 Hoarding and barriers:

.1 Provide temporary enclosures as required to protect the building in its entirety or in its parts, against the elements, to maintain environmental conditions required for work within the enclosure, and to prevent damage to materials stored within, all as required by the Construction Safety Act and other jurisdictional authorities.

1.2 Hoarding shall be provided to protect school operations from construction activity, secure the work areas, restrict non-authorized personnel from the work areas, and protect the Contractor's property and the Ontario Health & Safety Act.

1.3 Prevent unauthorized entry to the Site. Barricade, guard or lock access points to the satisfaction of the Consultant and post "NO TRESPASSING" signs.

1.4 Install signs for movement of people around Work Site as required and directed by the Consultant.

1.5 Provide secure, rigid guide rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs as required for protection of Work, workers, and the public.

1.6 Remove hoarding, barriers, building enclosures, guide rails and barricades upon Contract Completion unless otherwise noted on the Contract Drawings or as directed by the Consultant.

1.7 Contractor shall install hoarding in accordance with Contract Drawings.

2 SERVICE AND UTILITY SYSTEMS

2.1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.

2.2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.

2.3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.

2.4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.

2.5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.

2.6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.

5 PROTECTION

5.1 Protection of Public Area: Protect surrounding private and public property from damage during performance of the Work.

5.2 Protection of Building Finishes and Equipment:

.1 Provide protection for existing structure, finished and partially finished building finishes, waterproofing systems, and equipment during performance of the Work.

.2 Cover Owner's equipment and plant within the Site with 6 mil PVC sheet, or equal, taped to make it dust-tight. Equipment and existing work moved or altered to facilitate construction, movement of Products or equipment shall be stored, protected with dust-tight covers and subsequently returned to its original location.

.3 Obtain approval from the Consultant prior to the installation of temporary supporting devices into existing roof, ceiling, or wall members for the erecting of equipment or machinery. Repair roof, ceiling, and wall members used for this purpose to the satisfaction of the Consultant.

.4 Provide necessary screens, covers and hoarding as required.

.5 Any Products or equipment damaged while carrying out the Work shall be restored with new Products or equipment matching the original equipment. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations.

5.3 Protection of Off-Site Structures, Surfaces and Trees: Accept all cost and responsibility for any injury or damage to existing structures, surfaces and trees on the City's property which may be caused by the Contractor’s workforce and material suppliers.

5.4 Fire Protection:

.1 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, by-laws and to the satisfaction of the Consultant and insurance authorities.

.2 Excessive storage of flammable liquids and other hazardous materials is not allowed

on Site. Flammable liquids must be handled in approved containers. Remove combustible wastes frequently.

.3 Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently.

.4 Open burning of rubbish is not permitted on the Site.

.5 Handle, transport, store, use and dispose of gasoline, benzine or other flammable materials with good and safe practice as required by authorities having jurisdiction.

.6 Provide fire extinguishers of the non-freezing chemical type in each temporary building, enclosure and trailer. Use only fire-proofed tarpaulins.

.7 A fire watch shall be required for each of the following activities regardless of the number, duration or size of the activity in operation: .1 any open flame activities(e.g., soldering and welding); .2 shutdown of fire detection system; .3 shutdown of sprinkler system.

5.5 Maintain adequate cover over services as required by Utility Authorities.

6 FIRST-AID FACILITIES

6.1 Provide site equipment and medical facilities necessary to supply first-aid service to injured personnel in accordance with regulations of the Workmen's Compensation Act. Maintain facilities for duration of Contract.

7 USE OF NEW PERMANENT SERVICE & EQUIPMENT

7.1 Do not use any new permanent service or equipment without Owner's written approval.

7.2 Where permission is granted to use permanent services and equipment provide competent persons to operate services and equipment; inspect frequently and maintain facilities in proper operating condition at all times.

7.3 Permanent services and equipment shall be turned over to Owner in "as new" and perfect operating condition.

7.4 Use of permanent systems and equipment as temporary facilities shall not affect the warranty conditions and warranty period for such systems and equipment. Make due allowance to ensure that Owner will receive full benefits of equipment manufacturers warranty after project takeover.

8 PROJECT IDENTIFICATION

8.1 If required, obtain approvals from jurisdictional authorities for temporary signs.

8.2 Do not display signs without the Consultant's and Owners written consent.

8.3 Maintain signs in good condition for the duration of Contract.

9 SITE MAINTENANCE

9.1 Maintain the Site and adjacent premises in a clean and orderly condition, free from debris and other objectionable matter. Immediately remove rubbish and surplus Products, equipment and structures from the Site. If the Site is not cleaned (within 48 hours after the Contractor has been instructed to do so), the Consultant may clean the Site and retain the cost from monies due, or to become due, to the Contractor.

9.2 When the Work is substantially performed, remove surplus Products, tools, construction machinery and equipment not required for the performance of the remaining Work.

10 SITE STORAGE AND OVER LOADING

10.1 Confine the Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the Site with Products.

10.2 Products shall be stored only in areas designated or approved by the Consultant, and shall not be left lying on streets, sidewalks, boulevards or elsewhere within public view. Products which the Consultant may permit to be stored elsewhere than in the Contractor's storage areas shall be neatly stacked or otherwise disposed and shall be so maintained.

10.3 Fabrication shops shall not be set up within the structure except as directed by or with the permission of the Consultant.

10.4 Do not load or permit to be loaded any part of the Work with a weight or force that it is not calculated to bear safely. Be solely responsible and liable for damages resulting from violation of this requirement. Provide temporary supports as strong as permanent support.

10.5 Do not cut, drill or sleeve load bearing members unless shown on drawings or otherwise approved by the Consultant in writing for each location.

10.6 Site storage and loading requirements to be in accordance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

11 PUBLIC CONVENIENCE AND SAFETY

11.1 Maintain sidewalks at and adjacent to the Site in a safe condition throughout the Contract. Promptly remove ice and snow.

12 PUBLIC UTILITIES AND SERVICES

12.1 Verify limitations imposed on project work by presence of utilities and services, and ensure no damage occurs to them.

12.2 Notify service authorities concerned so that they protect, remove, relocate, or discontinue them, as they may require.

12.3 Make arrangements and pay for connection charges for services required for project work.

12.4 Locate poles, pipes, conduit, wires, fill pipes, vents, regulators, meters, and sanitary services work in inconspicuous locations. If not shown on Drawings, verify location of service work with Consultant before commencing installation.

13 CONSTRUCTION PARKING

13.1 Parking may be permitted on Site with the School principal's permission provided it does not disrupt the performance of Work, Site safety or the movement of vehicular or pedestrian traffic and is acceptable to the Consultant.

13.2 Contractor vehicles are not to be parked along school access routes and staff/visitor parking lots.

14 SITE VISITORS

14.1 During the progress of the Work, afford access to visitors duly authorized by the Consultant and facilitate inspections or tests they may desire to make. Record site visitors in log book maintained on site.

14.2 Ensure Site visitors wear appropriate safety apparel.

15 POLLUTION (DUST, DEBRIS, AND NOISE) CONTROL

15.1 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

15.2 Keep premises free of waste material.

15.3 Arrange and pay for removal of all waste generated by the work in manner acceptable to authorities having jurisdiction.

15.4 Limit noise levels in accordance with requirements of authorities having jurisdiction.

15.5 Maintain temporary erosion and pollution control features installed under this contract.

15.6 Control emissions from equipment and plant to local authorities emission requirements.

15.7 Prevent abrasive-blasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.

16 TREE PROTECTION

16.1 Provide tree protection as stipulated in 'City of Toronto Tree Protection Policy and Specifications Near Trees' and refer to Tree Protection Zone Specifications appended to this Document for information on existing trees to be protected.

16.2 Leave fenced areas undisturbed; do not use areas for storage, stockpiling or any other purpose. Do not dump or flush any contaminants in areas of tree feeder roots.

16.3 Do not attach rigging cables to trees.

16.4 Where limbs or portions of plants are required to be removed to accommodate new work, they shall be removed in accordance with accepted arboricultural practice.

16.5 Where root systems of protected trees adjacent to construction are exposed or damaged, they shall be neatly trimmed and the area backfilled with suitable material to prevent desiccation.

16.6 Where necessary give plants an overall pruning to restore the balance between roots and top growth and/or to restore appearance.

16.7 Except at locations where specific procedures are included in Contract Documents do not alter grades around existing trees/plants without first obtaining Consultant's consent and directions.

END OF SECTION

Tree Protection Zone Specifications

Background Information

This document concerns tree protection zone specifications, which are surface and sub-surface **root protection standards** that will impact on landscape design, construction techniques and maintenance practices.

Trees should be included as part of our overall infrastructure, as they are valuable, virtual environmental vacuum cleaners. They purify (clean) the air that we breathe, replacing tons of pollutants every day with fresh oxygen, and these specifications are in support of maintaining and improving the health of our TDSB urban forests. Trees are living organisms just like you and me, and if they are stressed from salt, soil compaction, heat, drought, root zone restrictions, poor growing medium, changes in hydrology or damaged root systems, the trees are then very vulnerable to disease and insect infestation.

We must understand and respect tree biology. It must be remembered that trees are living assets whose roots are generally found in the top 18" to 24" of the soil profile, however, they can extend out from the trunk two to three times the distance of the drip line. The drip line is a point on the ground that equals the distance from the trunk of the tree to the outer tips of the branches. Tree protection requires space, above and below the ground. Different species of trees vary in their ability to respond to maintenance and construction impacts. Age, size, structure and health of the tree also impact on their ability to recover. Young, healthy, vigorous trees, for example, have a greater capacity to recover because of their ability to compartmentalize wounds.

All of our TDSB trees over 30 cm. dbh (diameter breast height) are **protected by City by-laws** and must not be removed, injured or destroyed in any way without written authorization from the City. Please note that the term "tree" refers to all parts of the tree, including the roots. In addition, the Commissioner of Urban Forestry Services may require *Letters of Credit*, or *Letters of Acceptance of Responsibility* to secure the protection of these trees. These initial "damage deposits" usually change attitudes and responsibility.

Our TDSB tree replacement program outlines that if healthy, stable trees must be removed, or if they die because of construction activities, a tree replacement plan will be required in accordance with the pre-project value of the affected tree. If the affected trees are dead or seriously declining, a tree replacement plan of “one for one” (as a minimum) will be required.

This tree protection plan will only work if all parties (owners, designers, engineers, construction crews, supervisors and maintenance staff) are committed to the tree protection vision and the value of the trees. We must all exercise care, caution and

respect when working around trees to prevent injuring the tree or degrading the tree's environment.

Tree protection must begin at the design phase of the project with the TDSB critique and approval of the preliminary drawings, and this arboricultural professionalism must carry on right through to standard maintenance practices. Early involvement is essential in assessing design opportunities and constraints. A thorough understanding of what is planned is critical. Tree protection must become an integral part of the development process. It is an additional step, but an important one.

Trees need to be inventoried and assessed (resource evaluation) at the site level to determine what trees should be protected and what trees should be removed (current or future liability).

We must anticipate and evaluate the impacts that the designs will have on the tree's health and stability, and then suggest modifications, or make adjustments, to those construction plans if the impacts are too severe. To do that, we need accurate site information about the trees in relation to construction activity. Accurate trunk size (and location) and canopy drip lines (including trees on neighboring fence lines) must be plotted on all drawings. After the critique of the drawings has been submitted to the design team, we must respond to the designer's comments and alterations that have been made to the design.

All survey drawings must show elevations around the base of existing trees (record the grades on the high side and the low side of the tree and take the average). Three grade measurements should be taken at the drip line of trees that are over 30 cm. diameter breast height, as subtle grade changes inside and outside of the drip line will change soil hydrology.

The designers, project managers, supervisors, grounds team leaders and lead hands must know and understand the critical factors involved in tree protection. Site inspection of these trees is required before, during (especially when excavating and trenching occurs) and after the construction process. Field situations during the project may change, requiring a re-assessment of instructions and/or corrective actions. We must build positive relationships and teamwork by listening, communicating, and interacting in a professional manner. This process should also be coupled with appropriate signoffs at the end of the project.

The goal of these specifications is to protect existing trees by coordinating landscape design, construction techniques and maintenance practices. Tree root injury must be limited to a tolerable level, however, the goal here is to protect trees rather than repair injury. Our trees should be an asset to the project and the property for years to come. Trees that are healthy and structurally stable are the focus of this discussion.

Specifications

The following tree protection specifications must be included with **all drawings** where the land features of our school properties are impacted by landscaping or other construction activities.

The tree protection zone is described as the area around a tree in which no grading, trenching, excavating (which includes new post-holes for footings) or soil compaction is to occur. Within this tree protection zone there will also be;
---no root cutting
---no alteration or disturbance to existing grades of any kind
---no changes to the grade by adding fill, excavating or scraping
---no storage of construction materials or equipment
---no stockpiling of soil, debris or construction waste
---no movement or storage of heavy vehicles or equipment

Each tree will be evaluated according to factors such as species (and it's tolerance to impacts), age, health, vigor, size, form, structure, drainage patterns, location and surrounding features. In general, however, **the minimum tree protection zone will be the drip line of the tree.** This is why it is most important that the designer has accurate canopy dimensions shown on the drawings for all existing trees on TDSB property, as well as adjacent City or neighboring trees whose canopies (and underground root systems) will impact on TDSB property and construction plans.

Every effort should be made to travel over, and work from, hard surfaces, however, if heavy equipment such as trucks, tractors, loaders need to travel over tree root zones during the construction process, a minimum layer of 9" of tub grinder mulch should be spread where the traffic will be occurring to reduce root damage and soil compaction. This depth must be maintained for the duration of the job and then recycled on site when the job is complete. The use of light equipment and/or alternate routes should be considered.

If you can't get a good tree protection zone, consider using specialized construction techniques that will reduce or limit the root damage impacts, such as low pressure hydro-vacuuming, air knifing, directional boring or tunnelling, and arboricultural techniques such as root pruning by hand before mechanized excavating takes place. These techniques could also include hand digging, shoot pruning, mulching, irrigating and fertilizing.

Tree protection barriers must be included and priced as part of the project. If it is a short term project (up to 2 months), standard T-bars and plastic safety fence can be used. Light duty T-bars should not be used because they snap and break. If it is a longer term project, use 10guage chain link fence and standard T-bars. In all cases, standard T-bars should not be spaced more than 6 to 7 feet apart. These protection barriers must be

erected before the project starts, must be maintained throughout the project, and taken down when final inspection and signoffs are completed.

Questions or concerns regarding these TDSB tree protection zones should be directed to:
Aileen Leadbeater, <aileen.leadbeater@tdsb.on.ca>

1 SPECIFIED PRODUCTS

1.1 Work of this Contract is based on Products specified by:

.1 Manufacturer's catalogued trade names and/or;

.2 References to standards (i.e. CAN, CGSB, CSA, ASTM) or;

.3 Prescriptive Specifications or;

.4 Performance Specifications.

1.2 When one or more manufacturer's trade name is specified for a Product, any one of the specified Products will be acceptable. Products by other manufacturers are subject to the Consultant's acceptance as an equivalent substitution in accordance with the specified requirements of substitutions.

1.3 When more than one manufacturer's catalogued trade name Product is specified along with a referenced standard, any one of the specified Products will be acceptable on condition the Product complies with the referenced standard.

1.4 When a Product is specified by reference to a standard only, the Contractor may select any Product that meets or exceeds the specified standard for the intended purpose. The onus shall be on the Contractor to establish that such Products meet the reference standard requirements. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such Products are compatible with the Work with which they are incorporated.

1.5 When a Product is specified by prescriptive or performance Specification, any Product meeting or exceeding the Specification will be accepted.

1.6 When a Product is specified by reference to a standard or by prescriptive or performance Specification, upon request of the Consultant, obtain from the manufacturer, an independent testing laboratory report showing that the Product meets or exceeds the specified requirements.

1.7 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the Work.

2 SUBSTITUTIONS

2.1 Requests for substitutions will not be accepted prior to the Notification of Award. Substitutions will be considered by the Consultant provided that:

.1 The proposed substitutions have been investigated and complete data are submitted which clearly includes highlighting all aspects that meet the specifications. Consultant will only review data submitted. Incomplete data will be grounds for non-acceptance.

.2 Data relating to changes in the Contract Schedule, if any, and relation to other Work have been submitted.

.3 Same warranty is given for the substitution as for the original Product specified.

.4 All claims are waived for additional costs related to the substitution which may subsequently arise.

.5 Installation of the accepted substitution is co-ordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

2.2 Substitutions to methods or process described in the Specifications or drawings, may be proposed for the consideration of the Consultant. Ensure that such substitutions are in accordance with the following requirements:

.1 Time spent by the Consultant in evaluating the substitution shall not be the basis for a claim by the Contractor for extensions to the Contract Time.

.2 Clearly indicate how the proposed substitutions would be advantageous to the Owner or in the opinion of the Contractor would improve the operation of the installation.

.3 Be responsible for substitutions to methods or processes concerning such Work and ensure that the warranty covering all parts of the Work will not be affected.

.4 The cost of all changes in the work of Other Contractors, necessitated by the substituted methods or processes, if accepted, is borne by the Contractor.

.5 The substituted methods or processes fit into space allotted for the specified methods or processes. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

2.3 Substitutions will not be considered if:

.1 They are indicated or implied on shop drawings or Product data without formal request.

.2 Acceptance will require substantial revision of the Specifications and Drawings.

2.4 Do not substitute Products or methods or processes into the Work unless such substitutions have been specifically approved for the Work by the Consultant.

2.5 Approved substituted Products shall be subject to the Consultant's inspection and testing procedures. Approved substituted Products shall only be installed after receipt of the Consultant's written approval.

2.6 The Contract Price will be adjusted accordingly to any and all credits arising from the substitutions mentioned above.

3 APPROVAL OF PRODUCTS AND INSTALLATION METHODS

3.1 Wherever in the Specifications it is specified that Products and installation methods shall meet approval of Authorities having Jurisdiction, underwriters, the Consultant, or others, such approval shall be in writing.

4 PRODUCT DELIVERY CONTROL

4.1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which he intends to use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.

4.2 The Contractor shall contact the Consultant immediately upon receipt of information indicating that any material or item, will not be available on time, in accordance with the original schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.

4.3 The Consultant reserves the right to receive from the Contractor at any time, upon request, copies of actual purchase or work orders of any material or products to be supplied for the work.

4.4 If materials and products have not been placed on order, the Consultant may instruct such items to be placed on order, if direct communication in writing from the manufacturer or prime suppliers is not available indicating that delivery of said material will be made in sufficient time for the orderly completion of the Work.

4.5 The Consultant's review of purchase orders or other related documentation shall in no way release the Contractor, or his subcontractors and suppliers from their responsibility for ensuring the timely ordering of all materials and items required, including the necessary expediting, to complete the work as scheduled in accordance with the Contract Documents.

4.6 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to direct the Contractor to take the following measures at no increase in Contract Price:

.1 Substitute more readily available Products of similar or better quality and character, or

.2 Temporarily install another Product until such time as the specified Product becomes available, at which time the temporarily installed product shall be removed and the specified Product installed.

5 TRADEMARKS AND LABELS

5.1 Permanent labels, trademarks and nameplates on Products are not acceptable in the finished Work, except where required by authorities having jurisdiction, for operating instructions, or when located in service rooms.

5.2 Remove trademarks and labels by grinding, if necessary, painting out where the particular surface is being painted, or if on plated parts, replace with new plain plated or non-ferrous metal parts.

6 DELIVERY, STORAGE, HANDLING AND PROTECTION

6.1 Be responsible for handling and delivery of Products. Protect Products from damage during handling, storage and installation. Deliver store and handle items in accordance with manufacturer's instructions and as specified. Be responsible for all costs of delivery, loading and off-loading, and for transportation back to its origin for correction, if required, due to damage or defect. Reject materials and Products delivered to the Site which are damaged.

6.2 Manufacture, pack, ship, deliver, and handle Products so that no damage occurs to structural qualities and finish appearance, nor in any other way which is detrimental to their function and appearance.

6.3 Ensure that Products, while transported, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

6.4 Organize delivery of materials, Products and equipment to, and removal of debris and equipment from, the site and surrounding property.

6.5 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at the Place of the Work.

6.6 Coordinate mechanical and electrical equipment and apparatus deliveries with the manufacturer's and suppliers such that equipment and apparatus is delivered to the site when it is required, or so that it can be stored within the building and protected from the elements.

6.7 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

6.8 Deliver packaged Products, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

6.9 Label packaged products to describe contents, quantity, and other information as specified.

6.10 Labels attesting that materials conform to specified reference standards will be acceptable as verification that contents meet specified requirements. In the absence of labels, submit affidavits to validate conformance of Product to reference standards, as requested by the Consultant.

6.11 Label fire-rated Products to indicate Underwriters' Laboratories approval.

6.12 Handle and store materials and products in such a manner that no damage is caused to the materials and products, the Work, the site and surrounding property.

6.13 Do not obstruct or disrupt local traffic flow during construction period.

6.14 Allocate an area within the limits of the Work acceptable to the Owner for storage of Products brought to the site by all trades. Keep storage area tidy at all times and do not use other parts of he property for storage. Arrange and pay for off-site storage when required.

6.15 Locate products on site in a manner to cause minimal interference with the Work and building activities.

6.16 Store Products off the ground, in a manner to prevent damage, adulteration, deterioration and soiling to the Products, other building components, assemblies, other products, the structure, the site and surrounding property, and in accordance with manufacturer's instructions when applicable.

6.17 Store packaged or bundled Products in original and undamaged condition complete with written application instructions. Keep manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.

6.18 Do not place or store materials and Products in corridors, public areas, streets, lanes, passageways or similar locations.

6.19 Store Products so as not to create any overloading conditions to any part of the building, structure, falsework, form work and scaffolding.

6.20 Store Products subject to damage from weather in weatherproof enclosures.

6.21 Store cementitious Products clear of earth or concrete floors, and away from walls.

6.22 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

6.23 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

6.24 Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous material in bulk within the Work.

6.25 Store and mix paints in a heated and ventilated room or area assigned for this purpose. Keep this room or area locked when unattended. Remove oily rags and other combustible debris from the Place of the Work daily. Take every precaution necessary to prevent spontaneous combustion.

6.26 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01710. Protection shall be easily removable under work of Section 01710 without damage to finishes. Do not permit strippable tape or coatings to become baked on surfaces which they protect.

6.27 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use primer and paint to match original.

6.28 Protect glass and other finishes against heat, slag and weld splatter by provision on adequate shielding. Do not apply Visible markings to surfaces exposed to view in finished state or that receive transparent finishes.

6.29 Protect surfaces of completed work exposed to view from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable of the material and surface location.

6.30 Adequately protect trowelled concrete floors from damage. Take special measure when moving heavy loads or equipment on them.

6.31 Keep finished concrete floors free from oils, grease or other material likely to damage or discolour them or affect bond of applied finishes. Once building is enclosed, keep floors as dry as possible after curing.

6.32 Protect finished flooring from pedestrian traffic with reinforced kraft paper as a minimum, secured in place and with joints sealed by reinforced pressure sensitive tape. Maintain protection in place until contract completion.

6.33 Protect finished flooring from continuing construction work and delivery of products with plywood panels of minimum 6 mm thickness with joints between panels sealed with reinforced pressure sensitive tape. Maintain protection in place until work and deliveries are complete.

6.34 Make good or replace damaged materials to the satisfaction of the Consultant.

6.35 Hazardous Materials Information:

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets (MSDS) in accordance with jurisdictional authorities.

.2 Deliver copies of Material Safety Data Sheets (MSDS) to the Consultant on all Products intended for use in the Work and designated as a "controlled product."

7 MANUFACTURER'S INSTRUCTIONS

7.1 Unless otherwise indicated in the Specifications, fabricate, install, apply, connect, install, erect, use, clean, and condition Products in accordance with manufacturer's instructions except where more stringent requirements are specified. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.

7.2 Notify the Consultant in writing, of conflicts between the Specifications and manufacturer's instructions, so that the Consultant may establish the course of action. If requested, make a copy of those instructions available at the site.

7.3 In cases of improper installation or erection of Products, due to failure in complying with these requirements, the Consultant may direct removal and re-installation at no increase in Contract Price.

8 WORKMANSHIP

8.1 Do not employ any unfit person or anyone unskilled in their required duties. The Consultant reserves the right to require the dismissal from the Place of the Work, workers deemed incompetent, careless, insubordinate or otherwise objectionable.

8.2 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Consultant, whose decision is final.

8.3 Give particular attention to finished dimensions and elevations of the Work. Make finished Work fit indicated spaces accurately. Make finished Work flush, plumb, true to lines and levels and accurate in all respects.

8.4 In finished areas, conceal pipes, ducts, conduit and wiring in floors, walls, ceilings, chases, or behind furring except where indicated otherwise.

8.5 Ensure that service poles, fill-pipes, vents, regulators, meters and similar service installations are located in inconspicuous locations. If not indicated on drawings, verify location of service installations with Consultant prior to commencing installation.

8.6 Ensure that integrity of fire separations is maintained where they are penetrated.

8.7 Finish access panels and doors to match adjacent wall and/or ceiling finish unless otherwise specified or indicated.

8.8 Keep surfaces, on which finished materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.

8.9 Enforce fire prevention methods at site. Do not permit fires, open flame heating devices or accumulation or debris. Use flammable materials only if all safety precautions are taken. Provide and maintain in working order ULC labelled fire extinguishers of types suitable for fire hazard in each case, and locate them in prominent location and to approval of jurisdictional authorities.

8.10 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.

9 **DIMENSIONS**

9.1 Check all dimensions at the site before fabrication and installation commences and report discrepancies to the Consultant.

9.2 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.

9.3 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained

9.4 Wall thicknesses and openings shown on the drawings may be nominal only; ascertain actual sizes at the site.

9.5 Verify dimensions of shop fabricated portions of the Work at the site before shop drawings and fabrications are commenced. The Owner will not accept claims for extra expense by reason of non-compliance with this requirement.

9.6 Fabricate and erect manufactured items, shop fabricated items, and items fabricated on or off site, to suit site dimensions and site conditions.

9.7 In areas where equipment is to be installed, check dimensional data on equipment to ensure that area and equipment dimensions are compatible with necessary access and clearance provided. Ensure that equipment supplied is dimensionally suitable for space provided.

9.8 The mechanical and electrical drawings are intended to show approximate locations of mechanical apparatus, fixtures, equipment, piping and duct runs, electrical apparatus, fixtures, outlets, equipment, units, and conduit in diagrammatic form and wherein the mechanical and electrical items are not dimensioned, consider their locations to be approximate. Check the drawings and confer with the Consultant to settle the actual locations of these items as may be required to suit aesthetic and site conditions. Such relocation shall be done without change to the Contract Price.

9.9 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.

9.10 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes.

10 RELOCATION OF MECHANICAL AND ELECTRICAL ITEMS

10.1 The Owner and the Consultant reserve the right to relocate outlets at a later date, but prior to installation, without additional cost to Owner, assuming that the relocation per outlet does not exceed 3000 mm from the original location. No credits will be anticipated where relocation per outlet of up to and including 3000 mm reduces materials, products and labour.

10.2 Should relocations per outlet exceed 3000 mm from the original location the Contract Price will be adjusted in accordance with the provisions for changes in the Contract Documents.

10.3 Alter the location of pipes and other equipment, without additional cost to the Owner, if approved, provided the change is made before installation.

10.4 Make necessary changes, due to lack of coordination, as required and when approved, at no additional cost, to accommodate structural and building conditions.

11 EXPANSION, CONTRACTION, AND DEFLECTION

11.1 Conform to manufacturer's recommended installation temperatures. If items, components, assemblies, systems, and finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and consultant. Repair all resulting damage should expansion and contraction provisions provide inadequate.

11.2 Make provisions for expansion and contraction due to temperature changes within components, Products and assemblies, and between adjacent components, Products and assemblies, and due to building movements including but not limited to creep, column shortening, deflection, sway and twist. Ensure provisions for expansion, contraction and building movements prevent damages from occurring to and within components, Products and assemblies.

11.3 Make adequate allowance at wall and partition heads for deflection of the structure above. Determine requirements from Consultant where additional information is required. Where partitions butt to underside of floor assembly, or structural framing, the clearance shall be based on the span of the members supporting the floor or structural framing. In making such allowance use methods which maintain the integrity of the wall or partition as a sound, and/or fire barrier.

11.4 Make provisions in pipes, plenums, ducts and vessels containing air and fluids as is necessary to prevent damage due to fluid and air induced pressure, surges and vibrations, to pipes, plenums, ducts and vessels and to adjacent components, assemblies and construction to which pipes, ducts, plenums and vessels are attached or pass through.

12 DIELECTRIC SEPARATION

12.1 Ensure that a dielectric separator is provided in a permanent manner over entire contact surfaces to prevent electrolytic action (galvanic corrosion) between dissimilar materials. Similarly, prevent corrosion to aluminum in contact with alkaline materials such as contained in cementitious materials.

13 PRODUCTS AT SOUND ATTENUATING PARTITIONS

13.1 Avoid sound transfer at sound attenuating partitions by careful location and treatment of mechanical and electrical equipments, ducts, grilles, diffusers, electrical outlets and boxes, and similar items. Where electrical boxes are back to back, serving each side, locate them at least 250 mm apart laterally and, if interconnected, use flexible connections.

14 FASTENINGS

14.1 Include in the work of each section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work or other sections, deliver and locate devices in ample time for installation.

14.2 Do not install fibre, plastic or wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on drawings.

14.3 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, construction, components and equipment under static conditions, and to resist building thermal movement, creep and vibration.

14.4 Provide metal fastenings and accessories in same material, texture, colour, sheen and finish as metal on which they occur, unless indicated otherwise.

14.5 Prevent electrolytic action between dissimilar metals and materials.

14.6 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, and where attached to, or contained within, exterior walls and slabs, unless stainless steel or other material is specified. Leave steel anchors bare where cast in concrete.

14.7 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

14.8 Conceal fasteners where indicated. Keep exposed fastenings to a minimum, space evenly and in an organized symmetrical pattern.

14.9 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

14.10 Powder Actuated Fastenings:

.1 Do not use powder actuated fasteners for the support of ceilings.

.2 Do not use powder actuated fastenings on any portion of the Work, unless written consent for a specific use is obtained from the Consultant.

.3 Only low velocity tools will be permitted under any condition. Operators to be qualified and to be in possession of a valid operator's certificate.

15 **ADJUSTING**

15.1 Ensure that all components of assemblies fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.

15.2 Verify that work functions properly and adjust it accordingly to ensure satisfactory operation. Lubricate Products as recommended by manufacturer.

END OF SECTION

1 DEMONSTRATION AND INSPECTION OF PRODUCTS AND SYSTEMS

1.1 Arrange for a demonstration of systems and operating Products upon the 100% completion of their installation and prior to certification for Substantial Performance.

1.2 Include in the arrangements for the attendance of the Consultant, Owner, jurisdictional authorities, and personnel assigned by the Owner for the operation of the systems and/or Products.

1.3 Demonstrations shall be conducted by the Subcontractor responsible for the installation of the systems and/or Product, assisted by representatives of the manufacturer or supplier. All personnel conducting the demonstration shall be completely knowledgeable of all conditions of the operating, functioning and maintenance of the systems and/or Products.

1.4 Owner's representative will acknowledge the successful completion of each demonstration on a form provided by the Contractor. The form shall be agreed to by the Owner, Consultant and Contractor prior to demonstration and testing.

1.5 Submit copies of letters from manufacturers of Systems and/or Products before making application for certificate of Substantial Performance to verify that the Products has been installed and connected correctly, and that it is operating in a satisfactory manner. The certification shall be based upon inspection and testing of the Products by competent technical personnel. Include in letter of certification the names of personnel conducting the testing and inspection, the methods of inspection utilized, and the location in the building of the Products certified.

1.6 Following submission of letters of certification and their acceptance by the Owner, the owner shall have the right to use the Products on a trial basis and for instructing their personnel in its use.

2 FINAL INSPECTIONS AND CLOSE OUT

2.1 Submit proposed closeout procedures and schedule of inspection to Consultant for approval before final demonstrations and inspections commence.

2.2 Submit layout and survey requirements required by Owner and Authorities having jurisdiction.

2.3 Arrange for, conduct and document final demonstrations, inspections, close-out and take-over at completion of the Work in accordance with procedures described in OAA/OGCA TAKE-OVER PROCEDURES, OAA/OGCA Document No. 100. Where "Architect" is referred to in Document No. 100 it shall mean Consultant.

3 CERTIFICATE OF COMPLIANCE

3.1 Submit Certificates of Compliance, prior to the application for Substantial Performance, for each of the following items.

.1 An affidavit relative to the use of lead-free solder for all domestic water lines, regardless of location.

.2 Products for which Material Safety Data Sheets have been submitted and accepted.

.3 Other Work/Products identified in the Contract Documents as requiring a Certificate of Compliance.

3.2 Each Certificate of Compliance shall indicated names and addresses of the project, the Owner, the date of issue, product description including name, number, manufacturer, with a statement verifying that the Work/Product installed meets specified requirements and, if applicable, complies with the submitted and accepted Material Safety Data Sheets.

3.3 Each Certificate of compliance shall be issued on the subcontractor's letterhead, properly executed, under whose work the prospective Work/Product has been provided.

3.4 Each Certificate of Compliance shall be endorsed by the Contractor with his authorized stamp/signature. Ensure that submissions are made to allow sufficient time for review without delaying progress of scheduled completion.

END OF SECTION

1 CONSTRUCTOR

1.1 For the purposes of the Contract, the term "Constructor", as defined in the Occupational Health and Safety Act, shall mean the Contractor who shall be responsible for ensuring that the provisions of the statutes, regulations and by-laws pertaining to the safe performance of the Work are to be observed. The "Constructor" shall submit the Notice of Project.

1.2 In the event of conflict between any of the provisions of Statues, Regulations and Bylaws, and other requirements of authorities, the most stringent provision applies.

`1.3 The Contractor's representative shall be responsible for ensuring that the provisions of statutes, regulations and by-laws pertaining to safe performance of the Work and the work of Other Contractors and Owner's own forces working on the Site are observed and that the methods of performing the Work do not endanger the personnel employed thereon and the general public, and are in accordance with the latest edition of the Occupational Health and Safety Act. Contractor to include representatives of Other Contractors working on Site on the Joint Health and Safety Committee.

1.4 Prior to the Contractor's representative being absent from the Site, the Contractor's representative will name another person, in writing to the Consultant, who is competent to assume these responsibilities. The Contractor shall advise the Consultant of any change in the individual identified as the Contractor's representative.

1.5 At the discretion of the Consultant, the "Constructor" designation may be transferred to/from a Contractor at any time at no additional cost to the Owner.

2 PROJECT RESPONSIBILITIES

2.1 The Contractor's representative shall ensure that:

2.2 All measures and procedures prescribed by the following Acts and Regulations are carried out on Site:

.1 The Occupational Health and Safety Act;

.2 The Regulations for Construction Projects;

.3 WHMIS Regulations;

.4 The Environmental Protection Act and regulations,

.5 All other legislation, regulations and standards as applicable.

2.3 Every employer and every worker performing Work on the Site must comply with the requirements referred to above.

2.4 Ensure that the health and safety of workers, employees of the Owner and the general public are protected in relation to the Work performed on the Site.

3 WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)

3.1 Be familiar with and comply with WHMIS regulations.

3.2 Properly label controlled products. Provide proper warning labels and training at the Site.

3.3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS. Log shall be open for inspection by Owner, Consultant and all personnel on Site.

3.4 Provide copies of material safety data sheets (MSDS) for any controlled products prior to delivery to the Site.

3.5 Be responsible for all applicable requirements of the regulations.

3.6 Before commencing any Work on Site, attend the pre-construction meeting and provide the Consultant with a proposal as to how hazardous materials will be stored and dispensed on Site. In addition, specifically outline the measures which will be undertaken to prevent damage or injury in the event of an accidental spill.

3.7 Provide Handling Procedure for Hazardous Materials".

4 JOINT HEALTH AND SAFETY COMMITTEE

4.1 The Contractor shall be responsible for the establishment and operation of the Joint Health and Safety Committee as required by the Occupational Health and Safety Act.

5 DELIVERABLES

5.1 The Contractor shall deliver to the Consultant:

.1 The Contractor's Occupational Health and Safety Policy.

.2 The Contractor's safety program to implement the Occupational Health and Safety Policy for the Contract, which will effectively prevent and control accidents for the Contract.

.3 A copy of all communications with, and including all orders by, the Ministry of Labour or other occupational health and safety enforcement authority.

.4 A copy of all accident/injury investigation reports, not just the WSIB Form 7. Each report must contain a statement of actions that will be taken to prevent a recurrence.

.5 A copy of all inspection reports made by the Contractor in compliance with the employer's responsibility under the Occupational Health and Safety Act.

.6 A copy of all safety information pertaining to the Contract made and furnished by the Contractor's own "Safety Personnel" or outside consultants/advisers engaged for the purpose of inspecting the workplace for occupational health and safety.

.7 A verification that all workers in the employ of the Contractor on Site, have had a WHMIS training or refresher course within the last twelve months.

.8 A verification that all workers in the employ of the Contractor have had "Explosive Activated Tool Training" on the type of tools being used.

.9 A verification that the instruction manuals are on Site for all tools and equipment being used.

.10 A copy of the most recent workers compensation experience rating account, i.e. CAD-7, NEER, and/or an insurance carrier's experience rating account.

.11 Statistical information for the purpose of determining injury frequency and severity rates (hours worked, first-aid injuries, medical aid injuries, lost time injuries, restricted workday injuries, near-miss accident/incident and significant occurrence data), in a timely manner as required by the Consultant.

.12 The immediate reporting to the Consultant of all instances that are defined in the Occupational Health and Safety Act as "Notices of Injuries" and "Occurrences" and any occasion that a worker exercises their "Right to Refuse Unsafe Work".

5.2 The Consultant reserves the right to require additional or amended deliverables pertaining to safety during the duration of the Work at no additional cost to the Owner.

5.3 Items specified above shall be delivered to the Consultant prior to the Contractor commencing Work on the Site.

6 DUE DILIGENCE

6.1 The Contractor acknowledges that it has read and understands the measures and procedures relating to occupational health and safety as prescribed above. The Contractor acknowledges and understands its duties as therein set out and hereby expressly undertakes and agrees to comply with all such requirements and standards in their entirety and at the Contractor's expense.

6.2 The Contractor further agrees to fully cooperate with all health and safety requirements, rules, regulations, standards and criteria set out in the Contract Documents, which agreement is in furtherance of the Contractor's duties and responsibilities under occupational health and safety legislation.

6.3 The Contractor agrees that if, in the opinion of the Consultant or Owner, the health and safety of a person or persons is endangered or the effective operation of the system put in place to ensure the health and safety of workers on the Site is not being implemented, the Consultant or Owner may take such action as it deems necessary and appropriate in the circumstances, including, without limitation, the following:

.1 Require the Contractor to remedy the condition forthwith at its own expense;

.2 Require that the Site be shut down in whole or in part until such time as the condition has been remedied;

.3 Remedy the problem and the Owner shall back-charge the Contractor for the cost of such remedial work, together with an appropriate overhead factor as determined by the Owner in its sole discretion; and

.4 Terminate the Contract without further liability in the event the Contractor fails to comply with these provisions.

6.4 If a lien is registered, in respect to any monies held back, back-charged or assessed in accordance with these paragraphs, the Contractor shall consent to an order vacating such registration and shall indemnify the Owner for any and all loss, whereby direct or consequential which the Owner may sustain as a consequence of such registration.

7 SITE SAFETY PERSONNEL

7.1 In the event the Consultant deems it necessary, because of the Work, the Contractor shall assign a "Competent Safety Person" to assist the Contractor's representative in the discharging of safety responsibility, at no additional cost to the Owner.

END OF SECTION

1 GENERAL

1.1 Provide labour, Products, equipment, services, tools, and supervision necessary for cutting and patching work in accordance with the Contract Documents.

1.2 Obtain Consultant's approval prior to cutting, boring or sleeving load-bearing members.

2 DEFINITION(S)

2.1 The terms “make good”, “making good”, “made good”, “restore to existing”, “patch”, “repair”, or similar words or phases are used in standards and these Contract Documents to mean the following, unless context provides otherwise:

.1 Make good materials and finishes which are damaged or disturbed during the process of additions and reconstruction under the Contract.

.2 Where existing work is to be made good, match new work exactly with the existing work in material, form, construction and finish unless otherwise noted or specified.

.3 Where existing work is to be made good, there shall be no visible difference in appearance, performance, or aesthetics between the existing work and the new work by the naked eye at a distance of 3 metres from the surface being made good.

3 SUBMITTALS

3.1 Submit written request in advance of cutting or alteration which affects:

.1 Structural integrity of any element of the Structure or Contract.

.2 Integrity of weather-exposed or moisture-resistant elements.

.3 Efficiency, maintenance, or safety of any operational element.

.4 Visual qualities of sight-exposed elements.

.5 Work of Owner’s or Other Contractors.

3.2 Include in request:

.1 Identification of Contract.

.2 Location and description of affected Work.

.3 Statement of necessity for cutting or alteration.

.4 Description of proposed Work and products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on work of Owner’s or Other Contractors.

.7 Date and time Work will be executed.

3.3 Obtain Consultant's approval of proposed method of cutting prior to proceeding with the Work.

4 PRODUCTS

4.1 Same quality or better than Products incorporated in original installation.

5 PREPARATION

5.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

5.2 After uncovering, inspect conditions affecting performance of the Work.

5.3 Beginning of cutting or patching means acceptance of existing conditions.

5.4 Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of the project from damage.

5.5 Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

5.6 Protect work such as floors, finishes, trim, etc., as completely as possible to hold the replacing of damaged work to a minimum.

5.7 Preparation for new finishes:

.1 Remove existing finishes, including painting.

.2 Fill cracks and depressions with suitable filler and finish smooth, as recommended by the manufacturer of the new finishes.

.3 Grind protrusions level with substrates and finish smooth.

.4 Remove all evidences of existing adhesive, grease, oil, soil and other encrustations of foreign material by washing, scraping and grinding if necessary.

.5 Clean and prepare substrates to receive new work.

6 EXECUTION

6.1 Execute Work to avoid damage to other Work.

6.2 Execute cutting, fitting and patching including excavation and fill to complete the Work.

6.3 Employ appropriate trades with skilled labour to perform cutting Work.

6.4 Fit Work segments together, to integrate with penetrations through surfaces and with other Work.

6.5 Remove and replace defective and non-conforming Work.

6.6 Do any drilling, cutting, fitting, patching and finishing that may be required to make the various classes and kinds of other Work fit together in a professional and finished manner. Make watertight connections with adjoining structures.

6.7 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

6.8 Execute Work by methods to avoid damage to other Work and which will provide proper surfaces to receive patching and finishing.

6.9 Cut Products using proper equipment and methods. On rigid materials, use a masonry saw or core drill. Pneumatic or impact tools are not allowed on masonry work without prior approval.

6.10 Where new Work connects with existing structures, cut, patch and make good existing work to match original condition.

6.11 Be responsible for correct formation and bridging of openings in masonry and structural walls as required.

6.12 Ensure compatibility between installed Products and security of installation.

6.13 Restore Work with new Products in accordance with requirements of the Contract Documents.

6.14 Fit Work airtight to pipes, sleeves, ducts, conduits and other penetrations through surfaces.

6.15 Properly prepare surfaces to receive patching and finishing.

6.16 Refinish surfaces to match adjacent finishes; for continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.

END OF SECTION

1 PROGRESS CLEANING

1.1 Remove from finish work, spatters, droppings, soil, labels, and debris, before they set up.

1.2 Ensure that only cleaning materials are used which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.

1.3 Maintain building work areas "broom clean" at least on a daily basis, but shall also be done immediately before finishing work.

1.4 No waste material may be burned or buried at site. Remove as often as required to avoid accumulation, no less than, at the end of each working day.

1.5 Remove packaging materials and debris from the site immediately product and equipment is unwrapped or uncrated.

1.6 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers, in open drain courses, or anywhere on site.

1.7 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water. Provide containers in which to collect waste material and debris. Dispose of hazardous products in accordance with requirements of jurisdictional authorities.

1.8 Ensure that cleaning operations are scheduled to avoid deposits, of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.

1.9 Provide instructions for final cleaning of finishing work, and for inclusion in Maintenance and Operating Manuals.

2 FINAL CLEANING

2.1 Before final inspection, replace glass and mirrors broken, damaged, and etched during construction, or which are otherwise defective.

2.2 In addition to requirements for progress cleaning, Work shall include final cleaning by skilled cleaning specialists on completion of construction.

2.3 Remove temporary protections and make good defects before commencement of final cleaning.

2.4 Final cleaning shall remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building for all new work throughout new and existing Building. Work shall be done in accordance with manufacturer's instructions for each material. This work shall include:

.1 Washing of concrete floors.

.2 Cleaning and polishing of glass, mirrors, porcelain, enamel and finish metals.

.3 Vacuum cleaning of ceilings, walls and floors.

.4 Cleaning and polishing of ceramic tile floors.

.5 Cleaning of resilient flooring.

.6 Buffing of resilient flooring followed by two light coats of wax, each buffed.

.7 Washing clean of glazed wall surfaces.

.8 Cleaning of hardware, mechanical fixtures, plumbing fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components.

.9 Cleaning of windows and entrances, both interior and exterior surfaces.

2.5 Maintain cleaning until Owner has taken possession of building or portions thereof.

END OF SECTION

1 GENERAL

1.1 Hand over to the Consultant one hardcopy and 2 digital copies of a comprehensive operations and maintenance manual and material suitable for the Owner's maintenance employees. Manuals shall cover all Products supplied and installed under the Contract.

1.2 Submit digital draft of the operation and maintenance manuals for the Consultant's review at least 15 days before testing systems and equipment. Incorporate alterations and additions, as found to be necessary during testing, and prepare the final version of the manual from the corrected draft.

1.3 Operation and Maintenance manuals shall be submitted at time of application for Substantial Completion.

1.4 Testing of systems and equipment will not be deemed to be complete until the requisite number of copies of the final version of the manuals has been handed over to the Consultant.

1.5 If standard literature is incorporated into the operations and maintenance manual, any irrelevant information shall be deleted, or suitably noted.

1.6 The manuals shall have sufficient detail in order that the Owner can totally maintain the equipment without outside help.

1.7 Submit all material in English.

2 FORMAT

2.1 Organize data in the form of an instructional manual.

2.2 Binders: Commercial quality, 219 x 279 mm, maximum "D" ring size.

2.3 Digital copies on USB of DVD as required by TDSB.

2.4 Cover: Identify each binder with type or printed title "Contract Record Documents"; list title of Contract, identify subject matter of contents.

2.5 Arrange content by systems or process flow, under Section numbers and sequence of Table of Contents.

2.6 Provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.

2.7 Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

2.8 Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

3 CONTENTS

3.1 Operation and maintenance manuals shall contain the following minimum information and data:

.1 Table of Contents: Provide title of contract; names, addresses, and telephone numbers of Consultants and Contractors with the name of responsible parties; schedule of Products and systems, indexed to content of the volume.

.2 For each Product or system: List addresses and telephone numbers of Subcontractors, suppliers and service representatives, including local source of replacement supplies and parts including telephone numbers.

.3 Warranties: Warranties are between the Contractor and Owner. Warranties shall include, as a minimum:

.1 Description of warranty coverage

.2 Date warranty starts (being date of Contract completion)

.3 Date Warranty expires

.4 Contact name, address and phone number (the Contractor shall also be responsible for advising the Owner of changes in contact information during the warranty period)

.5 Equipment and components, performance curves

.6 Hydro certificates

.4 Reports: For each product or system provide the following:

.1 Manufacturer’s certified reports

.2 Factory test reports

.3 Field testing reports

.5 Details of design, construction and/or fabrication features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of the installation.

.6 Technical data, product data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts list.

.7 Schematics, interconnection lists: manuals shall be complete with schematic and writing diagrams, writing interconnection lists and diagrams fully cross referenced and coordinated, printed circuit board layouts including the component identification, component parts list with electronic substitution equivalent. Provide cross referenced components list and sequence of operations.

.8 Trouble shooting and fault location guide: Instructions to facilitate quick return of malfunctioning equipment to operation.

.9 Routine servicing and preventative maintenance schedule for Products and/or estimated hours required for routine servicing and preventative maintenance tasks.

.10 List of recommended spare parts and recommended quantity of each item to be stocked based on spare part availability and re-order time.

.11 Complete set of reviewed shop drawings.

.12 Product data: Mark each sheet to clearly identify specific Products and component parts, and data applicable to installation; delete inapplicable information.

.13 Drawings: Supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams and as required in the Specifications.

.14 Typed text: As required to supplement Product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions and as required in the Specification.

4 DRAWINGS

4.1 Prepare all required drawings on CAD, using AutoCAD. AutoCAD version to suite Owner’s CAD requirements.

4.2 Prepare CAD drawings to meet the requirements of the Owners or Consultant’s CAD Standards and Procedures.

4.3 Supply and hand over to the Consultant, one original photographic reproduction for each final drawing prepared under this Contract, including but not limited to circuit drawings, equipment layout drawings, and shop drawings.

4.4 Prior to Contract Completion, supply and hand over to the Consultant, one complete set of CAD Drawing Files in AutoCAD format on compact disk (CD) for each final drawing prepared under this Contract and one complete 11" x 17" hard copy set, including but not limited to circuit drawings, equipment layout drawings, and shop drawings.

4.5 Text files shall be written in word processing program acceptable to Owner.

5 TRANSMITTAL

5.1 Forward storage media to the Owner through the Consultant with a transmittal form. Transmittal shall contain the list of file names contained on the storage media.

5.2 Data forwarded to the Owner shall contain the following files in addition to the design information:

.1 Library parts/cells used in the design files.

.2 Level convention used for each design file.

.3 Plotting instructions used to prepare hard copies including colour tables, pen tables and plot scale.

.4 Working units of the design files.

.5 Font library, if the standard is not used.

END OF SECTION

1 PROGRESS RECORDS

1.1 Maintain on site, permanent written records of daily progress of the Work. Records shall be open to review by Consultant and Owner at all times and a copy shall be furnished to Consultant on a weekly basis.

1.2 Records shall show dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to number of employees of various trades and type and quantity of equipment employed daily, temperature, protection methods and other such data shall be noted.

2 RECORD DRAWINGS

2.1 Authorized deviations from drawings shall be marked in red accurately on one set of drawing prints in a neat, legibly printed manner and shall be dated. Prior to final inspection, neatly transfer the recorded information to a second set of drawing prints of the most recent revision to the drawings and submit both sets to the Consultant.

2.2 Maintain record drawings up to date as Work progresses. Status of maintained record drawings may be considered as a condition for validation of applications for payment.

2.3 Identify each record drawing as "Contract Record Copy" and maintain the record drawings in good condition. Make record drawings available to the Consultant at all times.

2.4 Record drawings shall include accurate dimensioned record of deviations and changes in Work from drawings.

2.5 Record drawings shall be signed and dated by Contractor.

2.6 Submit record drawing to Consultant for review and make corrections as directed by Consultant.

2.7 Record accurately all deviations in the Work.

2.8 Accurately record locations of concealed structure, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration Work and future additions. Do not conceal such Work until the location has been recorded.

2.9 Accurately record locations of equipment bases, anchors, concrete pads and roof curbs, sleeves, piping, conduits, ducts, maintenance holes and valves, etc. located either below, outside or within structure.

2.10 Where piping, conduits and ducts are underground, underfloor, embedded in concrete or otherwise in inaccessible locations, accurately record with respect to structure column lines or walls and elevations with respect to finished floor levels or grades referenced to the centre line of components.

2.11 Accurately record any components which will be in inaccessible locations for Consultant's review before the component is covered, or buried, or made inaccessible.

2.12 CAD drawings of Contract Drawings can be obtained from Consultant at a cost of $50.00 per drawing.

2.13 Clearly and prominently mark each drawing “RECORD DRAWING prepared by (name of Contractor)”

3 AS-BUILT DRAWINGS

3.1 Contractor shall provide as-built drawings and specifications for all disciplines in AutoCad and PDF format upon construction completion.

END OF SECTION

1 General

.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for demolition and removals Work in accordance with the Contract Documents.

.2 Work included: Requirements for demolishing, salvaging and removing wholly or in part the various items designated on the drawings or required to be removed or partially removed for the receipt of the Work of this Contract, including not necessarily limited to:

1. Removal of existing Windows, Blinds and items interfering with window removal and installation.
2. Removal of Doors, Screens and Frames.
3. Alteration and renovations to the existing building.
4. Cutting and removing of walls, masonry, window sills, in the existing buildings as indicated on Drawings.
5. Patching, making good openings and chases in walls, floors, ceilings, including the supply and installation of lintels, channels and finishes.
6. Removal of rubbish, debris, demolished fixtures, fitments and items not scheduled to remain the Owner's property, resulting from the demolition and preparatory work.
7. Remove abandoned services such as conduits, pipes, wiring, ducts, fixtures, equipment, etc. where required for the work or indicated on the drawings.
8. Removal of all mechanical items including services etc. where required for the work or indicated on drawings and or where not required to be relocated.
9. Removal of existing electrical items including fixtures, etc. where required for the work or indicated on the drawings and not required to be relocated.
10. Dust control during the operations of the work of this Section.
11. Removal shall mean removal from site and safe disposal in a legal manner.
12. Removal of paint from soffit and flashing at canopies.

.2 **REFERENCES**

.1CSA S350-M, Code of Practice for Safety in Demolition of Structures.

.3 **SUBMITTALS**

.1 Where required by Authorities having jurisdiction, submit a Fire Plan to local fire department for review and approval.

.2 Submit shop drawings, diagrams and details in accordance with the Conditions of the Contract.

.3 30 calendar days prior to start of demolition and removals Work, submit for review, drawings, diagrams or details showing sequence of disassembly Work and shoring of supporting structures in accordance with authorities having jurisdiction.

.4 Submit for approval, a plan showing impacts, interruptions and delays to Owners operations.

.5 Submit Dust Control Plan conforming to requirements of the City of Toronto's Public Health Services.

.6 Have submissions signed and sealed by Professional Engineer licensed in Province of Ontario.

.7 Submit to Consultant, details of where rubble, debris and other materials are to be disposed or reused. Include each disposal/reuse site location, operator's name and business address, type of license under which site operates, and criteria used by site to assess suitability of rubble, debris and other materials for disposal.

.8 Give notice to Utility Authorities controlling services and appurtenances which will be affected by demolition Work.

.4 QUALITY ASSURANCE

.1 Prepare waste audits, waste reduction workplans, source separation programs and recycling programs as required by jurisdictional authorities and update programs and implement such programs as required.

.2 Perform the work of this section in accordance with the 'Environmental Protection Act' including Ontario Regulation 102 and the 'Environmental Assessment Act' including Ontario Regulation 103.

.3 Conform to Fire Code, Regulation under the Fire Marshals Act.

.4 The demolition contractor must engage a registered professional engineer who holds a certificate of authorization and an appropriate level of liability insurance to prepare demolition procedures.

.5 As part of the contract requirements, the engineer for the demolition contractor should be required to sign the general review commitment required by city building departments.

.6 Roof Removal: Conform the requirements of Canadian Roofing Contractors Association.

.5 SITE CONDITIONS

.1 Interruptions to Owners operations will not be permitted.

.2 Perform operations, machine and equipment movements, deliveries and removals at time or times that will permit uninterrupted operations in and around structures, including parking, deliveries, and Site access and egress.

.3 Take over structures to be demolished based on condition on date that Tenders close.

.4 Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.

2 Products

.1 **MATERIALS**

.1 All materials requiring removal shall become the Contractor's property and shall be removed and disposed of from the site, as the work progresses, unless indicated otherwise.

.2 Salvaged material:
.1Salvage and stockpile Products, materials, and equipment as specified herein, indicated on Site or indicated on drawings.
.2Coordinate items to be salvaged with Consultant and Owner.
.3Salvaged materials shall not be chipped, cracked, split, stained or damaged.
.4Store items off of moist surfaces.

3 Execution

.1 **GENERAL**

.1 Close and secure all openings to prevent public access to the building, and to prevent any damage from elements.
Schedule work to coincide with commencement of new roofing system installation.

.2 Remove only enough existing roofing system materials that can be replaced with new roof system the same day of as the weather will permit in a day.

.3 Clean up rubble and debris, resulting from Work promptly and dispose at end of day or place in waste disposal bins. Empty bins on regular basis.

.4 Stockpiling of rubble, debris, and surplus Products on Site will not be permitted.

.5 Remove, handle and transport Products indicated to be salvaged and stored for future use. Transport Products to storage area(s) designated by Consultant. Perform Work to prevent any damage to Products during removal and in storage. Products damaged during removal, will be inspected by Consultant. Consultant will determine extent of damage and accept or refuse Products.

.6 Communicate Dust Control Plan procedures to all appropriate personnel on site and their head offices and due diligence measures to be maintained to control all fugitive emissions.

.7 Take precautions to guard against movement, settlement or collapse of adjacent services, sidewalks, driveways, or trees. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.

.2 EXAMINATION

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Examine adjacent structures and other installations prior to commencement of demolition and removals Work.

.3 Verify that openings are ready for new window installation.

.4 Verify that existing roof surface is clear and ready for work of this section.

.3 PRESERVATION OF REFERENCES

.1 Record location and designation of survey markers and monuments located within demolition area, prior to removal. Store and restore markers and monuments upon completion of Work or relocate as directed by Consultant.

.4 PROTECTION

.1 Prevent movement or damage of adjacent structures, services, and parts of existing structure to remain. Supply and install bracing, and shoring as required. Make good damage caused by demolition to acceptance of Consultant.

.2 Protect adjacent structures and property against damage which might occur from falling debris or other causes. Repair or replace damage caused from Work of this Section to acceptance of Consultant.

.3 Do not interfere with use of adjacent structures and Work areas. Maintain free, safe passage to and from adjacent structures and Work areas.

.4 Take precautions to support affected structures. If safety of structure being demolished, adjacent structures or services are endangered, cease demolition operations and take necessary action to support endangered item. Immediately inform Consultant. Do not resume demolition until reasons for endangering have been determined and corrected and action taken to prevent further endangering.

.5 If movement or settlement occurs, install additional bracing and shoring as necessary and make good damage to acceptance of Consultant.

.6 Hang tarpaulins where debris and other materials are lowered. Build in around openings with wood and plywood at locations used for removal of debris and materials.

.7 Prevent debris from blocking surface drainage system, elevators, mechanical, and electrical systems which are required to remain in operation.

.8 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger Work or adjacent structures and premises.

.9 Supply and install adequate protection for materials to be re-used, set on ground and prevent moisture pick-up. Cover stockpiles of materials with tarpaulins.

.10 Close off access to areas where demolition is proceeding by barricades and post warning signs.

.11S Supply, install and maintain legal and necessary barricades, guards, railings, lights, warning signs, security personnel and other safety measures, and fully protect persons and property.

.12 Dust/weather partitions:

.1 Prior to demolition Work proceeding in existing structures, temporarily enclose Work areas, access and supply and install dustproof and weatherproof partitions. Design partitions to prevent dust and dirt infiltration into adjoining areas, prevent ingress of water, and to resist loads due to wind.

.2 Prevent dust, dirt and water from demolition operations entering operational areas.

.3 Adjust and relocate partitions as required for various operations of Work.

.4 Upon completion of Work, remove and dispose of partitions from Site.

.13 Dust protection:

.1 Perform dust control procedures in accordance with approved Dust Control Plan and work of this Section.

.2 Clean water to be applied to hard and soft surfaces and on open excavation faces on Site daily to eliminate dust.

.3 Roadways and sidewalks to be cleaned daily or as required.

.4A designated truck loading area on granular material or existing asphalt to be used to mitigate tracking of potentially contaminated soil and demolition debris off Site. Contaminated loading points to be cleaned or re-established.

.5Loaded vehicles leaving Site to be cleaned of loose soil and debris with power washing or alternative method.

.6Trucks loaded with indigenous soil or demolition debris to be covered by tarps or attached screens.

.14 Blasting is not permitted.

.5 **PREPARATION**

.1 Provide, erect and maintain required hoarding, catch platforms, lights and other protection around Site before commencing work. Maintain such areas free of snow, ice, mud, water and debris. Lighting levels shall be equal to that prior to erection.

.2 Disconnect and/or re-route electrical data, communication and telephone service lines entering structures to be demolished. Remove abandoned lines as indicated on Contract Drawings. Post warning signs on electrical lines and equipment which is required to remain energized.

.3 Disconnect and cap designated mechanical services:
.1Sewer and water lines: Remove and dispose of as indicated on Contract Drawings.
.2Other underground services: Remove and dispose of as indicated on Contract Drawings.

.4 Disassemble and remove mechanical equipment, ductwork and piping complete with supports and associated components.

.5 Do not disrupt active or energized utilities designated to remain undisturbed.

.6 Perform rodent and vermin control to comply with health regulations.

.6 **CONCRETE CUTTING AND CORING**

.1 Prior to cutting or coring any concrete slab, suspended or on grade, or any concrete beam, investigate by telemetrically scanning the element for presence of embedded services (piping, cabling, conduit, etc.), and for locations of reinforcing steel in suspended concrete slabs and beams.

.2 Acceptable telemetric scanning systems include:
.1X-Ray scanning of suspended slabs and for concrete beams.
.2(Ground-penetrating) radar for slab on grade, for suspended slabs and for concrete beams.

.3 Magnetic radio scanners not acceptable for telemetric scanning.

.4 The term x-rays include gamma ray methods, and procedures that use electrically generated x-rays.

.5 Where x-rays employed:
.1Provide Owner minimum 5 working days advance notice of scanning time in order to provide sufficient advance notice to personal that may be affected by the x-ray work.
.2Conform to Owner’s radiation protection requirements prior to start of any x-ray work.

.6 Provide Owner and Consultant with inspection agency's written report, summarizing investigations and conclusions.

.7 Obtain Consultant's direction where investigations reveal that cutting or coring required in Contract would cut or damage embedded services, or cut or damage reinforcing steel in suspended concrete slabs or beams.

.8 Execute cutting and coring to prevent damage to all embedded services. Make good all damage arising from cutting embedded services.

.9 Execute cutting and coring to prevent damage (cutting in whole or in part) reinforcing steel in suspended concrete slabs with Consultant's prior authorization.

.10 Make good all damage arising from cutting reinforcing steel in suspended concrete slabs and beams.

.7 **DEMOLITION**

.1 Perform demolition with extreme care. Confine effects of demolition to those parts which are to be demolished.

.2 Perform Work and prevent inconvenience to persons outside those parts which are to be demolished.

.3 Carry out demolition in accordance with the requirements of CSA S350-M.

.4 Demolish parts of structure to permit remedial Work as indicated.

.5 Demolition shall proceed safely in systematic manner from roof to grade and as necessary to accommodate remedial work indicated. Work on each floor level shall be complete before commencing work on supporting structure and safety of its supports are impaired. Parts of building which would otherwise collapse prematurely shall be securely shored. Walls and piers shall not be undermined.

.6 Do not overload floor or wall with accumulations of material or debris or by other loads.

.7 Roof Areas: Remove existing roofing gravel, perimeter flashings, base flashings, counter flashings, vent stack flashings, roofing membrane, insulation, vapour retarder, and all associated components.

.8 Coordinate removal of roof mounted mechanical equipment, electrical equipment, and with relevant trades.

.9 Prior to removing roofing materials, temporarily plug drains to prevent any debris from entering the drainage system. Unplug at the end of each day and prior to rain.

.10 Perform Work to minimize dusting. Keep Work area wetted down with fog sprays to prevent dust and dirt rising. Supply and install temporary water lines and connections that may be required. Upon completion, remove installed temporary water lines. Use covered chutes, water down.

.11 Do not sell or burn materials on Site.

.12 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as Work progresses.

.13 At end of day's Work, leave Work in safe condition with no part in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements.

.14 Drainage and sewer system protection:
.1 Ensure that no dust, debris or slurry enters drainage and sewer system on Site.
.2 Remove and dispose of debris and slurry promptly from Site.
.3 Comply with City of Toronto Sewer Use By-Law.

.15Concrete:
- .1 Demolish concrete by methods which avoid impact loads on items which are not to be demolished.
- .2 Where only part or parts of a concrete floor, wall, roof, foundation or other items are to be demolished, use saw cuts to isolate areas which are to be demolished except where existing reinforcing steel is to be left in place. Prior to such isolating, install suitable support to prevent premature movement of area(s) being isolated and undesirable transfer of loads as cutting progresses. If necessary remove area(s) to be demolished by successively isolating small sections.
- .3 Where reinforcing steel is to be left in place, use saw cuts from surface of concrete around perimeter(s) of area(s) to be demolished, chip concrete without damaging reinforcing steel. Retouch damaged epoxy coating of existing reinforcing steel.

.16 Masonry:
- .1 Demolish block or brick or pre cast walls and veneers in small sections of not more than 2 m^2. Do not permit masonry to fall in mass from one level to another.
- .2 Where only part(s) of a wall is to be demolished, install adequate support for adjacent part(s).
- .3 After removal of masonry walls, grind smooth floors ready for new floor finish.

.17 Steel: Where only part or parts of structure is to be demolished, dismantle and maintain structure stable. Do not place excessive loads on components. Install adequate temporary guys and supports to ensure stability and to prevent excessive loading. Support each component being disconnected from structure, and lower, do not drop, component after it is disconnected.

.18 Cut openings through existing walls, partitions, roofs and floors. Establish exact location of steel reinforcing in existing concrete slabs or walls before cutting. Be responsible for damage to existing steel reinforcing and be liable for structural failure. Make good surfaces disturbed with materials to match existing.

.19 Sheet metal flashings:
- .1 Remove sheet metal flashings indicated on drawings.
- .2 Consultant to inspect sheet metal flashings to determine suitability for reuse. Stockpile sheet metal flashings to be reused.

.20 Scrape, repair, sand, clean and repaint fascias in accordance with Section 09 91 00.

.21 Demolish all other items indicated or required.

.8 DISPOSAL OF MATERIALS

.1 Remove from Site, rubble, debris, and other materials resulting from demolition and removals Work in accordance with Authorities having Jurisdiction, except where specified or indicated on Contract Drawings to be reused.

.2 Conform to requirements of municipality's Works Department regarding disposal of waste materials.

.3 Materials prohibited from municipality waste management facilities shall be removed from Site and dispose of at recycling companies specializing in recyclable materials.

.9 RESTORATION

.1 Where demolition removed a structure or installation, rough grade and restore area in accordance with Authorities having Jurisdiction.

END OF SECTION

1. GENERAL

1.1 General Requirements

.1 Supply all materials, labour, tools and equipment required for repair of concrete as provided in Contract Documents.

.2 All works shall comply with applicable requirements of the contract documents and all relevant Sections of this Specification.

.3 All work shall comply with the latest edition of Ontario Building Code, the Occupational Health and Safety Act, the Regulations for Construction Projects, local regulations, by-laws, and standards.

1.2 Scope of Work

The work of this section includes, but is not limited to the following:

.1 Repair of delaminated, honeycombed, or unsound concrete encountered on the surface of the exterior concrete bands and columns.

.2 Repair of cracks, spallings and other surface defects.

.3 Repair of corroded reinforcing steel

.4 Repair of cuts and holes or other similar defects on the exterior surfaces.

1.3 Codes and Standards

.1 Ontario Building Code and referenced standards, by-laws, and regulations.

.2	CSA 3 – A23.1	Concrete Materials and Methods of Concrete Construction
.3	CSA 3 – A266.2	Chemical Admixtures for Concrete
.4	CSA – A5	Ordinary Portland Cement
.5	CSA – S269.1	Falsework for Construction Purposes

1.4 Quality Assurance

.1 Employ a qualified team of restorers with at least five (5) years of specialized experience in concrete repair. Submit substantiating references, if requested.

.2 Produce trial mixes and provide concrete samples for laboratory testing after each new shipment of concrete material. This shall be done at least once a month.

1.5 Examination of Site Conditions and Documents

.1 Inspect the site conditions and review Contract Documents as well as all matters related to the nature of the work to be undertaken. Report any inconsistency or unusual conditions to the Consultant.

.2 Carefully examine extent of the work to be performed and all matters which are referred to in the specifications or are necessary for full and proper execution of the work.

.3 Sound vertical surfaces with hammer, to detect spalled and unsound concrete, and mark delaminated areas and spalled areas with spray paint.

.4 Before commencement of Work, obtain the Consultant's approval for the extent of all repair work.

2. Products

2.1 Repair Materials

.1 Concrete and mortar mixes:

.1 Cement: normal Portland Cement to CAN/CSA-A5, Type 10.
.2 Mixing water: clear and potable to CAN/CSA-A23.1.
.3 Fine aggregate: natural sand to CAN/CSA-A23.1.
.4 Coarse aggregate: crushed stone or gravel to CAN/CSA-A23.1, suitable for NBC type S concrete. Maximum size 12 mm except 6 mm for shallow repairs.

.2 Epoxy bonding compound:

Sikatop Armatec 110 by Sika Canada Inc. or approved equivalent.

.3 Epoxy mortar:
Pre-packaged, Sikadur 43 Patchpak or approved equivalent by Sika Canada Inc.

.4 Patching compounds:
Sika MonoTop-623^{FT,} Sika Top 123 plus , by Sika Canada Inc., or approved equivalent.

.5 Curing compound:
Florseal WB 18/25 by Sika Canada Inc. or approved equal compatible with the repair/patching material.

.6 Crack sealer:
"Dymonic FC" by Tremco, or "Sikaflex 1A Limestone or Sikadur 31", or "Anchorfix 4^{CA}" by Sika Canada Inc., or approved equal.

.7 Crack filler:
SikaFix PU manufactured by Sika Canada Inc., or approved equivalent.

.8 Ready Mix Concrete:

Sikacrete – 08 SCC by Sika Canada Inc. or approved equal.

2.2 Admixtures

.1 Admixtures shall conform to CSA CAN3-A266.2 and shall be compatible with all other ingredients.

.2 Latex modifier for concrete:
Modifier A by Dow Chemical Canada Inc. or approved equivalent.

.3 No calcium chloride or any admixture containing calcium chloride shall be used.

2.3 Storage and Handling

.1 Deliver, store and handle all materials strictly to the manufacturer's written instructions.

.2 Ensure that all materials are delivered to the site in undamaged original sealed containers with labels intact.

2.4 Replacement

.1 Alternate products, in lieu of those listed in this section, may be suggested by the Contractor in writing. These can only be used if approved in writing by the Consultant.

3. EXECUTION

3.1 Workmanship

.1 Comply with the requirements of CSA-A23.1 and other specific requirements of the Contract.

.2 Repair work shall be performed by a team of workers having at least 5 years of experience in concrete repair.

.3 Repair material/compound shall be applied in compliance with suppliers' requirements and instructions.

.4 Removal of deteriorated concrete and demolition shall be carried out using light chipping hammer/gun (preferably electric powered).

.5 Prior to commencement of repair work, the Contractor shall thoroughly inspect the concrete bands and columns.. review the Consultant's marking and check surrounding areas for defects by sounding the concrete surface using hammer. After examining the repair area, the Contractor shall review the repair method with the Consultant.

.6 After completion, the Contractor shall obtain the Consultant's acceptance of all repair works in a given area before removal of the access scaffolding.

.7 Bring to the attention of the Consultant any defect of deficiencies which may occur during repair work or have not been located before

3.2 Records

.1 Maintain accurate records of repair work indicating dates, location, size, and materials used for repairs and test samples taken.

3.3 Repair Procedure

.1 Removal of Unsound Concrete

.1 Establish extent of areas to be repaired and mark with paint or other suitable means. Arrange for the repair areas to be reviewed by the Consultant.

.2 Chip out all unsound or delaminated concrete of area to be repaired to a minimum depth of 25 mm.

.3 Widen all cracks that are open 0.3 mm or more by grooving a channel minimum 20 mm wide and 25 mm deep. Form sharp clean edges slightly undercut in wider channels.

.4 Where supplement or extension of reinforcement is required, remove additional concrete to expose sound existing rebars for splicing.

.2 Supplementary Reinforcement

.1 After thorough cleaning, check the actual cross section of the remaining in-place reinforcement and compare them with its original dimensions. Where a loss of reinforcement cross-sectional area exceeds three percent (3%), supplementary reinforcement shall be applied. Advise the Consultant of all such areas. Install additional reinforcement as directed by the Consultant.

.2 Where cross-sectional reinforcement area is reduced by steel corrosion, install additional rebars to make up for the losses as directed by Consultant.

.3 Support exposed rebars by suitable means such that the required minimum clearance of 20 mm between completely exposed reinforcing bars and the underlying surface is maintained. The concrete cover shall be maintained as well.

.4 Shallow patches that expose little or no wall reinforcement shall be anchored with 5 mm stainless steel threaded pins

fixed in the original concrete by epoxy and spaced at 200 mm in both directions.

.5 In large shallow areas, install shrinkage reinforcement in form of a suitable wire mesh fixed to the anchor pins.

.3 Surface Preparation

.1 After the removal of all unsound concrete, shape saw-cut edges at least 12 mm deep. Inside corners of the cavity shall be rounded to a 30 mm radius. The finished cavity should be reasonably uniform in depth and of moderately rough surface texture to encourage bonding and be as per detail drawings.

.2 Thoroughly clean all concrete and steel surfaces by wire brush or grinders. After cleaning, remove all loose particles, oil and dirt by wire brush and hose the concrete surfaces with water.

.3 Before patching material is placed, saturate concrete surrounding the repair area with clean water for several hours. Remove all free-standing water, let the prepared surfaces dry to a damp condition and apply epoxy bonding compound. When using ready mixed repair compounds, strictly follow manufacturer's instructions for surface preparation.

.4 Repair of cracks

.1 Widen concrete cracks, remove unsound concrete, expose encountered rebars as required and shape the created depressions.

.2 Drill holes into crack for injection ports, approximately 150 mm apart.

.3 Clean all loose material and dust flush the crack with water.

.4 Place epoxy mortar (Hilti C-100, Sikadur 31, or AnchorFix 4, or equivalent) along the length of the crack (for cap sealing); insert ports into the holes and

secure the ports in place using epoxy mortar. Wait until the epoxy mortar sets; time required to be obtained from manufacturer.

.5 Apply crack filling material, SikaFix PU or approved equivalent, through the lower ports using a heavy-duty steel tube caulking gun until the grout flows out from the highest port.

.6 Treat superficial surface cracking with a slurry consisting of one (1) part Portland cement, two (2) parts fine sand and one (1) part latex modifier, all by volume.

.4 Placing of Patching Material

.1 Apply epoxy bonding compound to steel and concrete surfaces in strict accordance with manufacturer's instructions. Where forms are required, they shall be tightly installed to prevent any leakage of the cement grout during concrete casting.

.2 For full depth repairs and restoration of sizable volumes use concrete with a low water/cement ratio. For shallow and small volume cavities use polymer-modified mortar or ready mixed repair compounds.

.3 Tap, vibrate or otherwise consolidate fresh concrete to achieve a dense and homogeneous repair free from voids or honeycombed areas.

3.4 Curing and Finishing

.1 Cure and protect patches as specified for cast-in-place concrete in CSA-A23.1 and directed by the Consultant. When using ready mix compounds, strictly follow supplier's written instructions.

.2 Cure ordinary concrete or mortar patches by covering with "wet burlap kept wet" and polyethylene sheet for 7 days or until the concrete has reached 75% of its 28-day design strength. Treat any superficial surface cracking with a slurry consisting of one (1) part Portland cement, two (2) parts fine sand, and one (1) part latex modifier, all by volume.

.3 Finish surface of patched area to give equivalent of a smooth float finish. Profile of patched area shall provide a minimum of 25 mm of concrete cover over reinforcing steel.

.4 Finished surface of the repaired area shall match the adjacent remaining unrepaired area/s.

.5 For final coating, painting, or any other treatment of all surfaces, refer to Architectural specifications and documents.

3.5 Inspection and Testing

.1 The Owner will appoint an independent inspection and testing agency, if required, to undertake concrete strength testing.

.2 Assist the agency in its work. Notify the agency of the concrete schedule. Provide concrete samples and standard test cylinders.

.3 Laboratory curing and testing of samples will be carried out in accordance with the applicable CSA standards. The agency will report to the Owner with copies to the Municipal Authorities. Report must state the location of concrete to which the tests relate and comment on abnormal results and conditions.

.4 Provide a group of three (3) cylinders for each standard strength test. One (1) specimen will be tested at 7 days and two (2) at 28 days.

.5 Provide one (1) additional site cured cylinder for testing at 7 days when concrete is placed under hot weather conditions.

.6 All repair work must be reviewed and approved by inspection agency after completion.

.7 Approval of repair work must be recorded and reported to the Consultant.

3.6 Defective Work

.1 Promptly make good defective Work to Consultant’s satisfaction.

.2 Defective Work shall include delamination and faulty workmanship and materials, including scaling, cracking, de-bonding, spalling, and corrosion of new reinforcing bars within new concrete areas

3.7 Quality Control on Site

.1 A professional Engineer shall inspect and review the concrete elements and mark defective areas to be repaired.

.2 Defective areas at column bases shall be removed to the extent necessary by removing existing grade finish (e.g. paving, soil etc.), if required. Make good grade finish when repair completed.

.3 Make all required field measurements.

.4 Do not close deep forms until reinforcement has been reviewed.

.5 Ensure that reinforcement is kept free from dirt, grease, loose mill scale and rust. Ensure that reinforcement is complete, adequately tied and properly positioned for cover before the concrete has been cast.

.6 Make slump tests with each standard strength test and when so directed by the Consultant.

3.8 Cleaning and Protection

.1 Remove from building site excess and waste materials, test areas, and debris resulting from Work of this Section.

.2 Leave premises in a condition acceptable to Consultant before completion of Work.

.3 Prevent traffic over completed areas, and protect Work of this Section from precipitation, freezing, and debris after final installation.

4 WARRANTY

4.1 Extended Warranty

.1 Provide five year extended warranty for Concrete Repair Work

5 TYPE OF REPAIR AND QUANTITIES

5.1 Type of Repair Work and Estimated Quantities

The table below includes types of Repair Work and estimated quantities included in the Base Price. The contractor shall propose unit prices for each item.

Item #	Type of repair Work	Quantity included in Base Price S.F.	Unit Price Per S.F.	Remarks
1	DC	120		
2	XR	115		
3	CC	50		
4	SP	30		

Legend:

DC: Delaminated and Deteriorated Concrete

XR: Deteriorated Concrete with Exposed Corroded Steel

CC: Crazed and Cracked Concrete

SP: Spalled/Popped out Concrete

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for concrete cleaning and coating Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).

.2 ASTM C882/C882M, Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear.

.3 ASTM D624, Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers.

.4 ASTM D638, Test Method for Tensile Properties of Plastics.

.5 ASTM D2240, Test Method for Rubber Property—Durometer Hardness.

.6 CAN/CSA A23.1/A23.2-M, Concrete Materials and Methods of Concrete Construction/Methods of Tests For Concrete.

.7 ICRI, Standards for Concrete Surface Preparation & Profiles

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data for concrete repair materials in accordance with the Conditions of the Contract indicating:
  - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings indicating sections, details, materials, dimensions, details of concrete repair techniques and surface finishes in accordance with the Conditions of the Contract.

.3 Certificates:
- .1 Submit certification from repair material manufacturers, stating that repair materials and proposed repair procedures are acceptable.
- .2 Submit certification from repair material manufacturers, acceptance of prepared surfaces in writing prior to start of work.

1.4 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in concrete repair Work of comparable complexity and scope, to perform following services as part of Work of this Section:
- .1 Review, stamp, and sign fabrication and erection shop drawings, design calculations.
- .2 Conduct inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed shop drawings.

.2 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience in concrete repair of a similar size and nature and that is approved by manufacturer.

.3 Mock-up:
- .1 Construct one mock-up of each type of repair in location acceptable to Consultant.
- .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with Work.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
- .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.4 Pre-installation meetings: Arrange with manufacturer's representative and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of starting work.

.5 Prepare proprietary materials in strict accordance with manufacturer’s printed instructions. Maintain a copy of manufacturers’ instruction on site at all times and verify that workers clearly understand them.

1.5 SITE CONDITIONS

.1 In addition to Cold Weather and Hot Weather Requirements specified in CAN/CSA A23.1/A23.2-M, Do not perform concrete repair work and coating outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
- .1 Concrete temperature: 10°C minimum.
- .2 Ambient air temperature: 16^0C to 30^0C
- .3 Precipitation: None.

.2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 48 hours after installation.

1.6 **EXTENDED WARRANTY**

.1 Submit an extended warranty for Concrete Repair & Coating in accordance with General Conditions, except that warranty period is extended to five (5) years from date of Substantial Performance of the Work.
- .1 Warrant against failure to meet design criteria and requirements, delamination and faulty workmanship and materials, including scaling, cracking, debonding, spalling within new concrete areas and consequential damage. Warranty shall include cost of removing covering materials and re-instating them.
- .2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 Refer to Section 03 37 00 for Concrete Repair materials and coordinate work with work of that section.

2.2 **LEVELLING MATERIALS**

.1 Levelling/ feathering material for all repaired areas:

- .1 Acceptable material: 'Sikatop 121 Plus' by Sika Canada or approved equal alternative.

.2 Primer for Coating:

- .1 Acceptable material: 'Sikagard 552 W Aqua Primer by Sika Canada or approved equal alternative.

.3 Coating:

- .1 Acceptable material: 'Sikagard 550W Elastic' by Sika Canada or approved equal alternative. Color: To match existing paint color.

.4 Water: potable.

2.3 **MIXES**

.1 Mix patching materials in accordance with manufacturer's written instructions.

3 Execution

3.1 **EXAMINATION**

.1 Verify that substrate preparation is acceptable to concrete repair & coating product manufacturer. Commencement of Work means acceptance of existing conditions.

3.2 **PREPARATION, REMOVAL OF EXISTING PAINT**

.1 General:

.1 Remove existing paint fully from all concrete beams and columns as per ICRE CSP 4-5 surface preparation guidelines (light scarification to medium shotblast).
.2 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
.2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool, shallow gouges, marks, and nibs.
.3 Clean, sweep, and vacuum surfaces to be finished, debris and dust-free prior to applying the primer and coating.

3.3 **PROTECTION OF EXISTING WORK**

.1 Protect fluorescent lighting tubes from damage, particularly during sandblasting. Be aware that sandblast grit in the air can damage fluorescent lighting tubes. Replace any fluorescent tubes damaged by the Work of this Section at no expense to Owner.

.2 Provide protective enclosure to work areas to prevent spread of dust outside work area.

.3 Protect parked vehicles as required to prevent dust accumulation on the vehicle.

.4 Provide ventilation and other equipment necessary for the safe execution of the Work.

.5 Provide temporary protection for surfaces subjected to concentrated loads before they have cured sufficiently to carry them without damage.

3.4 **SMALL SHALLOW CRACK REPAIRS**

.6 Rout out crack to dimensions indicated and clean out with compressed air.

.7 Repair small shallow delaminated areas with repair material specified.

.8 Before filler sets hard, cut out excess filler to provide smooth, flush surface.

.9 Provide repair top coat.

35 **FINISHING**

.1 Apply primer and finish coat as per manufacturer instructions.

3.3 **DEFECTIVE WORK**

.1 Promptly make good defective Work to Consultant's satisfaction.

.2 Defective Work shall include delamination and faulty workmanship and materials, including scaling, cracking, de-bonding, spalling, within repair areas.

3.4 **CLEANING AND PROTECTION**

.1 Remove from building site excess and waste materials, test areas, and debris resulting from Work of this Section.

.2 Leave premises in a condition acceptable to Consultant before completion of Work.

.3 Prevent traffic in completed areas, and protect Work of this Section from precipitation, freezing, and debris after final installation.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for masonry restoration Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C207, Specification for Hydrated Lime for Masonry Purposes.

.2 ASTM C881.Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

.3 CSA A179, Mortar and Grout for Unit Masonry.

.4 CSA A371-M, Masonry Construction for Buildings.

.5 CAN/CSA A3000, Cementitious Materials Compendium.

.6 CEAA, Canadian Environmental Assessment Agency.

1.3 **DESCRIPTION OF WORK**

.1 Work of this section includes, but is not limited to, the following:
- .1 Visually inspect for obvious signs of deteriorated masonry and testing/verification of masonry joints.
- .2 Raking identified unsound joints.
- .3 Preparation of masonry surface including joints surface cleaning, flushing of voids and open joints, and masonry wetting.
- .4 Repointing of identified masonry joints.
- .5 Removal of loose portions on concrete surface.
- .6 Resetting of dislodged masonry units.
- .7 Ensuring cure of mortar.
- .8 Grouting by hand, small voids.
- .9 Consolidation of fractured masonry units or spalled units.
- .10 Replacement of deteriorated or missing units.

1.4 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with the Conditions of the Contract for the following items:
  - .1 Chemical cleaning materials.
  - .2 Pointing mortar.
  - .3 Patching restoration mortar including manufacturer’s analysis/report on sample testing.
  - .4 Dowel anchors and armatures.

.2 Samples: Submit samples of products used in the work of this section in accordance with the Conditions of the Contract for approval.

1.5 QUALITY ASSURANCE

.1 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience and qualified applicators in the restoration of heritage masonry of a similar size and nature. Submit to Consultant, applicator's record of experience as proof of compliance.

.2 Mock-up:

.1 Construct one 1 m^2 mock-up to demonstrate repair procedure for each type of masonry material specified in location acceptable to Consultant.

.2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with Work.

.3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.3 Pre-installation meetings: Arrange with manufacturer's representative, Contractor, Subcontractors, restoration consultant, Owner's representative and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle Products in accordance with the Conditions of the Contract and as specified herein.

.2 Remove unacceptable materials from Site and replace to acceptance of Consultant. Store materials off ground protected from wetting by rain, snow or ground water, or inter-mixture with earth or other materials. Store metal ties and reinforcement to prevent corrosion.

.3 Do not concentrate storage of materials on any part of structure beyond design load, take particular care not to overload unsupported portions of structure which may have not attained their full design strength.

.4 Comply with CSA A371-M. Do not use salt or calcium-chloride to remove ice from masonry surfaces.

.5 Deliver mortar materials in original unbroken and undamaged packages with the maker's name and brand distinctly marked thereon. Prevent damage to units.

.6 Keep masonry materials free from ice and frost. Keep units protected from concrete, mortar and other materials which could cause staining.

1.7 SITE CONDITIONS

.1 Report in writing, to Consultant, areas of deteriorated masonry revealed during work. Obtain Consultant's approval and instructions of repair and replacement of masonry units before proceeding with repair work.

.2 Provide scaffolding, swing stages, supports, anchorages and ballast as required to execute the Work.

.3 Provide covered pedestrian walkways in accordance with requirements of authorities having jurisdiction.

.4 Protect or avoid contact of chemical cleaners to automobile and pedestrian traffic. Provide substrate protection for materials adjacent to masonry to be cleaned, which will prevent water or cleaners from damaging glass, metal or other substrates, and prevent water and fume intrusion to building interior.

.5 Comply with chemical cleaner manufacturer application limitations including effective cleaning temperature requirements. Do not work when conditions are such to cause wind drift of cleaners.

.6 Do not carryout work such as pointing, patching or unit replacement when ambient temperatures are likely to drop below freezing during day or night following such work.

.7 Following below freezing temperatures, do not carryout work involving mortar or patching compound until existing masonry and materials intended for use have reached temperatures above 5°C.

.8 Protect finished work from damage by weather. In addition to that specified herein, comply with CSA A371-M, and protect fresh mortar from freezing, precipitation and from drying too rapidly by means of waterproof, non-staining coverings, and other such means as required to provide durable mortar patches and joints.

.9 Protect finished work from damage by washing procedures and timing. Allow sufficient time for pointing and patching mortars to cure prior washing building facade. Take into account that cure time is dependent on ambient and substrate temperature.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Do not use chemical cleaners when ambient and surface temperatures are below 10^{o}C.

.2 Provide shading to wall to avoid cleaning in full, hot sunlight.

.3 Do not clean if there is risk of chemicals spray being blown onto publicly accessible areas.

.4 Collect, neutralize and dispose of water and chemicals in accordance with applicable regulations and Canadian Environmental Assessment Agency (CEAA).

2 Products

2.1 **MATERIALS**

.1 Pointing and Setting Mortar Materials: Furnish the following pointing mortar ingredients:
- .1 Aggregate: Natural Pit Sand to CSA A179, sharp, screened and washed pit sand, free of any organic matter, colour and grading to be approved by Consultant, to match existing.
- .2 Water: Potable to CSA A179.
- .3 Portland Cement: to CAN/CSA A3000 for grey cement, and white cement where required to match existing nearwhite joints.
- .4 Hydrated Lime: Type "S", to ASTM C207.
- .5 Mortar and grout for unit masonry: to CSA A179.

.2 Mortars:
- .1 Type 1: For laying up and backpointing: XHN-101 by Daubois. Premixed hydraulic lime mortar designed for historical restoration.
- .2 Type 2: For pointing: XHN-60 by Daubois. This mortar is also acceptable for back-pointing instead of XHN-101.
- .3 Type 3: The contractor must have demonstrated skill and success in mixing mortars if Type 3 mortars are to be used. The contractor may mix mortars on site provided mix proportions and colour is followed strictly to ensure uniform strength and colour throughout the entire project and that the contractor provide the exact recipe to the consultant of for part of the As-Built documents. For Type 3 mortars, use NHL-5 hydraulic lime by Daubois following the mixing procedures outlined below.

.3 Dowels/Face Bolts: 6 to 12 mm diameter threaded rod, Type 304 stainless steel.

.4 Armature Anchors & Reinforcing: Anchor rods and lateral reinforcing rods of 3 mm diameter Type 304 stainless steel. Furnish tiewire of 0.8 mm diameter stainless steel soft wire. Furnish screw-type insert anchors of Type 304 stainless steel.

.5 Specialty Repair Mortar: Furnish repair mortar ‘Custom Coloured’ by Keim Restauro, ‘Repair Mortar’ by Jahn International Restoration or ‘Repair Mortar’ by Neostone.

2.2 **CLEANING**

.1 Cleaner: Heavy-duty degreaser ‘Ultrite Degreaser’ by W. R. Meadows or approved alternative.

.2 Water: Clean potable water free from contaminants.

.3 Masking materials: Polyethylene, strippable masking (butyl rubber spray) to approval

of Consultant.

.4 Brushes: Use only brushes with natural or soft plastic bristles.

.5 Water pumps: Use water pumps fitted with accurate pressure regulators and gauges capable of being preset and locked at maximum specified levels.

.6 Gun equipment: Use gun equipped with pressure gauge at nozzle end. Use nozzles that give nebulized droplet spray.

.7 Furnish protection materials for all surrounding non-masonry surfaces such as taped polyethylene or other proven protective material, in accordance with cleaner manufacturer's recommendations. Furnish ‘Strippable Masking’ brush applied coating by Prosoco or approved alternative for application to glass, to prevent acid etching of such substrates.

.8 Furnish applicators protective gear, and application and rinse equipment as required and recommended by cleaner manufacturer.

2.3 MORTAR MIXES AND PROCEDURES

.1 Type 1 and type 2 mortars:
- .1 Prepare hydraulic lime mixes in strict accordance with manufacturer's recommendations to proportions in 3:1 above to produce a mortar no stronger than a type 'O' mix.
- .2 Mix the lime very thoroughly using a paddle mixer for 15 minutes with the selected aggregates and with the minimum amount of water to make the coarse stuff workable.
- .3 A small amount of slaked lime may be added to improve workability.
- .4 Mix on a clean boarded platform or in a mill before any water is added then again after watering.
- .5 This mix must be used within 2-1/2 hours or less in accordance with manufacturer's instructions and must not be knocked up after stiffening has taken place. At higher temperatures above 25oC the mix must be used within 1-1/2 hrs.

.2 Pointing and Setting Mortar:
- .1 Furnish mortar for setting and pointing of masonry mortar joints composed of 1 part portland cement, 2 parts lime and 9 parts sand. Furnish pointing mortar of colour to match existing at various locations on the building.
- .2 Age putty prepared from hydrated lime for minimum 24 hours. Age quick lime putty for minimum 10 days and store in covered, plastic lined containers.
- .3 Furnish required number of sets of measured containers for proportioning ingredients of 1-2-9 mix. Keep containers clean and free from encrustations or residue of materials, to assure correct and consistent proportional measure from batch to batch.

.4 Prehydrate pointing mortar by mixing to damp mass that will retain its form when pressed into ball but will not flow under trowel. Allow to stand not less than 1 hour, nor more than 2 hours. Discard setting and pointing mortar older than 3 hours after adding white cement.

2.3 Specialty Repair Mortar:

.1 Add water to dry premixed restoration mortar or patching compound, in accordance with manufacturer's specifications. Overwatering may cause efflorescence, cracking, discolouring or delamination after the fact. Generally, only enough water should be added to form a firm ball when squeezed in the hand.

.2 Do not mix more patching compound than can be put in place in 30 minutes. Discard patching compound that is more than 30 minutes old. Do not retemper mix.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Place safety devices and signs near work areas as indicated and directed.

.2 Seal or repair openings and joints where there is potential risk of water/chemical infiltration.

.3 Dry brush or scrape accumulations from walls, ledges and cornices.

3.3 **CUTTING-OUT**

.1 Carefully cut out with hand tools or pneumatic chisels with loose bits existing defective mortar from mortar joints, to a depth of at least 2-1/2 times the width of joint and a minimum of 32 mm deep.

.2 Hand held rotary saws or any type of grinder wheel are not permitted on this project unless prior approval is given by the consultant. If over cutting, abrading or other damage is observed these tools must be removed from the site and the contractor may be required to replace damaged units.

.3 Where mortar is found to be defective beyond the specified raking depth, continue raking until sound mortar is encountered.

.4 Thoroughly wash out loose particles and dust from prepared joint. Dampen masonry substrate, but do not saturate, with water just prior to application of pointing mortar. Avoid water runs over exposed masonry.

3.4 POINTING AND BACK POINTING

.1 Where cut-outs are deeper than raking depths specified above, back point joint to Bring mortar face to specified depths for raked out joints, to prepare for finish pointing. On brick walls, if conventional back pointing cannot fill the void obtain approval from consultant before "bagging" or grouting is permitted.

.2 Immediately prior to pointing, wet joints with misting bottle to control water adsorption.

.3 Prevent mortar from being placed or smeared onto face of brick when pointing. Avoid white ghost strips around joints.

.4 Compact mortar firmly into joints to ensure proper bonding as well as to minimize the possibility of shrinkage.

.5 At the initial set, finish mortar joint with a semi hard bristle brush to compact the joint and produce a textured finish and exposing the aggregate.

.6 Keep work clean and remove all droppings immediately and check at the end of each day.

.7 Prevent new mortar joints from rapid drying by misting frequently and covered with moist burlap for a minimum of 72 hours after completing an area.

.8 Call consultant for approval of an area before removing scaffold. Cracked and discoloured mortar joints will be rejected and must be redone.

3.5 PATCHING AND REBUILDING (RESTORATION MORTAR)

.1 Applicators of patching compound should familiarize themselves with the material by experimenting on salvaged pieces of masonry removed from exterior facade for other work which forms part of this Contract. In addition to requirements specified herein, comply with preparation and application instructions and recommendations by restoration mortar manufacturer.

.2 Patching and rebuilding work includes finished exposed surfaces of masonry where yellow coloured biscuit or core is exposed because the slip coat and glazed surface is damaged and/or missing. This work also includes cracks in face units, and old deteriorated face unit repairs including cracks which have refractured, loose and/or deteriorated patches, and old sealant filled cracks.

.3 Cut back loose, deteriorated and contaminated surfaces to be patched, using a point or tooth chisel to provide a sound, clean roughened substrate. Undercut sides of patch area minimum 3 mm to form a key.

.4 Reinforce patches that hang in tension or which are heavily profiled, with stainless steel armature anchored into opposing slant drilled holes or screw anchors as indicated.

.5 Do not feather out patching compound to zero thickness, provide minimum 3 mm thickness of material at edge terminations.

.6 Cut out cracks with hand tools or power grinder to provide undercut or dovetail key. Cracks include clean cracks and old cracks which had been previously filled with mortar or sealant and have subsequently refractured. Cut out cracks as required to remove all old mortar or sealant and to provide minimum 6 mm wide joint. Cut out cracks to achieve sound substrate, 2-1/2 times width of cut, but not more than 20 mm in depth where crack is 6 mm width or less. Where crack is wider than 6 mm cut out to full depth of face of masonry unit. Power tools other than power grinder for cutting out material may only be used where approved by Restoration Consultant.

.7 Wash out prepared cut and any drill holes with water jet, then repeatedly wet substrate to be patched until sufficiently damp to avoid quick moisture withdrawal from patching compound.

.8 Apply patching compound in lifts or layers, not exceeding 10 mm thick when hanging in tension or 20 mm thick on vertical planes. Supported patches may be any thickness.

.9 Roughen surface of each lift before next lift is applied. Allow only sufficient time between lifts to permit stiffening of previous lift. Do not wet patch between lifts unless previous lift has hardened for minimum of 24 hours.

.10 If surface between lifts is allowed to harden, ensure that such surface is thoroughly roughened with tooth chisel and surface is dampened before applying additional lifts.

.11 Raise patch to minimum 3 mm above adjacent existing plane.

.12 Do not continue patching compound or armature reinforcement across mortar joints. Joints running through patched area must be pointed with specified pointing mortar.

.13 Shade completed patch from direct sun, wind and rain. Use polyethylene covering taped to existing adjacent substrates to accomplish weather protection and to allow more controlled curing of patch, however sun shades must also be provided when curing in direct sunlight.

3.6 REANCHORING AND REPLACING OF DAMAGED UNITS

.1 Where unit masonry sections or fragments are to be removed and reset, remove section or fragment with care not to damage same. Soak section or fragment in water until saturated, then allow to drain until only surface damp before setting.

.2 Wet backing substrate several times until absorption rate has been reduced significantly.

.3 Apply full setting mortar bed to substrate and set masonry unit in place, using removable wedges as required to hold unit firmly in place. After setting mortar has cured remove wedges and apply pointing mortar into perimeter mortar joints as applicable and as specified herein.

.4 Where necessary to dowel replaced sections or fragments, set section or fragment in accordance with previous three subparagraphs and as follows. After unit is set in place and wedged, drill anchor hole through unit into substrate. Provide countersunk hole in face of unit to allow minimum 10 mm thick patch over end of threaded dowel. Set threaded dowel in epoxy resin as specified herein, or provide Hilti "Hit System" adhesive applicator, or equivalent system to set dowel. Fit dowel with nut and bolt-up to snug. Allow setting bed to cure. Remove unit setting wedges and apply pointing mortar into perimeter mortar joints as applicable and as specified herein. Fill counterbore in face of masonry unit with patching mortar (restoration mortar) as specified herein for patching.

3.7 **CLEANING**

.1 Apply cleaner, pressure wash and brush clean substrate in accordance with manufacturer’s written instructions and approved test mock-up.

.2 Apply a second application of cleaner and pressure wash substrate in accordance with manufacturer’s written instructions and approved test mock-up.

.3 Avoid prolonged wetting and excessive water penetration.

.4 Do not exceed maximum pressure at nozzle or have nozzle closer to masonry than approved by Consultant at tests.

.5 Do not allow degreaser to dy out.

.6 Rinse off masonry to satisfaction of Consultant until no indications of chemicals are present.

.7 Rinse from bottom to top and from top to bottom.

3.8 **CLEAN UP**

.1 Clean up work area as work progresses. Upon completion, clean and restore areas used for work to condition at least equal to that previously existing.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for the miscellaneous and metal fabrication Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.2 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.4 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.5 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.6 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.7 CAN/CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

.8 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.9 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.10 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.11 CSA W48, Filler Metal and Allied Materials for Metal Arc Welding.

.12 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.13 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

.14 CAN/CGSB 1.40-M, Primer, Structural Steel, Oil Alkyd Type.

.15 CGSB 1-GP-181, Organic Zinc Rich Primer.

.16 CGSB 85-GP-16M, Painting Galvanized Steel.

.17 Steel Structures Painting Council (SSPC), Steel Structures Painting Manual, Vol. 2.

1.3 DESIGN REQUIREMENTS

.1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.4 SUBMITTALS

.1 Shop drawings:

.1 Submit shop drawings for fabrication and erection of miscellaneous and metal items in accordance with Section 01 33 00 indicating:

.1 Materials, core thicknesses, class of finish (AMP 555), connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.2 Ensure shop drawings are of one uniform size and based on field measurements.

1.5 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in Work of comparable complexity and scope, to perform the following services as part of the Work of this Section:

.1 Design railings and metal fabrication items that are required to resist live, dead, lateral, wind, or seismic loads.

.2 Review, stamp, and sign shop drawings.

.2 Workmanship: Fabricate Work of this Section to meet the required class of workmanship indicated below in accordance with AMP 555, Section 8.

.1 Class 1: for use on direct exposed to view fabricated items:

.1 Exposed surfaces are finished smooth with pitts, mill marks, nicks, burrs, sharp edges, and scratches filled or ground off. Defects should not show when painted, polished, or finished.

.2 Welds should be concealed where possible. Exposed welds are ground to small radius with uniform sized cove unless otherwise noted.

.3 Distortions should not be visible to the eye.

.4 Exposed joints are fitted to a hairline finish.

.3 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.

2 Products 2.1

MATERIALS

.1 General:
- .1 All materials under Work of this Section, including but not limited to, primers and paints are to have low VOC content limits.
- .2 Unless detailed or specified herein, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
- .3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of Work of this Section.
- .4 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.

.2 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W. Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.

.3 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.

.4 Welding materials: CSA W48 and CSA W59-M.

.5 Fasteners: Conforming to ASTM A307, Grade A, in areas not exposed to view, use unfinished bolts with hexagon heads and nuts. In areas exposed to view, use bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts Z275 zinc coated in accordance with ASTM A653/A653M. Supply bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.6 Finish coating: Epoxy Polyester coating conforming to AAMA 2603 with selected finish. Colour to later selection by Consultant; ‘D1000 Series’ by Akzo Nobel Powder Coatings Ltd. or approved alternative. Provide manufacturers recommended primer.

.7 Primer paint: CAN/CGSB-1.40-M or CPMA 1.73a.

.8 Galvanized primer paint: Inorganic zinc rich primer. For use on galvanized fabrications where touch up is to remain unpainted in finished work; Carbozinc 11WB by Carboline Company, Catha-Coat 305 by Devoe Coatings or Zinc Clad XI by Sherwin Williams.

.10 Drilled inserts: Mega by ITW Construction Products or HSL by Hilti Inc. heavy-duty anchors, sizes as shown.

2.2 **FABRICATION**

.1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to the Consultant.

.2 Fit and assemble Work in shop where possible. Execute Work in accordance with details and reviewed shop drawings.

.3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use screws for interior metal work. Use welded connections for exterior metal Work unless otherwise found acceptable by the Consultant.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.

.5 Execute shop welding to requirements specified.

.6 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to the Consultant's acceptance.

.7 Assemble members without twists or open joints.

.8 Correctly size holes for connecting Work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.

.9 Draw mechanical joints to hairline tightness and seal countersunk screw and access holes for locking screws with metal filler where these occur on exposed surfaces.

2.3 **FABRICATED ITEMS**

.1 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.

.2 Where work is required to be built into work of other Sections supply such members to respective Sections.

.3 Provide metal fabrication items indicated below and items not indicated to be supplied under other Sections. The following items includes miscellaneous and metal fabrication including but not limited to the items listed below.

.4 Railings, guardrails, and posts:

.1 Design railings to withstand minimum horizontal and vertical loads as required to meet requirements of authorities having jurisdiction. In no instance shall load design of railings be less than 2.2 kN/m horizontally and 1.5 kN/m vertically.

.2 Close open ends of steel handrails with 1.9 mm thick closure neatly welded. Fabricate railings and guardrails as shown on drawings.

.3 Railing bracket: Fabricate as shown. After fabrication, galvanized bracket in accordance with ASTM A123.

.7 Miscellaneous steel brackets, supports and angles

.1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.

.2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.

2.4 ANCHORS AND FASTENING

.1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.

.2 Use self-drilling expansion type concrete anchors for attaching to masonry and concrete

.3 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

2.5 WELDING

.1 Perform welding by electric arc process.

.2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:

.1 CSA W48 - for Electrodes. If rods are used, only coated rods are allowed.

.2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.

.3 CAN/CSA W117.2-M - for safety.

.3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish paint.

.4 Test welds for conformance and remove Work not meeting specified standards and replace to Consultant's acceptance.

2.6 **SHOP PAINTING**

.1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.

.2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.

.3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.

.4 Clean but do not paint surfaces being welded in field.

.5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.

.6 Do not prime machine finished surfaces, but apply an effective anti-rust compound.

.7 Take precautions to avoid damage to adjacent surfaces.

2.7 **POWDER COAT FINISH**

.1 Shop apply electrostatic coating in strict accordance with manufacturer's printed instructions.

.2 Provide primer where required and one finish coat.

.3 Ensure application of each coat into all corners, pinholes and other difficult areas and ensure full coverage to all surfaces.

.4 Ensure a smooth finish, free of laps, sags, runs, pin holes, crawls and skips. Back lap all edges to achieve full coverage.

2.8 **HOT DIP GALVANIZING**

.1 After fabrication, hot dip galvanize specific miscellaneous steel items as indicated. Plug relief vents air tight. After galvanizing, remove plugs, ream holes to proper size and re-tap threads. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.

.2 Hot-dip galvanize members in accordance with CAN/CSA G164-M and requirements of the following ASTM, with minimum coating weights or thicknesses as follows:

.1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/metre of actual surface, for 4.8 mm and less thickness members 600 g/m^2 for 6 mm and heavier members 640 g/m^2.

.2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153,Table 1 for the various classes of materials used in the Work.

3 Execution

3.1 EXAMINATION

.1 Examine previously installed Work, upon which this Section depends, verify dimensions and condition of existing Work, and coordinate repairs, alterations, and rectification if necessary. Commencement of Work of this Section is deemed to signify acceptance of existing, prior conditions.

.2 Obtain Consultant's written approval prior to field cutting or altering of structural members.

3.2 ERECTION

.1 Install metal fabrications in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Fit joints and intersecting members accurately. Make Work in true planes with adequate fastenings. Build and erect Work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.

.3 Perform drilling of concrete and steel as required to fasten Work of this Section.

.4 Erect rails in true vertical and horizontal planes, rigid, and free from whip.

3.3 FIELD PAINTING

.1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for rough carpentry Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.

.3 ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.

.6 CAN/CSA O80 Series M, Wood Preservation.

.7 CSA O86, Engineering design in wood.

.8 CSA O121-M, Douglas Fir Plywood.

.9 CAN/CSA O141, Softwood Lumber.

.10 CSA O151-M, Canadian Softwood Plywood.

.11 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority

1.3 **QUALITY ASSURANCE**

.1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: Grade mark in accordance with applicable CSA standards.

.3 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.

.4 Moisture Content of wood at time of construction shall be 19% maximum.

.5 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80-M.

.6 Dimensions of lumber shall conform to dressed sizes specified in CAN/CSA-0141 unless actual dimensions are otherwise indicated or specified.

.7 Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions shall be dry size.

.8 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Consultant for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.

1.4 **ENVIRONMENTAL REQUIREMENTS**

.1 When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

1.5 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Store materials in a dry area. Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.

2 Products

2.1 **MATERIALS**

.1 General: All materials under Work of this Section, including but not limited to, adhesives are to have low VOC content limits.

.2 Lumber: Softwood, G4S, moisture content 19% or less at time of installation, in accordance with the following:
- .1 Lumber shall be of same species and grade, equally seasoned and shall be processed and stamped at same mill.
- .2 CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.
- .3 Board quality: Construction or better.
- .4 Dimension quality:
  - .1 Structural joists, planks, and framing: No. 1 Select Structural.
  - .2 Light framing: Construction.
- .5 Decking: Commercial.

.3 Plywood: CSA O121-M, G1S unsanded, T & G, standard construction, laminated with waterproof adhesive, exterior grade, Thickness as indicated on drawings.

.4 Sheathing: Douglas Fir, CSA 0121-M or CSA O151-M; Select-Tight Face, exterior grade, T & G.

.5 Wood Decking: NLGA, commercial, Western Red Cedar, Douglas Fir or Spruce, single or double tongue and groove and 'veed' one side, predrilled at 750 mm oc for lateral spiking. Kiln dry decking to 15% maximum moisture content. 1.8 to 6 m or longer with a minimum of 90% planks exceeding 3 m. Square end trimmed. For single spans shorter than 3 m use decking of same length as span.

.6 Roof lumber: NLGA, Construction grade light framing, Jack Pine, S4S, pressure treated to CAN/CSA-O80 series using copper based waterborne preservative treatment, impregnated to a net retention of 4 kg/ m^3 of preservative unless otherwise specified by preservative manufacturer.

.7 Surface applied wood preservative: Green coloured copper napthenate or 5% pentachlorophenol solution, water repellant preservative or same copper based preservative as used for shop impregnation, in accordance with CAN/CSA O80.

.8 Fire retardant treatment of lumber and plywood (interior and protected locations): 'Dricon FRT' fire retardant treatment by Biewer Lumber or approved alternative, conforming to ASTM E84, to provide a flame spread rating of 25 or less.

.9 Rough hardware: Conforming to ASTM F1667; Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:
- .1 Nails, spikes and staples: Spiral type.
- .2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
- .3 Screws: Countersunk head, full thread type.
- .4 Splines: galvanized metal, as recommended by decking manufacturer.
- .5 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.
- .6 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere.

.10 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **GENERAL**

.1 Lay out work carefully and to accommodate work of others. Cut and fit accurately: erect in position indicated by Drawings.

.2 Install rough carpentry to allow for expansion and contraction of the materials.

.3 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.

.4 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.

.5 Provide anchors, bolts, and inserts required for attachment of the work of this Section, to those performing the work of other Sections and who are responsible for their installation.

.6 Do not attach work by wood plugs or blocking in concrete or masonry. Use lead shields, expansion shields, or similar methods only as approved by Consultant.

3.3 MISCELLANEOUS WOODWORK

.1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for Work under other Sections. Do not assume that Drawings show required work exactly or completely. Anchor wood members securely in place.

.2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other Work.

.3 Except where steel supports are specifically shown, provide wood blocking and supports in metal stud partitions for fastening of item such as casework and other wall mounted accessories. Have respective trades approve the location of such wood blocking.

.4 Bolt wood blocking or nailing strips to steel framing.

.5 Align and plumb faces of furring and blocking to tolerance of 1:600.

.6 Use fire retardant lumber for blocking/framing in ceiling\ spaces, partitions and bulkheads.

3.4 ROOF WOODWORK

.1 Install continuous wood nailers around roof perimeters, curbs and roof openings larger than 150 x 150 mm, and at edges of insulation as detailed. Install cut cant strips and continuous nailers on copings and curbs as detailed.

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

.3 Fasten roof woodwork at maximum 400 mm o.c. in staggered pattern unless noted otherwise.

3.5 WOOD DECKING

.1 Do wood deck work in accordance with CSA O86 except where specified otherwise.

.2 Install decking in accordance with CSA O86, simple span pattern.

.3 Provide minimum of one bearing support for each plank except for cantilevers which shall extend over two supports. Install sloping deck with tongues up. Join butt ends with splines to assure tight square fit.

.4 Stagger end joints in adjacent planks minimum of 0.5 m. Separate joints in same area by at least two intervening courses. Avoid joints in first fifth of end spans. Minimize joints in middle third of any span.

.5 Remove tool marks, bruises, and scratches.

.6 Apply preservative to end cuts where pressure treated lumber is specified.

3.6 BACKBOARDS

.1 Install plywood backboards, primed and painted white on both sides, with fire retardant paint.

.2 Use minimum 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

3.7 FASTENERS

.1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.

.2 Use hot dipped galvanized fasteners for exterior Work and Work below grade.

.3 Countersink bolts and bolt heads as required for clearance of other Work.

.4 Size fasteners to penetrate base member by half of fastener length minimum. Minimize splitting of wood members by staggering nails in direction of grain.

.5 For plywood use spiral, annular or resin coated nails and staples.

3.8 SURFACE-APPLIED WOOD PRESERVATIVE

.1 Treat raw surfaces, drilled holes and cut ends of pressure treated wood with 2 coats of wood preservative immediately after cutting.

.2 Apply preservative by dipping, by brush or by pouring into plugged holes to completely saturate surface.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for the thermal insulation Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 CGSB 71-GP-24M, Flexible Adhesive for Bonding Cellular Polystyrene Insulation.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Mineral Fibre Thermal Insulation for Buildings.

1.3 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with the Conditions of the Contract indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.

.2 Certification: Submit installer's certification verifying compliance with specification requirements.

1.4 **QUALITY ASSURANCE**

.1 Qualifications: Execute Work of this Section by company specializing in thermal insulation Work with minimum of three years, recent, documented experience, on Work of comparable complexity and scope.

2 Products

2.1 **MATERIALS**

1. Semi-rigid mineral insulation: ASTM C612, Type IVB; mineral wool insulation. Thickness: As indicated on Drawings. ‘Cavity Rock’ by Rockwool Limited or Owens Corning Canada.

2. Insulation retainers: In accordance with manufacturer requirements.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Ensure substrate surfaces are dry, clean, suitable to receive adhesive and free from other deleterious substances.

3.2 **INSTALLATION**

.1 Install thermal insulation in longest panel sizes possible in accordance with manufacturer's instructions.

.2 Butt insulation with moderate contact and, cut and fit them tightly around other construction elements. Offset single layer vertical joints and both vertical and horizontal joints in multiple layer applications,

.3 Make thermal insulation continuous, maintain thermal protection continuity and secure to prevent displacement. Ensure that insulation is tight to substrate without air gaps.

.4 Cut and fit thermal insulation tightly around electrical boxes, plumbing and heating pipes and ducts, exterior doors and windows, and other protrusions.

.5 Leave 75 mm separation between thermal insulation and heat emitting devices such as recessed light fixtures.

.6 Cut and trim thermal insulation neatly to fit spaces; do not excessively compress insulation to fit. Install only thermal insulation boards which are free from chipped or broken edges.

.7 Pack miscellaneous cavities with insulation to maintain continuity of thermal barrier.

.8 Arrange for Consultant to review thermal insulation before it is enclosed.

3.4 **SECUREMENT**

.1 Cavity wall insulation:
- .1 Provide insulation tight to the inner wythe starting at the base of the wall in parallel courses with tight butt joints. Stagger end joints in adjacent course.
- .2 Provide finish work level, plumb and true.

.3 Provide securement for cavity wall insulation with wedge type retainers in accordance with manufacturer's written instructions.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for vapour retarders Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 CAN/CGSB 19.21-M, Sealing and Bedding Compound, Acoustical.

.2 CAN/CGSB-51.34-M, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
  - .2 Product transportation, storage, handling and installation requirements.

.2 Samples: Submit following samples in accordance with Section 01 33 00:
.1 Two 300 x 300 mm samples of vapour retarders and through wall flasning

.2 Two samples, 300 mm long, of fastening bar.

1.4 **QUALITY ASSURANCE**

.1 Mock-up:
- .1 Construct one 10 m^2 mock-up of vapour retarder in location acceptable to Consultant indicating as a minimum one lap joint, one inside corner, one window interface, and one electrical box.
- .2 Arrange for Consultant's review and acceptance.
- .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

2 Products

2.1 **MATERIALS**

.1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Air/vapour barrier membrane components and accessories must be obtained as a single-source from the membrane manufacturer to ensure total system compatibility and integrity.

.3 Membrane vapour retarder: 1.0 mm thick, single-ply, self-adhering, self-sealing, rubberized asphalt, bonded to a cross-laminated high density polyethylene film.
- .1 'Blueskin SA' by Bakor Inc.
- .2 'CCW 705' by Carlisle Coatings & Waterproofing.
- .3 'Sopraseal Stick 1100' by Soprema.
- .4 'Exo-Air 110' by Tremco.
- .5 'Air-Shield" by W. R. Meadows.

.4 Through-wall flashing membrane and dampproof course (Self-Adhering) shall be Blueskin® TWF manufactured by Henry-Bakor or approved equal, a SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film, having the following physical properties:
- .1 Colour: Yellow,
- .2 High Temperature Stability: 110 degrees C min. to ASTM D5147 (resistance to flow),
- .3 Thickness: 1.0 mm (40 mils),
- .4 Air leakage: <0.005 L/s.m² @ 75 Pa to ASTM E283-91,
- .5 Water vapour permeance: 1.6 ng/Pa.m².s (0.03 perms) to ASTM E96,
- .6 Low temperature flexibility: -30 °C to CGSB 37-GP-56M.

.5 Primer:
- .1 'Aquatac' by Bakor Inc.
- .2 'CCW-AWP Primer' by Carlisle Coatings & Waterproofing.
- .3 'Elastocol 700' by Soprema.
- .4 'ExoAir WB Primer' by Tremco
- .5 'Mel-Prime Water Base' by W.R. Meadows.

.6 Mastic & Sealant:
- .1 '925 BES Sealant' by Bakor Inc.
- .2 'CCW 704 Mastic' by Carlisle Coatings & Waterproofing.
- .3 'Sopramastic' by Soprema.
- .4 'Acoustical Sealant' by Tremco
- .5 'Sealtight Pointing Mastic' by W.R. Meadows.

.7 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.

.8 Fasteners: As specified herein or manufacturer's recommended fastener for attaching to Substrate.

3 Execution

3.1 **EXAMINATION AND COORDINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Verify that existing substrates to receive vapour retarder are clean, dry, sound, smooth, and continuous.

.3 Coordinate installation of vapour retarders with work of other Sections to achieve a vapour tight building envelope.

3.3 **MASTIC AND PRIMER**

.1 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for vapour retarder is achieved.

.2 Prime substrate surfaces to receive vapour retarder in accordance with manufacturer's instructions, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.

.3 Prime surfaces. Re-prime surfaces if not covered with vapour retarder within 4 hours.

3.4 **MEMBRANE VAPOUR RETARDER INSTALLATION**

.1 Install mastic where required to ensure integrity of vapour retarder installation at protrusions and other complex details.

.2 Install vapour retarder in accordance with manufacturer's instructions in locations indicated.

.3 Lap vapour retarder ends and edges 50 mm minimum. Roll vapour retarder and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.

.4 Extend vapour retarder as required to connect to other components of Work comprising vapour retarder system.

.5 Cut and fit vapour retarder as required for passage of protrusions, ensuring continuous adherence to substrate.

.6 At end of days' Work, trowel mastic water cut-off along uppermost edge of incomplete vapour retarder assembly, to prevent loss of adhesion and damage vapour retarder.

3.5 FASTENING BARS

.1 Supply and install continuous mechanical fastening bar to clamp vapour retarder both sides of unfilled gaps, cracks, and joints.

3.6 FIELD QUALITY CONTROL

.1 Inspect vapour retarder continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of vapour retarder.

.2 Where punctures and tears are extensive, replace entire damaged section.

.3 Do not cover or permit to be covered any portion of vapour retarder until it has been inspected by Consultant.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

1. This Section provides for the exterior wall, Air Barrier

2. Related Sections include the following:
    1. Section 06 10 00 "Rough Carpentry" for exterior sheathing.
    2. Section 07 42 43 “Composite Wall Panels”

1.2 REFERENCES

1. CCMC Technical Guide 07193 Sheathing, Membrane, Breather Type

2. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; Compliant with Procedure B (Water Method) for interior to exterior testing.

1.3 SUBMITTALS

1. Product Data: Include manufacturer's written instructions, technical data, and tested physical and performance properties of breathable underlayment.

2. Shop Drawings: Provide scale drawings (or larger) showing relationship of underlayment to:
    1. Framing members.
    2. Thermal Insulation.
    3. Sheathing.
    4. Pipe, Conduit and Duct penetrations.

3. Samples:
    1. 8-1/2-x-11-inch square of breathable underlayment sheet.
    2. Tapes (Single & Double-Sided).
    3. Provide materials and fasteners for mock-up as specified in General Requirements.

4. Manufacturer’s Instructions: Provide manufacturer’s instructions showing the recommended procedures and sequence of installation of breathable underlayment.

1.4 QUALITY ASSURANCE

1. Ensure all work of this section and the related sections is performed in accordance with local codes and system manufacturer’s instructions.

2. Obtain all breathable underlayment through one source from a single manufacturer.

3. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review requirements for underlayment, including surface preparation specified under other Sections, substrate condition and pretreatment, temporary weather protection, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.5 DELIVERY, STORAGE, AND HANDLING

1. Deliver materials to Project site in original containers with seals unbroken, wrapped in a polythene sleeve, labeled with manufacturer's name, and product brand name. B. Store rolls under cover, on a clean, level surface, either flat or upright.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Products: Air Barrier for Wall Systems: Triple layer, spun bonded polypropylene, breathable membrane with a nominal weight of 120 g/m², water vapour transmission of 150 perms minimum as per ASTM E96-95 Method A, Air Permeance: 0.0002 L/s-m2 @ 75 Pa per ASTM 2178 per AC 38 (No Air Leakage). SRP AirOutshield™ WALL by SRP Canada, 1-866-533-0233, www.srpcanada.ca or approved equal.

2.2 AUXILIARY MATERIALS

1. Detail Tape: SRP 100 UV Tape, single sided. To seal SRP-AirOutshield™WALL to itself and to other surfaces and substrates.

2. Seam Tape: SRP 60 UV Seam Seal Tape: Black single sided seam tape distributed by SRP Canada Inc. To seal vertical and horizontal seams between layers of SRP-AirOutshield™ WALL.

3. Seam Tape: SRP 1” D.S (double sided) Seam Tape distributed by SRP Canada Inc. To seal vertical and horizontal seams between layers of SRP-AirOutshield™WALL.

4. Sealant: BASF MasterSeal NP-1

5. All accessories and materials to be supplied by the same manufacturer.

6. Fasteners
    1. Fasteners: Minimum No. 12-gage [0.109-inch-shank-diameter (2.77mm)] corrosion resistant steel or stainless steel nails having a minimum 3/8-inch diameter (9.5 mm) head, or minimum No. 14 gage [0.083-inch-shank-diameter (2.11 mm)] corrosion-

resistant steel or stainless steel screws or nails installed with a 1-inch-diameter (25.4 mm) caps, plate or washer.

PART 3 - EXECUTION

3.1 EXAMINATION

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

3.2 SURFACE PREPARATION

1. Clean and prepare to provide a clean and dry substrate free of frost, loose nails, dirt, debris or other contaminants that would adversely affect the installation of the breathable underlayment.

2. Do not expose the membrane to chemicals including surfactants (soaps) or solvents.

3.3 PENETRATIONS

1. Pipes and Conduits
    1. Cut a piece of Air Barrier membrane to act as a skirt around counter flashed penetrations. Distance from penetration to edge of barrier “skirt” minimum 2”.
    2. Make four cuts to form a star shape and place over penetration snugly. Extend “ears” of material along vertical penetration and seal with manufacturer approved Tape.
    3. Tape top edge of “skirt” to wall using manufacturer approved Seam Seal Tape. Do not tape bottom edge at this time.

3.5 AIR BARRIER INSTALLATION

1. Form a continuous air barrier at all details using the manufacturer approved tapes.
2. Connect to flashings and air barriers in adjacent areas as installed by others.
3. Increase fasteners to maximum 6” on centre vertically and maximum 16” on centre horizon-
   tally.
4. Mechanical fasteners that penetrate the Air Barrier must be set flush and fastened securely into solid backing. When fastening into gypsum board and other non-structural boards, ensure the fastener penetrates a stud or other solid backing.
5. Tape all vertical and horizontal laps using manufacturer approved Seam Seal Tape.

3.6 Cladding Installation

1. Ensure Air Barrier is installed in compliance with this specification and all details are complete.

2. Install primary cladding system as soon as possible and in accordance with the system manufacturers written instructions and the project specifications.

3.7 FIELD QUALITY CONTROL

1. Engage an independent inspector to observe substrate and installation. Inspector shall provide a written, sign-off log, on all penetrations before the underlayment is placed against them. Form of log shall be approved by Architect before contract with inspection service is approved.

3.8 PROTECTING AND CLEANING

1. Protect installed Air Barrier from damage due to ultraviolet light, harmful weather exposures, physical abuse, chemicals including surfactants, soap and solvents.

2. Repair torn breathable underlayment as follows:
   1. Insert a full height piece of underlayment extending 12 inches horizontally beyond the damage and extend up and under the underlayment above. Mechanically attach underlayment to substrate top and bottom. Tape all seams.

3. Remove mud and similar marks with a water scrub; do not use soap or solvents. If chemicals have been spilled on underlayment, remove and replace as stated above.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, products, tools, equipment and services necessary for exterior soffit system Work complete in accordance with the Contract Documents.

.2 Work Included:
  .1 Existing wood planks or plywood soffit shall be scraped, sanded and refinish with paint.

1.2 **REFERENCES**

.1 CAN/CSA-G164, Hop Dip Galvanizing of Irregularly Shaped Articles

1.3 **DESIGN REQUIREMENTS**

.1 Design soffit system to accommodate expansion and contraction of soffit elements without causing buckling, failure of joints, undue stress on fasteners or other effects detrimental to appearance or performance.

1.4 **SUBMITTALS**

.1 Product data:
  .1 Submit duplicate copies of manufacturers Product data in accordance with the conditions of the Contract indicating:
    .1 Performance criteria, compliance with appropriate reference standard, characteristics and system limitations.
    .2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings:
  .1 Submit shop drawings in accordance with the Conditions of the Contract indicating:
    .1 Details, sections, dimensions, tolerances, connections, terminations, control joints, system components, installation sequence, accessories and other pertinent information required for proper and complete installation.
    .2 Complete design data to confirm that soffit system meet design requirements specified.

.3 Samples: Submit two 300x300 mm samples of complete soffit system in accordance with the conditions of the contract.

.4 Reports: Submit written inspection reports within 5 working days after each inspection.

.5 Closeout submittals: Submit maintenance and cleaning instruction for soffit system for incorporation into Operations and Maintenance Manuals in accordance with the Conditions of the Contract.

1.5 **QUALITY ASSURANCE**

.1 Installers qualifications: Perform Work of this Section by a company that has a minimum of five years proven experience installing work of similar size and nature and that is approved by system manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.

.2 Soffit system manufacturer shall conduct Site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with the Contract Documents and reviewed shop drawings. Perform inspections once per week minimum.

.3 Mock-up:
- .1 Construct one 3000 mm minium mock-up of the soffit system in location acceptable to Consultant.
- .2 Arrange for consultant's review and acceptance.
- .3 Mock-up may remain as part of the Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.6 **SITE CONDITIONS**

.1 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environment requirements for 24 hours before, during and after 24 hours after installation.

.2 Do not proceed with application of materials immediately prior to, during or immediately after inclement conditions, or if wet weather is anticipated within 24 hours after application. Do not apply material to wet, frozen or frosted surfaces.

1.7 **EXTENDED WARRANTY**

.1 Submit warranty for soffit system work in accordance with the General Conditions, except that the warranty period is extended to 5 years.
- .1 Warrant against failure to meet the design criteria and requirements such as failure to stay in place, cracking, warping and finish degradation.
- .2 Coverage: Complete replacement including affected adjacent Work.

2 Products

.1 **MATERIALS**

.1 Exterior Cementitious board: High strength Portland cement building panel with self adhesive glass tape, with heavier mesh reinforcement for suspended applications. Durock by CGC Inc. or approved alternative by Certain Teed Gypsum Canada, or G-P Products. Finished in accordance with Section 09 91 00.

.2 Accessories: Hop-dip galvanized in accordance with CAN/CSA-G164-M, in locations shown on Contract Drawings.

.3 Fasteners: Provide type 304 stainless steel fasteners.

.4 Sealant and sealant primer: In accordance with Section 07 92 00.

.5 Seal joints at items projecting through membrane watertight to acceptance of Consultant.

.3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **PREPARATION**

.1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, and other foreign matter detrimental to performance. Ensure environmental and site conditions are suitable for installation of system.

.2 Supply and install temporary protection of adjacent surfaces to prevent damage resulting from Work in this Section.

.3 Prepare surfaces in accordance with manfacturer’s written instructions.

.4 Protect finished work at end of each day or on completion of each section of work from water penetration. Protect complete installation from moisture for 48 hours minimum.

.5 Wood soffits shall be scraped, sanded, patched, cleaned and prepared for repainting in accordance with Section 09 91 00.

3.3 **SOFFIT SYSTEM**

.1 Install soffit system in accordance with reviewed shop drawings and manufacturer’s written instructions. Comply with system manufacturer’s requirements regarding termination at end of each days work and resumption of work.

.2 Seal all cut edges, ends, utility holes and fasteners heads, as recommended by manufacturer.

.3 Tape and fill all joints and fasteners heads using materials recommended by cement wallboard manufacturer.

3.4 **CONTROL JOINTS**

.1 Install 12.7mm control joints at the following locations:
- .1 Soffit abuts a structural element, dissimilar wall or other vertical penetration.
- .2 Construction changes within the plane of the soffit.
- .3 Ceiling or soffit dimension exceed 15m in either direction.
- .4 Locations indicated on drawings.

3.5 **REPAIR**

.1 Remove damaged, cracked, broken, defectively finished, or tool marked components and replace with new.

.2 Refinish soffits in field with compatible materials and only in agreement of consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for flashing and sheet metal Work in accordance with the Contract Documents.

.2 Work included:
- .1 Replace prefinished metal fascia or cornice (will be installed on existing/repaired wood framing).
- .2 Repair existing metal fascia or cornice (that are installed on a wood framing) to be scraped, sanded and re-painted.
- .3 Replace prefinished metal flashing (will be installed on existing/repaired wood framing or masonry parapet).
- .4 Repair existing metal flashing (that are installed on a wood framing) to be scraped, sanded and repainted.
- .5 Perimeter roofing work with similar and matching to existing material and roofing system will be required for installation of new flashing.

1.2 **REFERENCES**

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM C920, Specification for Elastomeric Joint Sealants.

.3 OIRCA, Ontario Industrial Roofing Contractors Association.

1.3 **SUBMITTALS**

.1 Shop drawings:
- .1 Submit shop drawings in accordance with the Conditions of the Contract indicating:
  - .1 Proposed method of shaping, forming, jointing.
  - .2 Fastening, and application of flashing and sheet metal Work.

.2 Samples:
- .1 Submit following samples in accordance with the Conditions of the Contract:
  - .1 50 x 50 mm samples of sheet metal material, colour and finish.
  - .2 Representative sample section of prepainted metal flashing illustrating Slocking jointing method, minimum 600 mm long.

2 Products

2.1 **MATERIALS**

.1 All materials under Work of this Section, including but not limited to, sealants and paints are to have low VOC content limits.

.2 Prepainted sheet steel: ASTM A653/A653M; Classification LFQ, Grade A, Z275 zinc coating designation, 0.76 mm minimum base steel thickness, commercial quality, prefinished with Perspectra Series coating system by U.S. Steel Canada, or WeatherX by Vicwest Steel. Colour to be selected by Consultant.

.3 Plastic cement: Trowel grade asphalt mastic.

.4 Sealant: ASTM C920, Type S, Grade NS, Class 25; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. 'CWS' by Dow Corning or approved alternative.

.5 Cleats and starter strips: Starter strips to be continuous, of same material as flashing used, 1.2 mm thick.

.6 Gutter membrane: 1.5 mm thick, non-reinforced, cured, synthetic single-ply EPDM. Adhesive as recommended by EPDM manufacturer.

.7 Fasteners: Flat head roofing nails of length, type and thickness suitable for metal flashing application.

.8 Washers: of same material as sheet metal, 1 mm thick with rubber packings.

.9 Touch-up paint: Same colour and material as [prepainted sheet steel], as recommended by prefinished coating manufacturer.

2.2 **FABRICATION**

.1 Fabricate copings, flashings, curb counter flashings, starter strips, scuppers, down spouts and miscellaneous flashings in accordance with OIRCA and to details shown.

.2 Form prepainted sheet material at shop to shapes shown. Make end joints where adjacent lengths of metal flashing meet, in accordance with jointing method specified.

.3 Form pieces in 2400 mm maximum practical lengths. Make allowance for expansion at joints.

.4 Hem exposed edges 13 mm minimum on underside for appearance and stiffness. Mitre and seal corners with sealant.

.5 Reglets and Cap flashing: Form flashings of as detailed and in accordance with OIRCA. Provide slotted fixing holes and steel/plastic washer fasteners.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install coping flashings, curb counter flashings, starter strips, scuppers, down spouts and miscellaneous flashings to details shown on the Contract Drawings and in accordance with OIRCA.

.2 Use concealed fasteners. Exposed fasteners such as pop rivets are not allowed.

.3 Install continuous starter strips to present a true, non-waving, leading edge. Anchor to back-up for a rigid, secure installation.

.4 Make end joints using an S lock joint. Execute by inserting end coping length in 25 mm deep S lock formed in end of adjacent length. Extend concealed portion of S lock 25 mm outwards and nail to substrate. Face nailing of joints will not be permitted.

.5 Seal where necessary to form weathertight seal between flashing and adjoining surfaces and between flashing and other Work. Sealing Work consists of bedding between members where possible. Tool sealant to concave profile where exposed.

.6 Insert metal flashing under cap flashing to form weathertight junction.

.7 Caulk flashing at cap flashing with sealant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for firestopping and smoke seals Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops.

.2 CAN/CGSB 19.13, Sealing Compound, One Component, Elastomeric, Chemical Curing.

.3 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.4 ULC-S115, Standard Method of Fire Tests of Firestop Systems.

.5 CAN/ULC-S702, Thermal Insulation, Mineral Fiber for Buildings.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with the Conditions of the Contract indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.
  - .3 Submit firestop manufacturer's Product data for materials and prefabricated devices, including manufacturer's printed installation instructions.

.2 Shop drawings:
- .1 Submit shop drawings in accordance with the Conditions of the Contract indicating:
  - .1 Fire rated systems for each typical application.
  - .2 Construction details, accurately reflecting actual job conditions.

.3 Certification:
- .1 Submit certified documentation from manufacturer for each worker performing Work of this Section.
- .2 Submit installer's and Product manufacturer's certification verifying compliance with the Contract Documents and conformance with ASTM E814 and ULC-S115.

1.4 **QUALITY ASSURANCE**

.1 Perform Work of this Section by manufacturer-approved, skilled, qualified, and experienced workers trained in installation of Work of this Section.

1.5 **SITE CONDITIONS**

.1 Conform to manufacturer's requirements and maintain a minimum temperature of 5^0 C for a minimum period of 24 h before application, during, and until application is fully cured.

.2 Maintain sealant at a minimum 18° C for best workability.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Acceptable manufacturers of rated systems include:
- .1 AD Fire Protection Systems Inc.
- .2 Hilti Canada Corporation.
- .3 3M Canada Inc.
- .4 Tremco Ltd.

2.2 **MATERIALS**

.1 Firestop sealant: single component, low modulus, silicone rubber, moisture curing, ULC labelled to CAN/CGSB 19.13-M and ULC-S115.

.2 Firestop insulation: to CAN/ULC-S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.
- .1 Density: 81 kg/m^3 when tested to ASTM C303.
- .2 Combustibility: Noncombustible to CAN/ULC S114.
- .3 Melt temperature: >1175 degrees C.
- .4 Surface burning characteristics: to CAN/ULC S102, maximum flame spread of 0, smoke developed of 0.
- .5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.
- .6 Smolder Resistance: 0.01 percent when tested to CAN/ULC S129.

.3 Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of authorities having jurisdiction.

.4 Primer: As recommended by firestop sealant manufacturer.

.5 Impaling clips: Manufacturer's standard, galvanized steel.

2.3 **SYSTEMS**

.1 Firestopping and smoke seals: ULC or Intertek Testing Services listed Products and systems in accordance with ULC-S115 suitable to actual application and installation conditions.

.2 Do not use Products containing asbestos.

.3 Firestopping components shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

.2 Verify that substrates and surfaces to receive firestopping and smoke seals are clean, dry, and frost free.

3.2 **FIRESTOP AND SMOKE SEAL LOCATIONS AND RATINGS**

.1 Install ULC firestop systems rated to match fire design rating of assemblies into which they are installed.

.2 Install firestop and smoke seal systems. Use systems with required ratings at following typical locations, including but not limited to:

.1 Gaps at intersections of fire-resistance rated masonry and gypsum board partitions.

.2 Control and sway joints in fire-resistance rated walls and partitions such as masonry and gypsum board.

.3 Gaps at top of fire-resistance rated partitions such as masonry and gypsum board partitions.

.4 Penetrations through fire-resistance rated walls and partitions including mechanical and electrical services and openings and sleeves for future use.

.5 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.

.6 Perimeter of retaining angles on rigid ducts greater than 0.012 m^2, firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

3.3 **PREPARATION**

.1 Prepare, modify, and adjust void sizes, proportions, and conditions to conform to fire rated assembly requirements such as assembly opening size and dimensional restrictions.

.2 Mask adjacent surfaces to avoid spillage and over-coating of adjacent surfaces. Remove stains from adjacent surfaces.

3.4 **INSTALLATION**

.1 Install firestopping and smoke seal systems in accordance with manufacturer's instructions and fire rated assembly to establish continuity and integrity of fire separations.

.2 Install firestop insulation in compacted thicknesses required by ULC design. Compress insulation approximately 50 percent.

.3 Install primers as recommended by firestop Product manufacturers.

.4 Install temporary forming, damming, back-up as required, remove after materials have achieved initial cure and will resist displacement.

.5 Use resilient, elastomeric firestopping systems in following locations:
- .1 Openings and sleeves for future use.
- .2 Penetration systems subject to vibration or thermal movement.
- .3 Penetration systems in acoustical containment enclosures.

.6 Trowel and tool exposed firestop Product surfaces to uniform, smooth finish.

.7 Repair damaged firestopped surfaces to acceptance of Consultant.

.8 Install firestop filler in horizontal joints with two impaling clips per 4'-0" length, maximum.

.9 Identify each firestop penetration assembly with permanent label listing following:
- .1 Assembly and rating in hours.
- .2 Date of installation.
- .3 Installing company's name and telephone number.

.10 Do not cover materials until full cure has taken place.

3.5 **CLEAN-UP**

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for sealant Work in accordance with the Contract Documents.

.2 Labour, Products, equipment and services necessary for the removal of existing sealant and installation of new sealant in accordance with the Contract Documents.

.3 Work of this Section does not include sealant work identified in individual specification sections.

1.2 **REFERENCES**

.1 ASTM C920, Specification for Elastomeric Joint Sealants.

.2 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 **SUBMITTALS**

.1 Product data: Submit copies of Product data in accordance with the Conditions of the Contract describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.

.2 Samples:
- .1 Submit following samples in accordance with the Conditions of the Contract.
  - .1 Two samples of sealant/caulking, for colour selection.
- .2 Two samples of back-up material and primer for physical characteristics.

1.4 **QUALITY ASSURANCE**

.1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.

1.5 **SITE CONDITIONS**

.1 Do not install materials when ambient air temperature is less than 5°C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 **DELIVERY, STORAGE AND HANDLING**

.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 **EXTENDED WARRANTY**

.1 Submit an extended warranty for Sealant Work in accordance with General Conditions, except that warranty period is extended to 2 years from date of Substantial Performance of the Work.
- .1 Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces.
- .2 Coverage: Complete replacement including affected adjacent Work.

2 Products

2.1 **MATERIALS**

.1 General:
- .1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.

.2 Sealant **Type A**: ASTM C920, Type S, Grade NS, Class 25; One-part, non-sag type, silicone sealant, in standard colours selected.
- .1 'DC CWS' by Dow Corning Inc.
- .2 'Sikasil 305CN' by Sika.
- .3 'Tremsil 400' by Tremco.

.3 Sealant **Type B**:
- .1 'Sikaflex-15LM', from Sika Canada Inc.

2.2 **ACCESSORIES**

.1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

.2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.

.3 Bond breaker: Type recommended by material manufacturers.

.4 Void filler around the window frames to be one part expanding polyurethane foam.

.5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 **MIXING**

.1 Follow manufacturer's instructions on mixing, shelf and pot life.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSPECTION**

.1 Verify that joint sealants, backing, and other materials containing hazardous materials have been removed.

.2 Verify that joint substrates and adjoining materials are structurally sound.

.3 Verify that joints to be renovated can be satisfactorily repaired with the specified methods and materials.

3.3 **PREPARATION**

.1 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing Work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.

.2 Remove all existing sealant, loose rust and mill scale by hand cutting, power grinding or wire brushing. Completely remove sealant build up in all joints. Remove any loose particles by blowing joint out with compressed air.

.3 Clean substrate surfaces so that they are free from caulking, dust, grease, soiling, or extraneous matter, which are detrimental to the adhesion of the sealant.

.4 Chemically clean all non-porous surfaces, such as aluminum and glass, by solvent wipe and drying with a clean cloth.

.5 Patch, repair, and smooth minor substrate defects and deficiencies. Clean porous surfaces such as masonry and concrete by mechanical abrading.

.6 Where existing fasteners are loose, tighten or replace as required.

.7 Substrate moisture tests:
- .1 Test for moisture content over areas where sealant is to be applied.
- .2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before sealant system application. Install temporary drying fans if necessary.

.3 After drying of the substrate, re-test employing same criteria.

.8 Mildew removal: Scrub with solution of TSP and rinse with water, and allow to dry completely.

.9 Erect scaffolding and rigging required to perform sealant Work in accordance with reviewed Shop Drawings.

.10 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.

.11 Depth of recess: Maintain depth to ½ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.

.12 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.

.13 Prime sides of recess, in accordance with sealant manufacturer's instructions.

.14 Condition products for use in accordance with manufacturer’s recommendations.

3.4 INSTALLATION

.1 Apply sealant immediately after adjoining Work is in condition to receive such Work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.

.2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth surface, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.

.1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

.2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.

.3 Make sealant bead uniform in colour.

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

.5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.

.6 Clean recesses and re-apply sealant.

.7 Remove masking tape immediately after joints have been sealed and tooled.

3.5 CLEANING

.1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.6 SCHEDULE OF LOCATIONS

.1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of Work of this Section. Generally seal following locations:
- .1 Concrete, masonry, wood and stone to metal.
- .2 Wood to masonry, concrete and stone.
- .3 Metal to metal.
- .4 All dissimilar materials.
- .5 Where ‘sealant’ or ‘caulking’ in indicated on drawings.

.2 Sealant **Type A**:
- .1 Exterior joints between masonry and steel or aluminum.
- .2 Exterior joints between masonry and shelf angle.
- .3 Exterior joints between steel or aluminum and concrete or masonry.
- .4 Interior and exterior control joints, except in floors.
- .5 Door frames, interior and exterior side.
- .6 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
- .7 Seal thresholds.

.3 Sealant **Type B**:
- .1 Concrete expansion joints.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, tool, equipment and services necessary for Aluminum work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.

.2 AAMA CW-10, Care and Handling of Architectural Aluminum from Shop to Site.

.3 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.

.4 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).

.5 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.6 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.7 ASTM B221M, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Profiles and Tubes.

.8 ASTM C920, Specification for Elastomeric Joint Sealants.

.9 ASTM E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.10 ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.11 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.

.12 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.

.13 CAN/CGSB 1.108-M, Bituminous Solvent Type Paint.

.14 CAN/ULC S702, Thermal Insulation, Mineral Fibre, for Buildings.

.15 NFRC 100, Procedure for Determining Fenestration Product U-factors.

.16 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 **DEFINITION(S)**

.1 Aluminum Work: Shall mean aluminum windows, doors, and framing mentioned in Part 2 of this Specification Section.

1.4 **DESIGN REQUIREMENTS**

.1 Design Aluminum Work to meet requirements of AAMA/WDMA/CSA 101/I.S.2/A440, ASTM E283, ASTM E330, ASTM E331, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.

.2 Design Aluminum Work in accordance with following Climatic Design Data for Toronto contained in the Ontario Building Code:
- .1 Design temperature: January 1%, July 2 1/2%.
- .2 Hourly wind pressures: 1 in 50 year occurrence.

.3 Design Aluminum Work to accommodate following without producing detrimental effect:
- .1 Cyclic 40EC daily thermal swing of components.
- .2 Cyclic, dynamic loading and release of loads such as wind loads.
- .3 13 mm vertical deflection in supporting structure and movement of supporting structure due to live, dead load, and creep or deflections, seismic load, sway displacement and similar items.

.4 Design complete aluminum window systems, including glazing, to meet the following performance criteria:
- .1 U-factor: Maximum 2.556 W/m2.K.
- .2 SHGC: Maximum 0.40.

.5 Design to prevent accumulation of condensate on interior side of Aluminum Work framing under the following service conditions:
- .1 Interior temperature: 20EC.

.2 Exterior temperature: -18EC. .3
Interior RH: 30%.

.6 Design windows in accordance to AAMA/WDMA/CSA -101/I.S.2/ A440, to the following performance levels:
- .1 Performance class:
  - .1 Fixed - Class AW-IPG40-FW.
  - .2 Vent - Class AW-PG40-AP.
- .2 Minimum performance grade (PG): 35.

.3 Minimum positive design pressure: 1680 Pa.
.4 Minimum negative design pressure: - 1680 Pa.
.5 Minimum water penetration test pressure: 290 Pa.
.6 Minimum air infiltration/exfiltration: A3.
.7 Water tightness: B7.
.8 Window Load resistance: C5.
.9 Condensation resistance: I57

.7 Restrict air infiltration/exfiltration, through Aluminum Work in accordance with ASTM E283 at pressure differential as indicated:
.1 Entrance assemblies: 0.0003 $m^3/s\ m^2$ at differential of 300 Pa.
.2 Doors (per door): 2.78 m^3/h m per linear metre of crack at differential of 75 Pa.

.8 Design and detail controlled drainage path to actively discharge water, which enters into or forms within Aluminum Work, to exterior; prevent accumulation or storage of water within Aluminum Work. Prevent water from entering interior when tested in accordance with ASTM E331.

.9 Design and detail air barrier, vapour retarder, and rainscreen products and assemblies into continuous and integrated Aluminum Work envelope. Optimize Aluminum Work design to align envelope layers and to minimize thermal bridges.

.10 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 and 19 mm maximum for heights under 4115 mm and L/240 and 25 mm maximum for heights over 4115 mm.

.11 When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span in accordance with ASTM E330.

.12 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.

.13 Provide all reinforcing within aluminum members as required by design and OBC to provide structurally sound assembly. In any case, mullion size shall not be increased due to provision of reinforcing.

.14 Design Aluminum Work and connections to substrate where the bottom of the Aluminum Work extends to a point below 1070 mm above finished floor level and separates a floor level from an adjacent interconnected space to withstand the required guard and handrail loads in accordance with the OBC and applicable local regulations. When requested by Consultant, provide a letter signed and sealed by a Professional Engineer certifying that the Aluminum Work conforms to the OBC requirements.

.15 Design operable windows within reach of occupants with limiting stops conforming to requirements of OBC.

1.5 **SUBMITTALS**

.1 Shop drawings:
- .1 Submit shop drawings in accordance with the Conditions of the Contract indicating:
  - .1 Plans, sections, details, type of extrusions, profiles, finishes, panels, spandrels, operating components, doors, related flashings, closures, fillers, and end caps, and sealants.
  - .2 Products and glazing types.
  - .3 Anchorage inserts, system installation tolerances.
  - .4 Section and hardware reinforcement, anchorage, assembly fixings.
  - .5 Detailing, locations, and allowances for movement, expansion, contraction
  - .6 Path of cavity drainage and air pressure equalization.
- .2 Shop drawings shall bear the stamp and signature of a qualified professional engineer licensed to practice in the province of Ontario.

.2 Samples:
- .1 Submit two samples of following in accordance with the Conditions of the Contract.
  - .1 250 mm long samples of each type of extrusion and finish.
  - .2 250 x 200 mm samples of insulating glass unit.
  - .3 One complete corner detail of door frame, glazing, and finish for each door type.
  - .4 Each door hardware item for Consultant's approval.
  - .5 250 x 200 mm sample of aluminum panel.
  - .6 200 x 200 mm sample of insect screen for operable windows for Consultant's approval of fibreglass mesh.

.3 Reports:
- .1 Submit substantiating engineering data, and independent test results of pretested, Aluminum Work to substantiate compliance with the design criteria including air leakage and water penetration conforming to ASTM E283 and ASTM E331.
- .2 Submit documentation to substantiate ten years of experience in Unitized Aluminum Work manufacture and installation.
- .3 Submit signed MFRC CMA label Certificate prepare in accordance with NFRC-705 and issued by independent NFRC accredited agency or signed report prepared in accordance with CAN/CSA-A440.2 and issued by an independent CSA accredited agency.

.4 Close-out submittals: Submit Aluminum Work data for incorporation into the

Operations and Maintenance Manual as part of the Conditions of the Contract.

1.6 QUALITY ASSURANCE

.1 Retain a Professional Engineer, licensed in Province of Ontario, with experience in Aluminum Work of comparable complexity and scope to perform the following services as part of the Work of this Section:
- .1 Design of Aluminum Work.
- .2 Review, stamp, and sign shop drawings.
- .3 Conduct on-Site inspections and prepare and submit inspection reports.

.2 Mock-up:
- .1 Fabricate, deliver, and erect one, full scale mock-up of each type of Aluminum Work, in location acceptable to Consultant.
- .2 Demonstrate full range of Products, finishes, textures, quality of fabrication, and workmanship.
- .3 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

.3 Arrange for on-site air and water test to meet specified standards.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Handle Aluminum Work in accordance with AAMA CW-10.

.2 Protect aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.8 EXTENDED WARRANTY

.1 Aluminum work: Submit an extended warranty for aluminum entrances and aluminum windows Work by manufacturer in accordance with General Conditions, except that warranty period is extended to 5 years.
- .1 Warrant against failure to meet the design criteria and requirements such as interior leakage, finish degradation, frame condensation.
- .2 Coverage: Complete replacement including affected adjacent Work.

.2 Glazing:
- .1 Provide a 10 year warranty, commencing from date of Substantial Performance, against defects in the insulating glass units and warrant them to be free from material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause, under normal design conditions. Warrant the following:

.1 The insulating glass units shall be free from condensation, fogging material obstruction of vision as a result of dust or film formation on the internal glass surfaces by any cause under design conditions.

.2 The insulating glass units shall not change their mechanical design properties and shall not in any way deteriorate, degrade, delaminate or change their visual appearance.

.3 The glass units will not break due to thermal shock and temperature differential due to inherent glass faults, other than extrinsic glass breakage.

.2 Warrant that glazing work is water and weather tight and free from distortion; that glazing materials will not deteriorate from exposure to the atmosphere and weather, will not be displaced, and will be free from permanent deformation under load; and that glass and insulating glass units will not be broken, cracked or scratched by causes resulting from defects in material, workmanship or design of glazing installation.

.3 Cracked or scratched glass, shrinking, cracking, staining, hardening, sagging of glazing materials; loosening or rattling of glass; and leaking of glazed joints will be considered defective work.

.4 Warranty shall provide for the removal of defective Products, replacement with new Products conforming to the specifications, and restoration of work damaged by removal and replacement including labour and installation costs.

2 Products

2.1 ACCEPTABLE MANUFACTURER(S) AND SYSTEM(S)

.1 Curtain wall: ‘ThermaWall TW 2200 Series’ by Alumicor Limited or approved alternative.
Back section depth: 70mm (2 ¾”)

.2 Operable Windows: ‘UniVent 1350 Series’ by Alumicor Limited or approved alternative by Kawneer, Old Castle Building Envelope or Windspec Inc.

.3 Aluminum windows: ‘RainBlade1970 Series’ with minimum 133 mm deep profile by Alumicor Limited or approved alternative by Kawneer, Old Castle Building Envelope or Windspec Inc.

.4 Aluminum doors: ‘Thermaporte 7700 T 600B Series’ by Alumicor Limited or approved alternative by Kawneer, Old Castle Building Envelope or Windspec Inc.

2.2 MATERIALS

.1 All materials under Work of this Section, including but not limited to, sealants are to have low VOC content limits.

.2 Aluminum extrusions and channels: ASTM B221 and ANSI H35.1 AA6063 alloy, T6 temper.

.1 Profile and dimensions: Refer to Contract Drawings.

.2 Thermal breaks in frame members: Vertically aligned with glazing.

.3 Provide mullions caps to replace stainless steel caps as shown on drawings.

.3 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.

.4 Reinforcements and anchors: ASTM A167, Type 304 to AISI No. 2B finish. Size as shown.

.5 Glass and glazing materials: As specified in Section 08 80 00.

.6 Airseal and Aluminum Work sealant: ASTM C920, Type S, Grade NS, Class 100/50; One-part, low-modulus, moisture-curing, silicone. 'Dow Corning 790' by Dow Corning; 'Spectrem 1' by Tremco. Verify compatibility with insulating glass unit manufacturer's secondary sealant. Colour as selected by Consultant. Primer as recommended by manufacturer.

.7 Frame sealant: Type as recommended by the Aluminum Work manufacturer.

.8 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.

.9 Airseal transition membrane: 'Sopraseal Stick 1100' by Soprema Inc., 'Exoair 110' by Tremco or 'Air-Shield' by W.R. Meadows. Membrane to come complete with applicable primer.

.10 Anchors, clips, and angles: Extruded aluminum or stainless steel.

.11 Shims and blocking for frame: Rigid plastic, wood is not permitted.

.12 Flashings, closures and trim: 1.0 mm minimum aluminum sheet, finish to match extrusion finish.

.13 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304.

.14 Isolation coating: CAN/CGSB-1.108-M; Bitumastic coating, acid and alkali resistant material.

.15 Spray Foam Insulation: CFC free, polyurethane foam in place, closed cell low expansion, one component, minimum density 15 kg/m^3.

.1 'ENERFOAM' by Dow Chemical Canada.

.2 'IPF All Weather Pro' by Rivenco Industries.

.16 Window hardware: Manufacturer's standard heavy duty corrosion resistant hardware.

.1 Hinging hardware: 4 bar concealed hinges - 301 series heavy duty steel by Anderberg with positive stop and adjustable friction shoe.

.2 Restrictors: Openings shall be restricted into path of travel max opening 125 mm and 225 mm as required.

.3 Aluminum sills: Breakforms are not acceptable. All exposed edges to ground round. Provide sample for Consultants approval. Part No. 24570 by Alumicor or approved alternative.

.4 Roto Operators: one Roto Operator/awning unit, solid with satin bronze, complete with two claw handle locks.

.5 "Teleflex" window operating system for windows with high window sill as indicated on drawing.

.17 Door hardware: Manufacturer's standard heavy duty hardware, based on the following:

.1 Hinging device: extruded aluminum continuous gear hinge or 1 1/2 pair of heavy duty stainless steel butts complete with back up plates.

.2 Closing device: LCN 4040 Series closers with back up plates.

.3 Pull handles: Alumicor 1180, 25 mm diameter, anodized aluminum offset pull handles

.4 Push bars (for doors without panic hardware): Alumicor 246, 25 mm diameter, anodized aluminum push bar.

.5 Locking (basic locking): Adams Rite MS1850 Dead Lock or approved equal as per TDSB standard with manufacturers standard cylinder on exterior and thumbturn on interior.

.6 Locking (panic hardware): Von Duprin 33/35A rim panic or Von Duprin 3547 vertical rod panic or approved equal as per TDSB standard.

.18 Insect screen (windows): Extruded aluminum frames containing heavy duty, fine fibreglass mesh in accordance with AAMA/WDMA/CSA 101/I.S.2/A440. Screen to be retained in place with turn clip type fixings. Provide samples for the Consultant's approval.

.19 Weatherstripping: Durable, non-absorbing material resistant to deterioration by aging and weathering.

2.3 FABRICATION

.1 Fabricate window system in accordance with reviewed shop drawings and manufacturer's written instructions.

.2 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.

.3 Fabricate Aluminum Work in accordance with reviewed shop drawings and manufacturer's written instructions.

.4 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints for weatherproof seams.

.5 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.6 Do not expose manufacturer's identification labels on aluminum assemblies.

.7 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing, form to profile shown. Fabricate filler and closure pieces as necessary for a complete and weather tight installation.

.8 Certify aluminum windows as complying with the AAMA/WDMA/CSA 101/I.S.2/A440 design criteria and requirements using an easily removable label located on the inside face of glazing.

.9 Position operable windows on main frame to provide direction of opening specified, free and smooth operation, without binding or sticking against main frame members.

.10 Fabricate doors and frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.

.11 Fabricate Aluminum Work closures and trim from aluminum sheet. Form to profile shown. Make weathertight.

.12 Double weatherstrip doors. Install weatherstripping in specially extruded ports and secure to prevent shrinkage or movement.

.13 Fabricate glazing recess with drainage to exterior.

2.4 ALUMINUM DOORS

.1 Fabricate doors of welded construction.

.2 Glazing stop: Aluminum, square, snap-on type, designed for glazing system.

2.5 FINISH

.1 Extrusion finish: Clear anodized finish to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A31.

.2 Doors: Clear anodized finishes to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A31.

.3 Panel and sheet finish: As indicated on drawings to match adjacent extrusion finish.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **INSTALLATION**

.1 Install Aluminum Work in accordance with reviewed shop drawings, manufacturer's instructions, AAMA/WDMA/CSA 101/I.S.2/A440 and to meet requirements of authorities having jurisdiction.

.2 Install Aluminum Work in accordance with reviewed shop drawings and manufacturer's written instructions.

.3 Install Work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.4 Apply isolation coating at 0.8 mm dry film thickness to prevent corrosive or electrolytic action between dissimilar materials such as aluminum to concrete, masonry, galvanized steel and similar conditions.

.5 Install flashings, closures, and trim pieces.

.6 Fill voids between aluminum framing and adjacent construction with foam insulation.

.7 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.

.8 Refer to Contract Drawings for glazing type locations. Install glazing in accordance with Section 08 80 00.

.9 Install aluminum door manufacturer's standard weatherstripping at door frame perimeter. Install weatherstripping throughout entire length and width of doors at jambs and heads.

.10 Install doors and hardware to manufacturers' written instructions. Clean and adjust hardware for correct performance.

.11 Adjust operable parts for correct function.

.12 Remove damaged or unacceptable Products and assemblies from Site and replace to Consultant's acceptance.

.13 Install glass presence markers, in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.3 ERECTION TOLERANCES

.1 Tolerances: Non-cumulative.
- .1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative or 12 mm/30 m, whichever is less.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Vertical and horizontal positions: +/- 3 mm.
- .4 Racking of face: 6 mm, nil in elevation.
- .5 Operable components: Consistent with smooth operation and weatherproof performance.
- .6 Maximum perimeter sealant joint between Aluminum Work and adjacent construction: 13 mm.

3.4 GLAZING PERIMETER AIRSEAL

.1 Install glazing perimeter airseal at entire perimeter of each insulating glass unit to achieve an airseal from insulating glass unit to window frame. Do not obstruct path of cavity drainage and air pressure equalization.

.2 Perform sealant work in accordance with manufacturer’s written requirements.

3.5 AIRSEAL TRANSITION MEMBRANE

.1 Install primer and airseal transition membrane in accordance with manufacturer's instructions. Install airseal transition membrane into extrusion reglet as indicated on drawings. If there is no extrusion reglet, mechanically fasten airseal transition membrane to frame with batten bar fastened at 150 mm o.c.

.2 Overlap airseal transition membrane 75 mm minimum and lap in direction of waterflow.

.3 Coordinate airseal transition to adjacent parts of Work.

3.6 JOINT BACKING AND ALUMINUM WORK SEALANT

.1 Prepare substrate surface and mask as recommended by sealant manufacturer.

.2 Install joint backing and sealant at Aluminum Work and perimeter joints for weather tight installation in accordance with sealant manufacturer's instructions. Tool sealant. Remove excess sealant.

3.7 **CLEANING**

.1 Maintain Aluminum Work, inside and outside, in clean condition throughout construction period.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

.3 Remove AAMA/WDMA/CSA 101/I.S.2/A440 certification labelling when directed by Consultant, in writing.

.4 Wash Aluminum Work with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for finish hardware Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 BHMA, Builders Hardware Manufacturing Association.

1.3 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with the Conditions of the Contract indicating compliance with reference standards, transportation, storage, handling and installation requirements.

.2 Shop drawings:
- .1 Submit shop drawings and 3 complete hardware lists in accordance with the Conditions of the Contract indicating:
  - .1 Door locations, sizes, hardware manufacturer's catalogue numbers, finish symbols and quantities required.
  - .2 Locations and mounting heights of each type of hardware.
- .2 Supply templates and required information to door and frame manufacturer to enable accurate sizes, locations of cut-outs and reinforcement for hardware.
- .3 Submit templates to required trade to arrange for provisions for accurate setting and fitting of hardware.

.3 Samples:
- .1 Submit 2 samples in accordance with the Conditions of the Contract of each item that is different from hardware specified and include manufacturer's parts lists and installation instructions.
- .2 Submit hardware component samples illustrating style, colour and finish. Tag samples identifying applicable Specification article number, brand name and number, finish, building location, date and catalogue number.
- .3 Do not order hardware until samples have been accepted. Submit new samples to replace rejected samples. Supply hardware and finishes identical to each accepted sample.

.4 Closeout submittals:
- .1 Submit the following in accordance with the Conditions of the Contract for each Product for incorporation into Operation and Maintenance Manual:
  - .1 Maintenance data.
  - .2 Operating instructions and safety precautions.
  - .3 Parts list with name and address of supplier.
  - .4 Lubrication schedule and type of lubricant recommended.
  - .5 Keys, tools and special devices.
  - .6 Inspection procedures related to preventive maintenance.

1.4 **QUALITY ASSURANCE**

.1 General:
- .1 Manufacturers: Companies specializing in manufacturing door hardware and registered with BHMA.
- .2 Hardware supplier: Company specializing in supplying commercial door hardware and acceptable to manufacturer.

.2 Certifications:
- .1 Employ an Architectural Hardware Consultant to inspect completed installation and certify that hardware has been supplied and installed in accordance with manufacturer's printed instructions and as specified.
- .2 Submit manufacturer's certificate that finish hardware meets specified requirements.

1.5 **DELIVERY, STORAGE, AND HANDLING**

.1 Be responsible for packaging of hardware, on a set by set basis. As material is received from various manufacturers identify it to correspond to Hardware List symbols.

.2 Label packages legibly, indicating manufacturer's number, types, sizes, opening number and Hardware List reference number. Wrap hardware and include in package, screws, bolts and fastening necessary for correct installation. If hardware package is not complete, pay additional charges incurred by installer.

.3 Deliver hardware to Site packaged, labelled and cross-referenced to hardware list for each item and it's scheduled installation location.

.4 Accept Products of this Section on Site and that each item is undamaged.

.5 Catalogue and store hardware in secure area.

2 Products

2.1 **GENERAL**

.1 Carefully check and verify Hardware List against Contract Drawings to ensure that hardware listed can be used as specified. Inform Consultant of concerns regarding quality, quantity, operation or function of hardware selected:
- .1 Verify hand of doors, examine details on Contract Drawings and at Site to ensure hardware supplied can be correctly installed and is correct for Work as constructed.
- .2 Select hardware in accordance with applicable codes and regulations and to approval of local Fire Marshall.
- .3 Replace and pay for defective hardware including hardware which was incorrectly selected, and remedial and installation costs.

.2 Ensure that hardware selected will function correctly, meets Contract requirements and Ontario Building Code and authorities having jurisdiction.

.3 Ensure that each hardware item is of same type, design and by same manufacturer.

.4 Manufacturer's names or trade marks are not permitted on exposed surfaces of hardware.

.5 Include in packing slip a list of parts, name of supplier and door number in which lock is to be installed.

2.2 **ACCESSORIES**

.1 Items to be attached to masonry or concrete with expandable shields, lag screws, bolts or other fastening devices as required. Exposed screws: Stainless steel, Phillips or Robertson heads.

2.3 **FINISHES**

.1 Metal finishes: Free from defects, clean, unstained and of a uniform colour for each type of finish required. Exposed surfaces and anchors: Specified finish symbol of item.

3 Execution

3.1 **INSTALLATION**

.1 Install hardware in accordance with manufacturer's installation instructions and applicable codes and regulations.

.2 Remove existing mortise hardware on reused doors and install new lever mortise hardware.

.3 Install hardware in accordance with hardware templates.

.4 Adjust fixed and operable hardware for correct clearances and function.

.5 Mount hardware measured from finished floor to centre of hardware, unless indicated otherwise:

.1 Top hinge: 250 mm from head of door to top.
.2 Bottom hinge: 265 mm from finished floor to bottom of hinge.
.3 Intermediate hinge: Equal distance between top and bottom hinge.
.4 Locksets, latchsets: 1000 mm
.5 Push plates: 1000 mm to centre of plates.
.6 Guard bars: 1100 mm
.7 Door pulls: 1000 mm to centre of pulls.
.8 Blank strike: 1450 mm
.9 Blank fronts: 1450 mm

3.2 **FIELD QUALITY CONTROL**

.1 Have hardware inspected after installation by hardware supplier's representative, obtain certification in writing that hardware has been supplied and installed in accordance with Specifications and hardware manufacturer's instructions and is functioning correctly.

3.3 **HARDWARE SCHEDULE**

.1 Finish Hardware Schedule will be provided at a later date.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment, tools, and services necessary for glass and glazing Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM D2240, Test Method for Rubber Property - Durometer Hardness.

.2 CAN/CGSB-1.108-M, Bituminous Solvent Type Paint.

.3 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.

.4 CAN/CGSB-12.3-M, Flat, Clear Float Glass.

.5 CAN/CGSB-12.8, Insulating Glass Units.

.6 CAN/CGSB-12.9-M, Glass, Spandrel.

.7 CAN/CGSB-12.20-M, Structural Design of Glass for Buildings.

.8 Glass Association of North America (GANA) Glazing Manual.

1.3 **DESIGN REQUIREMENTS**

.1 Design glass to CAN/CGSB-12.20-M. Perform stress analysis. Design units to accommodate live, dead, lateral, wind, seismic, handling, transportation, and erection loads.

.2 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.

.3 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.4 Perform a thermal stress analysis on each insulating unit and provide heat strengthening and/or tempered units as necessary to prevent thermal breakage.

1.4 **SUBMITTALS**

.1 Shop drawings: Submit shop drawings in accordance Section 01 33 00 for fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

.2 Samples:

.1 Submit following samples in accordance with Section 01 33 00.

.2 Submit one sample of each type of glass.

.1 200 x 200 mm of each type of insulating glass unit.

.3 Certificates: Submit manufacturer's certification that glass and glazing materials are compatible.

.4 IGMA Compliance Audit: Submit in accordance with Section 01 78 23, a written certification of successful completion of a Compliance Audit within the last six months.

1.5 **QUALITY ASSURANCE**

.1 Insulating glass unit fabricators shall be a certified member of the Insulating Glass Manufacturer's Alliance (IGMA). IGMA members must participate in the certification program and shall have successfully passed a Compliance Audit within the last six months.

1.6 **SITE CONDITIONS**

.1 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures over 4°C, and when positive that no moisture is accumulating on them from rain, mist, or condensation.

.2 When temperature of glazing surfaces is below 4°C, obtain from Consultant approval of glazing methods and protective measures which will be used during glazing operations.

1.7 **EXTENDED WARRANTY**

.1 Submit a warranty for Glazing work in accordance with General Conditions, except that warranty period for insulating glass unit is 10 years.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

.1 Glass manufacturers:
- .1 AGC Flat Glass.
- .2 Guardian Industries.
- .3 PPG Industries Ltd.
- .4 Viracon Inc.
- .5 Cardinal Glass Industries.

2.2 **MATERIALS**

.1 All materials under Work of this Section, including but not limited to, primers, coatings, sealers, sealants, adhesives and cleaners are to have low VOC content limits.

.2 Tempered glass **(TGL)**: CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear or tinted as indicated, minimum 6 mm thick.

.3 Insulating glass units: Factory sealed to CAN/CGSB-12.8-M and IGMA requirements utilizing approved metallic stainless-steel edge spacer. Dual seal with a PIB primary seal and silicone secondary seal.

.4 Argon gas: 90% pure. Argon gas to be used to fill air space at all insulated glass units.

.5 Low-E coating (Soft coat): High performance sputtered low-E coating. Provide insulating glass units with low-E coating edge deletion and low-E coating. Apply low-E coating to second surface unless otherwise indicated. 'Comfort Ti-AC 36' by AGC Flat Glass, 'Solarban 90' clear by PPG Industries Inc. or approved alternative.

.6 Glazing schedule:

.1 Exterior curtain wall and window glazing: 6 mm TGL outside, argon filled air space, 6 mm TGL inside, 25 mm overall thickness, complete with low-e film, and etched tempered glass designation shall be visible.

.2 Exterior Doors: 6 mm TGL outside, argon filled air space, 6 mm TGL inside, 25 mm overall thickness, complete with low-e film, and etched tempered glass designation shall be visible.

.8 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by glass manufacturer.

.9 Glazing sealant: Silicone sealant as recommended by glazing manufacturer. Verify compatibility with insulating glass unit secondary sealant.

.10 Heel & toe bead: Silicone sealant as recommended by glazing manufacturer.

.11 Glazing gasket: 'Visionstrip' by Tremco Ltd., extruded composite glazing seal, size as recommended by manufacturer.

.12 Glazing tape: 'Polyshim II' glazing tape EPDM shim.

.13 Glazing splines: EPDM or neoprene, extruded shape to suit glazing channel retaining slot, colour as selected.

.14 Setting blocks (regular): EPDM, 80 - 90 Shore A durometer hardness to ASTM D2240, 100 mm long x 6 mm high x rebate width minimum, size designed for glass size and weight of glass unit.

.15 Edge blocks: EPDM, 60-70 Shore A Durometer hardness, sized with 3 mm clearance from glass edge and spanning glass thickness(es). Capable of withstanding weight of glass unit, self adhesive on face.

.16 Glass presence markers: Easily removable, non-residue depositing.

.17 Isolation coating: CAN/CGSB 1.108-M; Bitumastic paint.

.18 Screws, bolts and fasteners: Type 304 stainless steel.

2.3 **FABRICATION**

.1 Verify glazing dimensions on Site.

.2 Clearly label each glass lite with maker's name and glass type. Ensure labels are easily removable, non-residue depositing type. Do not remove labels until after Work is accepted by Consultant.

.3 Fabricate glazing not less than 3 mm smaller than rebate size in either dimension; allow for edge spacers, shims, and setting blocks as necessary.

.4 Work shall have smooth finished surfaces free from distortion and defects detrimental to appearance and performance.

.5 Carefully make and fit details. Take special care with exposed finished Work to produce a neat and correct appearance to the Consultant's acceptance.

.6 Fabricate argon filled thermal units with air space filled minimum 90% filled with argon gas.

.7 Provide 6 mm thick inner and outer glass lites where required to maintain mullion spacing and glass areas as indicated on drawings.

3 Execution

3.1 **EXAMINATION**

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 **PREPARATION**

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 **INSTALLATION**

.1 Provide glazing in accordance with IGMA recommendations. Provide continuous contact between glazing tapes to the glazing.

.2 Install glazing to the Work of Sections 08 11 13 and 08 51 13.

.3 Provide neat, straight sight lines. Trim excess glazing material flush with top of stops and fixed leg of frames.

.4 Remove protective coatings, glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.

.5 Apply primer/sealer to contact surfaces, prior to glazing.

.6 Apply glazing tape as per manufacturer's instructions including recommended corner sealant.

.7 Use setting blocks at 1/4 points and spacers to centre glass unit in frame.

.8 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.

.9 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.

.10 Apply a continuous heel bead of sealant around perimeter of inboard lite of the sealed unit and the metal framing.

.11 Install glazing gasket in accordance with manufacturer's recommendations.

.12 Do not cut or abrade tempered, heat treated, or coated glass.

.13 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

.14 Remove, dispose of, and replace broken, cut and abraded glass.

.15 Exterior glass: Glaze units with gasket on exterior side and glazing tape on interior side. Seal gap between glazing and stop with sealant to depth equal to bite of frame. Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

.16 Interior glass: Glaze interior glass using glazing gasket glazing tape.

3.4 **CLEANING**

.1 Immediately remove sealant and compound droppings from finished surfaces.

.2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for gypsum board Work.

1.2 **REFERENCES**

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM C475, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.3 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.

.4 ASTM 665, Mineral- fiber Blanket Thermal Insulation for light frame construction and manufactures housing.

.5 ASTM C754, Specification for Steel Framing Members to Receive Screw-Attached Gypsum Board.

.6 ASTM834, standard specifications for Latex Sealant.

.7 ASTM C840, Specification for Application and Finishing of Gypsum Board.

.8 ASTM C1002, Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases.

.9 ASTM C1396, Specification for Gypsum Board.

.10 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.11 CGSB 19-GP-21M, Sealing and Bedding Compound, Acoustical.

1.3 **DESIGN REQUIREMENTS**

.1 Design ceiling suspension system in accordance with manufacturer's printed directions and ASTM C754.

.2 Design ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

.3 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

.4 Design suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures.

.5 Design subframing as necessary to accommodate, and to circumvent, conflicts and interferences where ducts or other equipment prevent the regular spacing of hangers.

.6 Design wall framing system and reinforce as necessary to accommodate and support items attached to and supported by wall framing system.

1.4 REGULATORY REQUIREMENTS

.1 Provide fire separations and fire protection exactly as specified in test design specification that validates the specified rating. Verify that work specified in other Sections, as a part of the entire assembly, meets applicable validating test design specification.

1.5 SUBMITTALS

.1 Product data:

.1 Submit copies of manufacturer's Product data in accordance with the Conditions of the Contract indicating:

.1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.

.2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings in accordance with the Conditions of the Contract indicating adjacent construction, elevations, sections and details, dimensions, thickness, finishes and relationship to adjacent construction, suspension system, curved suspension system, framing and blocking for supported items.

.3 Certifications: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.6 QUALITY ASSURANCE

.1 Qualifications: Execute the Work of this Section by skilled, qualified, and experienced workers trained in the installation of the Work of this Section.

.2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in this type of work of comparable complexity and scope to perform the following services as part of the Work of this Section:

.1 Design of framing and connections to adjacent construction.

.2 Design of suspended gypsum board assemblies.

.3 Design of minimum 20 gauge metal studs, unless otherwise required to suit loading conditions.

.4 Review, stamp, and sign shop drawings.

.5 Conduct on-Site inspections and prepare and submit inspection reports to confirm work is carried as per shop drawings.

1.7 SITE CONDITIONS

.1 Do not begin Work of this Section until:

.1 Mechanical and electrical Work above the ceiling is complete.

.2 Substrate and ambient temperature is above 15°C.

.3 Relative humidity is below 80 %.
.4 Ventilation is adequate to remove excess moisture.

.2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and 24 h after installation.

2 Products

2.1 **MATERIALS**

.1 Steel framing: ASTM C754; ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
.1 Bailey Metal Products Limited
.2 Corus Metal Profiles

.2 Steel studs and track runners: ASTM C645; Formed from galvanized steel sheet, minimum 0.91mm thick or as indicated on the contract drawings, galvanized steel studs and runners, to match stud thickness, depth as indicated on Contract Drawings.

.3 Main carrying channels: ASTM C645; Formed from galvanized steel sheet, 38 x 19 mm cold rolled, channels.

.4 Resilient channel: ASTM C645; 0.02" thick galvanized metal, 57 wide x 12mm deep for walls and ceiling to reduce sound transmission.

.5 Furring channels: ASTM C645; Formed from galvanized steel sheet, 22mm winged flange type, cold rolled.

.6 Furring channels (hat type): ASTM C645; 0.5mm base steel thickness, galvanized. 70mm wide x 22mm deep hat shaped channel.

.7 Heavy duty furring channels: ASTM C645; 0.9mm (20 ga.) steel thickness, galvanized hat shaped channel with a wider and deeper size as required by manufacturers.

.8 Hanger wires: 4.1mm minimum diameter galvanized pencil rod.

.9 Tie wire: 1.6mm thick minimum diameter, soft annealed, galvanized steel wire.

.10 Corner bead, casing bead, and special shapes: Formed from 0.6 mm thick minimum, galvanized steel sheet, designed to be concealed by joint compound.

.11 Control joint strip: Roll formed from galvanized steel sheet, with a tape protected recess, 6mm wide x 11mm deep.

.12 Deflection track: ASTM C 645 top runner with 50.8 mm deep flanges, in thickness indicated for studs and in width to accommodate depth of studs.

.13 Deflection track fire rated: 25mm deep leg deflection track on rated walls. “Fire Trak Shadowline” by Fire Trak Corp. or approved alternative.

.14 Ceiling clips: Hot dip galvanized partition attachment clips, in square and reveal edge, “PAC15 Series” to match grid system by CGC Inc. or approved alternative.

.15 Screw fasteners: ASTM C1002 Type S; Corrosion resistant.

.16 Concrete anchors: tie wire sleeve anchors, ‘Redi-Drive TW' by Red Head or approved alternative.

.17 Acoustic/Fire insulation: Paperless, semi-rigid, spun mineral fibre mats, of thickness as indicated on Contract Drawings, Thermafibre by CGC Inc., or Roxul AFB or Flexibatt by Roxul Inc., or Quiet Zone Batts by Owens Corning Inc., or NoiseReducer Insulation by CertainTeed.

.18 Acoustical sealant: CGSB 19-GP-21M; Single component, non-skinning synthetic rubber sealant. Acoustical Sealant by Tremco.

.19 Gypsum Board: ASTM C1396, gypsum board 12.7mm thick of maximum practical lengths to minimize end joints, unless indicated otherwise by CGC Inc. Georgia- Pacific Canada LP or CertainTeed Canada.

.20 Abuse & Moisture Resistant CGC Sheetrock® Brand Glass-Mat Panels Mold Tough® VHI Firecode®: ASTM Standards: C1396, C1629, C1177, D3273-10, Edge Porfiles: Tapered Edge, Fire Class A, For use in a fire rated system, Humidity Resistant, Moisture & Mold Resistant
Types: Fibre-Reinforced Gypsum Panel, Glass-Mat Interior Panels, Gypsum Panels

.21 Soffit Boards: Abuse and Moisture Resistant 15 mm Durock® Cement Board.

.22 Primer: Where indicated by board manufacturer, provide primer as required to achieve finishes as defined in ASTM C840, such as Level V Wall and Ceiling, by CertainTeed, or approve alternate.

.23 Exterior sheathing: “Dens-Glass Gold” by G-P Products.

.24 Sheathing screws: to ASTM C1002, Type S, corrosion resistant, 1/2" penetration into steel, complete with 1-1/2" diameter washers.

.25 Joint reinforcing tape: ASTM C475; 2" wide x 0.01" thick, perforated paper, with chamfered edges.

.26 Bonding adhesive: Type for purpose intended and as recommended and approved by manufacturer.

.27 Joint and patching compound: ASTM C475; Asbestos-free, supplied by manufacturer of gypsum board used.

.28 Fast setting patching compound: ASTM C475; Asbestos-free, Sheetrock or Durabond by CGC Inc, or Machine Pro by CertainTeed Canada Inc., or approved alternative.

.29 Access doors: Supplied by other Sections for installation as part of the Work of this Section.

3 Execution

3.1 **SUSPENSION FRAMING**

.1 Install ceiling systems in accordance with manufacturer's written instructions and reviewed shop drawings.

.2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.3 Install hanger wires at 4'-0" maximum centres along carrying channels, not less than 1", and not more than 6" from channel ends.

.4 Install additional hangers at lighting fixture and ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.

.5 Install main carrying channels transverse to structural framing members. Lap main carrying channels 8" minimum at splices and wire each end with two loops and prevent clustering or lining-up of splices.

.6 Install furring channels at 16" o.c., not less than 1", and not more than 6" from perimeter walls, at openings, at interruptions in ceiling continuity, and at change in plane. Install furring channels to a tolerance of 1/8" maximum in 12'-0"

.7 Install additional main carrying and furring channels to frame and to reinforce openings such as recessed lighting fixtures, access hatches, ceiling grilles, outlet boxes, ventilating outlets and similar items.

3.2 **STEEL STUDS AND FURRING**

.1 Install steel stud partitions to underside of structure unless indicated otherwise.

.2 Install track runners at floors, ceilings, and underside of structure; align track runners accurately and secure to structure at 24" centres maximum.

.3 Install double top track runner assembly to prevent the transmission of structural loads to steel studs.

.4 Install steel studs vertically at 16" and not more than 2" from abutting walls, at openings, and at each side of corners. Install studs securely to track runners.

.5 Schedule and coordinate steel framing installation with mechanical and electrical services installation.

.6 Install full height, double studs at door and service openings, fastened together and stiffened back to the structure to prevent vibration when doors close.

.7 Provide double studs boxed together at all openings, sill, head and jambs and at door jambs, fastened together and stiffened back to the structure to prevent vibration. At each opening exceeding 3'-0" in width, double studs shall be 20 ga. extending to structure above, and adequately anchored at each end. Provide steel studs above and below openings spaced at 1'-4"noc maximum. All metal stud partitions above doors and screens over 4'-0" wide shall be secured to structure over and reinforced with sway bracing to stabilize walls to prevent lateral movement.

.8 Erect three studs at corner and intermediate intersections of partitions. Space 2" apart and brace together with wired 3/4" channels.

.9 Stiffen partitions over 8'-0" high or 10'-0" long, or both, with horizontal bracing extended for full length of partitions. Provide one line of bracing in partitions. Space lines to provide equal unbraced panels. Provide bracing for portions of partitions over door openings in partitions over 10'-0" high, and bracing both above and below openings in partitions located no greater than 6" from top and bottom of opening, and extending two stud spaces beyond each edge of opening for both doors and windows. Wire tie or weld bracing to studs.

.10 Frame control joints using back to back double studs at abutting structural elements, at dissimilar backup interface, at dissimilar walls and ceilings, at structural expansion and control joints, at door and other openings, and at 30'-0" maximum spacing in continuous runs. Install control joint strips and secure in place.

.11 Install additional support framing at openings and cutouts for built-in equipment, upper cabinet support, access panels and similar items.

.12 Attach to framing adequate steel reinforcing members or an 18 ga. steel stud mounted horizontally and notched around furring members to support the load of, and to withstand the withdrawal and shear forces imposed by, items installed upon the work of this Section. Such items include, but are not restricted to, coat hooks, wall-hung cabinets and fitments, shelving, curtain and drape tracks; Owner supplied equipment; and minor mechanical and electrical work. Heavy mechanical and electrical equipment shall be self-supporting in Divisions 15 and 16.

.13 Provide for support and incorporation of flush-mounted and recessed mechanical and electrical equipment and fixtures only after consultation and verification of methods with those performing the work of Divisions 15 and 16.

.14 Install cross bracing in accordance with the steel stud manufacturer's recommendations.

3.3 FIRE RATED ASSEMBLIES

.1 Install fire rated assemblies in accordance with applicable ULC tested and approved designs.

.2 Stiffen fire rated walls over 12'-0" high, where linear length of wall is greater than 8'-0" between perpendicular wall supports, with diagonal bracing above the ceiling extending

perpendicular to wall at a 45° angle to structure above. Locate diagonal bracing at maximum 8'-0" o.c.

.3 Where double layers of gypsum board are shown, and required for fire rating, screw first layer to studs and furring and laminate the second layer to the first using joint filler as an adhesive. Stagger joints between first and second layers.

3.4 ACOUSTICAL INSULATION

.1 Install acoustic insulation in partitions, between steel studs of exterior insulation and finish system, and as indicated on Contract Drawings and in accordance with the manufacturer's instructions. Fill stud cavities to full height of partitions and carefully cut and fit acoustic insulation around services and protrusions.

3.5 ACOUSTICAL SEALANT

.1 Install acoustical sealant to acoustically insulated partitions in accordance with the manufacturer's instructions and Contract Drawings.

.2 Install acoustical sealant under floor runner track, at partition perimeter both sides and at openings, cut-outs, and penetrations, concealed from view in the final installation.

3.6 GYPSUM BOARD

.1 Comply with ASTM C840. Install gypsum board in accordance with manufacturer's written instructions.

.2 Install gypsum board vertically or horizontally, whichever results in fewer end joints. Locate end joints over supporting members.

.3 Install gypsum board in lightly butted contact at edges and ends and with 1.6 mm maximum open space between boards; do not force gypsum board into place. Do not install imperfect, damaged or damp boards.

.4 Install gypsum board butting paired tapered edge joints, and mill-cut or field-cut end joints; do not place tapered edges against cut edges or ends.

.5 Install vertical joints minimum 12" from the jamb lines of openings and stagger vertical joints over different studs on opposite sides of partitions.

.6 Do not locate joints within 8" of corners or openings, except where control joints occur at jamb lines or where openings occur adjacent to corners. Where necessary, place a single vertical joint over the centre of wide openings.

.7 Install gypsum board over concrete and concrete masonry units with adhesive as recommended by gypsum board manufacturer where indicated on Drawings.

.8 Cut, drill and patch gypsum board as may be necessary to accommodate the Work of other trades.

.9 Fire Separations:

.1 Construct gypsum board assemblies, where located, in accordance with tested assemblies to obtain required or indicated fire rated assemblies. As a minimum fire separations shall consist of metal framing covered on both sides by fire-rated gypsum board.

.2 Install assemblies tightly to enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges.

3.7 SHEATHING INSTALLATION

.1 Install sheathing and sheathing materials in accordance with manufacturer's written instructions.

.2 Install sheathing with long dimension perpendicular to metal studs, offset joints and butt tight, centre edges of sheathing over metal studs, mechanically fasten with specified fasteners and washers in accordance with manufacturer's instructions.

.3 Lap self adhesive membrane ends 2" minimum. Roll adhesive membrane and laps for continuous adhesion over entire substrate area.

.4 Seal screw holes with mortar/adhesive.

3.8 CORNER, CASING BEADS AND TRIM

.1 Corner reinforcing bead: Install along all external angles, erect plumb, level and with a minimum of joints. Secure with screws at 9" o.c. apply filler over flanges flush with nose of the bead and extending at least 3" onto surface of board each side of corner. When filler dries, apply a thin coat of topping cement and blend onto adjoining surfaces.

.2 Casing bead: Install where wallboard butts against a surface having no trim concealing the juncture and where shown on drawings. Erect casing beads plumb or level, with minimum joints, and secure with screws at 12" o.c. apply filler over flange flush with bead and extending at least 3" onto surface of board. When dry, apply a thin coat of topping cement and blend onto adjoining surfaces.

.3 Recess channels and trim: Install recess channels and special metal trim where shown. Secure to substrate. Provide casing beads full height on wallboard edges at recess channels and metal trim.

3.9 JOINT TAPING AND FINISHING

.1 Install reinforcing tape and a minimum of 3 coats of joint compound over gypsum board joints, metal trim and accessories, and screw fasteners in accordance with the gypsum board manufacturer's instructions.

.2 Fill gaps between, and any imperfections in, gypsum boards with joint compound, allow to dry, and sand smooth ready for painting.

.3 Install finished gypsum board Work smooth, seamless, plumb, true, flush, and with square, plumb, and neat corners.

.4 Finish gypsum board in accordance with ASTM C840 to the following grades:

.1 Level 0: No taping, finishing, or accessories required. Use above suspended ceilings and within other concealed spaces, unless the assembly is fire rated, sound rated, sound or smoke controlled, or unless the space serves as an air plenum.

.2 Level 1: At joints and interior angles embed tape in joint compound. Leave surface free of excess joint compound. Tool marks and ridges are acceptable. Use above suspended ceilings and within other concealed spaces if the gypsum board assembly is fire rated, sound rated, sound or smoke controlled, or the space serves as an air plenum.

.3 Level 2: At joints and interior angles embed tape in joint compound with one separate coat of joint compound applied over joints, angles, fastener heads, and accessories.

.4 Level 3: At joints and interior angles embed tape in joint compound with two separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use where heavy grade wall coverings are the final decoration.

.5 Level 4: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply joint compound smooth and free of tool marks and ridges. Use for all locations except those indicated for other finish levels.

.6 Level 5: At joints and interior angles embed tape in joint compound with three separate coats of joint compound applied over all joints, angles, fastener heads, and accessories. Apply a thin skim coat of joint compound, or a material manufactured especially for this purpose, to the entire surface. Leave surface smooth and free of tool marks and ridges. Use where semi-gloss or gloss finish coatings are the final decoration, areas with natural light or very well lit with artificial light.

3.10 ACCESS DOORS

.1 Install access doors supplied as part of other parts of the Work.

3.11 SITE TOLERANCES

.1 Install metal support systems to ensure that, within a tolerance of +1/8" and -1/16" for plaster thickness, finish surfaces will be flat within 1/8" under a 10'-0" straightedge, and with no variation greater than 1/16" in any running 1'-0", and that surface planes shall be within 1/8" of dimensioned location.

3.12 WORK IN EXISTING AREAS

.1 In existing areas, where existing gypsum board work has been demolished and/or damaged and repair work is required, provide new gypsum board finish.

.2 Thoroughly prepare areas to be repaired. Provide neat, clean and straight cuts.

.3 Finish all repair work as specified for new work.

.4 In existing areas where existing openings are to be filled in with gypsum board, provide new gypsum board wall and ceiling construction. Ensure new board faces are flush with faces of abutting existing walls and ceilings.

3.13 **REPAIR**

.1 Make good cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.

.2 Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for painting Work in accordance with the Contract Documents.

.2 Work included:
- .1 Paint exposed concrete beam and columns, steel, wood, metal panels, metal flashing, metal siding, hollow metal doors and frames and cementitious board as required. All to be exterior grade.
- .2 Repair and repainting of concrete finishing and stucco like finishes on a concrete substrate.
- .3 Removal of existing paint, prepare substrate and apply painting. This will be mainly exterior painting on various substrates.

1.2 **REFERENCES**

.1 CAN/CGSB 85.10, Protective Coatings for Metals.

.2 CAN/CGSB-85.100, Painting.

.3 Master Painters Institute (MPI), Painting Specification Manual.

.4 SSPC Steel Structures Painting Council, Standards.

1.3 **SUBMITTALS**

.1 Product data:
- .1 Submit copies of manufacturer's Product data in accordance with the Conditions of the Contract indicating:
  - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
  - .2 Product transportation, storage, handling and installation requirements.
- .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.

.2 Samples:
- .1 Submit following samples in accordance with the Conditions of the Contract.
  - .1 Three 300 x 150 mm drawdowns of each colour minimum 4 weeks before paints are required.
- .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.

.3 Certificates:
- .1 Submit certification from paint manufacturer, on company letterhead, indicating each product proposed for use is Manufacture's premium grade, first line Product.

.2 Submit certified documentation to confirm each airless spray painter has minimum of 5 years' experience on applications of similar complexity and scope.

.3 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

.4 Reports:

.1 Submit written field inspection and test report results after each inspection.

.2 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.

.3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

1.4 QUALITY ASSURANCE

.1 Finishing Work: Perform work to MPI requirements for premium grade.

.2 Supervision: Have Work supervised by a full-time qualified foreperson who has 10 years minimum experience on Contracts of similar complexity and scope.

.3 Mock-up:

.1 Construct three 10 m^2 mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.

.2 Obtain Consultant's acceptance in writing before proceeding with the Work of this Section.

.3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.

.4 Repaint over mock-ups which do not form part of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.

.2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO_2 fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.

.3 Maintain storage enclosures at minimum 10^oC ambient temperature and to manufacturer's instructions.

1.6 SITE CONDITIONS

.1 Apply coatings under the following conditions:
- .1 Exterior coatings (except Latex): 5° C minimum.
- .2 Exterior latex coatings: 10°C minimum.
- .3 24 hours minimum after rain, frost, condensation, or dew.
- .4 When no condensation is possible (unless specifically formulated against condensation).
- .5 Interior coatings: 7°C minimum.
- .6 Relative humidity: 85% maximum.
- .7 Not in direct exposure to sun light.

.2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.

.3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

.4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of Work not being painted including, but not limited to, the following:
- .1 Light fixtures, fire and smoke detectors.
- .2 Sprinkler heads.
- .3 Prepainted diffusers and registers.
- .4 Prepainted equipment.
- .5 Fire rating labels and equipment specification plates.
- .6 Finished surfaces.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Green Performance Standard GPS-1-05".

1.8 MAINTENANCE

.1 Deliver to Owner's place of storage on completion of work, sealed containers of each finish painting material applied, and in each colour. Label each container as for original, including mixing formula. Provide the following:
- .1 1 L of extra materials when less than 50 L are used for Project;
- .2 3.78 L of extra stock when 50 to 200 L are used;
- .3 7.57 L of extra stock when over 200 L are used.

1.9 EXTENDED WARRANTY

Submit a warranty for paint work in accordance with General Conditions, except that warranty period is extended to 2 years.
- (1) Warrant against peeling, cracking, blistering and any other defect.
- (2) Coverage: Complete repaint of affected Work.

2 Products

2.1 MATERIALS

.1 Paint:
  .1 All materials under Work of this Section, including but not limited to, primers, stains, and paints are to have low VOC content limits.
.2 Products in accordance with the MPI Painting Specification Manual, Exterior and Interior Systems;
  .1 For each MPI paint code, manufacture's premium grade, first line Products is to be use.
  .2 Uniform dispersion of pigment in a homogeneous mixture.
  .3 Ready-mixed and tinted whenever possible.

.3 Products within each MPI paint system code: From single manufacturer.

.4 Acceptable manufacturers:
  .1 Benjamin Moore.
  .2 Dulux Paints/PPG.
  .3 Para Painting & Coatings.
  .4 Sherwin Williams.

2.2 COLOUR SCHEDULE

.1 Consultant will select choice of colours and gloss when compiling a Colour Schedule after award of Contract; allow for colour selection beyond paint manufacturer's standard colour range.

.2 Refer to Colour Schedule for selected colour references.

.3 Conform to gloss reflectance definitions listed in MPI Specification Manual.

.3 PAINTING AND FINISHING SCHEDULE

.1 Refer to Table 1, MPI Painting and Finishing Schedule coded systems, comply with MPI Painting Specification Manual.

Table 1: Painting and Finishing Schedule

EXTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Cementitious Composition board	Cementitious siding	EXT 3.3	Ext 3.3A	Latex
Concrete (clear water repellent)		EXT 4.2	EXT 4.2H	Water repellant

Structural steel and metal fabrications		EXT 5.1	EXT 5.1D	Alkyd
Steel (High heat)	Boilers, pipes, flues, heat exchangers)	EXT 5.2	EXT 5.2C	Inorganic Zinc
Galvanized steel	HM doors & frames, handrails	EXT 5.3	EXT 5.3B	Alkyd
Wood paneling	Wood soffits	EXT 6.4	EXT 6.4A	WB solid colour stain

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **PREPARATION**

.1 General:

.1 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
.2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool and sand paper marks, shallow gouges, marks, and nibs.
.3 Clean, sweep, and vacuum floors and surfaces to be painted, debris and dust-free prior to painting.
.4 Refer to MPI Painting Specification Manual for surface preparation requirements of substrates not listed here.

.2 Where finish hardware has been installed remove, store, re-install finish hardware, to accommodate painting. Do not clean hardware with solvent that will remove permanent lacquer finishes.

.3 Alkali Content tests and neutralization:
.1Test for ph level using litmus paper on dampened substrate.
.2Neutralize surfaces over 8.5 ph with 4% solution of Zinc Sulphate for solvent based systems and tetrapotassium pyrophosphate for latex based systems, to below 8.0 ph, and allow to dry.
.3Brush-off any residual Zinc Sulphate crystals.
.4Coordinate paint system primer / sealer to be alkali-resistant.

.4 Substrate moisture tests:
.1 Test for moisture content over entire surface to be painted, minimum one test/ 2 m^2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.

.2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before paint system application. Install temporary drying fans if necessary.
.3 Re-test employing same criteria.

.5 Cementitious and masonry (existing): Clean existing surfaces by pressure washing where indicated on drawings with a TSP solution and pressure range of 1500 - 4000 PSI at 6 - 12". Rinse areas with clean water and allow to throughly dry. Provide for collection and disposal of water.

.6 Cementitious and masonry (Concrete, block):
.1 Allow 28 days cure before painting.
.2 Coordinate repair of protrusion-chipping and grinding, and honeycomb filling with responsible trades.
.3 Remove dirt, loose mortar, scale, powder, efflorescence, and other foreign matter.
.4 Remove form oil and grease with trisodium phosphate, rinse, and allow to dry thoroughly.
.5 Prepare surfaces in accordance with CAN/CGSB-85.100.
.6 Remove rust stains with solution of sodium metasilicate after thorough wetting; allow to dry thoroughly.

.7 Metal Fabrications (existing): Scrape and either hand or power wire brush surfaces to remove mill and scale.

.8 Aluminum (mill finish): Wash with Xylene solvent, apply etching primer, then paint immediately.

.9 Galvanized steel sheet:
.1 Z275 (Satin & Spangled Sheet): SSPC SP7 brush blast.
.2 ZF075 (Wiped Coat): Remove contamination, wash with Xylene solvent.
.3 Touch-up damaged galvanized areas with organic zinc rich primer.

.10 Galvanized iron and steel: Prepare galvanized and ungalvanized metal surfaces according to CAN/CGSB-85.10.
.1 Unpassivated, unweathered and weathered: Remove contamination, wash with Xylene or Toluol solvent, allow to dry thoroughly. Make paint system primer/sealer an etching type primer.
.2 Manufacturer pre-treated (including passivated): SSPC SP7.
.3 Touch-up damaged galvanized areas with organic zinc rich primer.

.11 Structural steel and miscellaneous metal fabrications:
.1 Coordinate the following with the responsible trades:
.1 Rust, mars, mill scale, and weld-burn touch-ups.
.2 Oil, grease, weld flux and other residue removal.
.2 Prime paint items, not otherwise indicated to be primed as part of another Section.
.3 Touch-up damaged galvanized areas with organic zinc rich primer.

.12 Wood (existing):

.1 Rough woods: brush surface free of all dirt, dust and foreign matter with a wire brush.
.2 Smooth woods: brush surfaces with a stiff fibre brush to remove dirt, dust etc.

.13 Wood and Millwork:
.1 Wood surfaces to be clean and dry with a moisture content of less than 15%.
.2 Remove foreign matter prior to prime coat; spot coat knots, pitch streaks and sappy sections with sealer.
.3 Fill nail holes and fine cracks after primer has dried.
.4 Back prime interior and exterior woodwork.

.14 Factory primed surfaces:
.1 Touch up damaged areas.
.2 Clean as required for top coat.

.15 Coordinate with other trades to prevent:
.1 Damage, and inadvertent activation of fire and smoke detectors.
.2 Odour and dust distribution by permanent HVAC systems including fouling of ducts and filters.

.16 Field-mix Products in accordance with manufacturer's written instructions.

3.3 APPLICATION

.1 Apply painting systems in accordance with the MPI Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.

.2 Painting systems listed are required minimum, apply additional coats if necessary, to obtain substrate hiding acceptable to the Consultant.

.3 Tint intermediate coats lighter than final top coats for identification of each succeeding coat and to facilitate inspections. Include only manufacturers recommended reducing and tinting accessories. Do not add adulterants.

.4 Primer to be specialized primer coating system as required by manufacturer for selected colour. Standard primer being tinted shall be tinted to a maximum of 1.5% by volume.

.5 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.

.6 Apply paint uniformly in thickness, colour, texture, and gloss, as determined by the Consultant under adequate illumination and viewed at a distance of 1500 mm. Apply finishes free of defects in materials and application which, in the opinion of the Consultant, affect appearance and performance. Defects include, but are not limited to:
.1 Improper cleaning and preparation of surfaces.
.2 Entrapped dust, dirt, rust.
.3 Alligatoring, blisters, peeling.
.4 Scratches, blemishes.
.5 Uneven coverage, misses, drips, runs, and poor cutting in.

.7 Do not apply coatings on substrates which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.

.8 Repaint entire areas of damaged or incompletely covered surfaces, to the nearest inside or outside corner; patching will not be permitted.

.9 Miscellaneous painting requirements:
- .1 Paint projecting ledges, and tops, bottoms and sides of doors both above and below sight lines to match adjacent surfaces.
- .2 Paint door frames, access doors and frames, door grilles, prime coated butts, and prime coated door closers to match surface in which they occur.

.10 Mechanical, electrical and other painting coordination:
- .1 Paint mechanical services in accordance with Mechanical Identification Division 21, 22 and 23.
- .2 Coordinate painting of pipes, ducts, and coverings with the Work of Division 21, 22 and 23 to precede pipe colour banding, flow arrows, and other pipe identification labeling installation.
- .3 Paint exposed conduit, pipes, hangers, ductwork, grilles, gratings, louvres, access panels, fire hose cabinets, registers, convector and radiator covers, enclosures, and other mechanical and electrical equipment including services concealed inside cupboard and cabinet Work; apply colour and sheen to match adjacent surfaces, except as noted otherwise.
- .4 Paint portions of surfaces such as duct interiors, piping, ductwork, hangers, insulation, walls, and similar items, visible through grilles, louvres, convector covers etc., matte black in colour.
- .5 Remove the following to accommodate painting, carefully store, clean, then re-install on completion of each area and when dry:
  - .1 Switch and receptacle plates, fittings and fastenings, grilles, gratings, louvres, access panels, convector covers, and enclosures.

3.4 **FIELD QUALITY CONTROL**

.1 Dry film thickness tests:
- .1 Test for film thickness over entire surface to be painted, minimum one test/2 m^2 in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
- .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.
- .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
- .4 Re-test employing same criteria after repair.

3.5 **CLEANING**

.1 Remove spilled, splashed, and spattered paint promptly as Work proceeds and on completion of Work. Clean surfaces soiled by paint spillage and paint spatters. Repair or replace damaged Work, as directed by Consultant.

3.6 **PROTECTION**

.1 Post Wet Paint signs during drying and restrict or prevent traffic where necessary.

.2 Post sign, after Consultant's inspection and acceptance of each room, reading: PAINTING COMPLETE - NO ADMITTANCE WITHOUT CONTRACTOR'S PERMISSION.

END OF SECTION

1.0 GENERAL

.1 The Shade System is a commercial grade, chain driven, manually operated roller screen system for interior window shading. Features include a removable shade cloth mounting attachment to roller for ease of repair or replacement. The roller and retracted shade cloth are concealed in a cassette box with Fascia cover.

.2 The intended prime application is for general classroom use to provide control of direct sunshine penetration; reduction of heat gain; energy saving; reduced glare or reflectivity while maintaining access to outdoor views. Materials used provide long life use and have recyclable or reusable components.

.3 Shade cloth selection is based on functional need for light conditions based on window orientation. The openness factor is expressed as a percentage (%) reflecting the density of the weave. Shade cloth is resistant to fading, abrasion, mildew, rot and can be maintained by occasional wipe down. Shade cloth material will retain shape and form.

.4 Other applications are available from same suppliers to address special functional needs such as blackout; skylight or dual configurations where two functions needed to be fulfilled.

1.1 SUMMARY

.1 General Requirements: The Conditions of the Contract is part of this Section and shall apply as if repeated here. Conform to requirements of all Sections affecting the work of this section.

1.2 SUBMITTALS

.1 Sample: Submit for approval a sample shade, installed where directed, fully representing the shades to be provided. Submit samples of fabrics and finish colours for selection and approval.

.2 Failure to submit samples may result in disqualification of tender.

.3 Fire-Performance Characteristics: Provide shade material tested in accordance with NFPA 701 - Vertical-Burn Test and rated "PASS". AND CAN USC 109.

1.3 QUALITY ASSURANCE

.1 Qualifications: Shade Systems specified in this Section shall be provided by one manufacturer who takes full responsibility for design, engineering and installation.

Patry Products Inc. (Solarfective Products Ltd)
SunProject of Canada Inc.

.2 Equivalent product by other manufacturer must be submitted for approval by Consultant or Owner.

1.4 DELIVERY, STORAGE AND HANDLING

.1 All materials shall be free of damage when delivered to the site. Protect all work with suitable heavy wrapping before delivery to the site. Maintain protection until final clean-up.

.2 Store parts in a designed area to permit natural ventilation over their finished surfaces.

.3 Protect the work of this Section from damage resulting from the work of other Sections.

1.5 SITE CONDITIONS

.1 Check dimensions at the site before fabrication commences, and report to Consultant or Owner in writing all discrepancies.

.2 Where dimensions are not available before fabrication is commenced, the dimension required to be agreed upon between the various Sections concerned.

1.6 WARRANTY

.1 Provide an extended warranty of the work of this Section, covering the period for two years beyond the expiration of the one year warranty period specified in the General Conditions of the Contract as amended by Document 00800: Supplementary Conditions or Part 2 under General Requirements section 2.18 Total warranty of Three (3) years. Plus (10) year no nonsense manufacturer's warranty.

.2 Promptly correct, at no expense to the Owner, any defects or deficiencies which become apparent within Warranty Period from date of Substantial Performance.

.3 Warranty shall provide for steadfastness of dye colours, fade-proof fabric, free from deterioration in any fashion due to exposure to sunlight, to be permanently flame-retardant, shrink and complete replacement cost including removal of existing system material and installation of new materials.

1.7 MAINTENANCE

.1 Submit maintenance and operating instructions, detailing the care, maintenance and cleaning of fabric.

1.8 MANUFACTURERS

TDSB SELECTED WINDOW SHADE SYSTEMS SPECIFIC PRODUCT LINES:

.1 Patry Products: Solarfective Line: Teleshade System (with Fascia)
65 Evans Ave. Toronto, Ontario M6S 3V7
Contact: Zbig Poloczek 416 - 763-0398

.2 SunProject of Canada Inc: Moduline GC Shade System (with Fascia)
511 Edgeley Blvd. Concord, Ontario L4K 4G4

.3 Other manufacturers must be approved by Consultant or Owner.

1.9 ALTERNATES

.1 Bidder must provide bid on specified items.

.2 Bidder providing or requesting consideration of alternate products shall be fully liable for all costs attributable to acceptance of the change from the architects, engineers, general contractors and subcontractors effected by the charge. Further, bidder shall clearly indicate reasons for the consideration of the alternate product. Such description shall include, but not be limited to performance; construction; installation and operation; advantages of the proposed alternate system.

.3 Alternate product requests must be applied for 14 days prior to bid closing.

2.0 OPERATION

.1 Effortless, easy lift manual chain drive. Shade to be able to move freely when pulled on hembar or chain. The unit shall consist of a tension activated lifting mechanism. The lifting mechanism must contain a memory lock which shall maintain pre-tensioning when the shade is removed from the cassette bracket ,and shall not require re-tensioning when shade is re-inserted into the bracket. The roller mechanism must be reversible for future alterations and maintenance on site.

.2 Internal tension idler (I.T.I) limiter automatically adjusts and controls the amount of torque being generated for constant smooth operation of the shade system. The(I.T.I) automatically releases during down-travel, and automatically engage during up-travel of the shade system.

.3 Lifting mechanism must accommodate tension modules for maximum shade performance when necessary. The tension modules must also contain a memory lock for torque retention.

.4 Noise reduction seals must be used for sound isolation and absorption of the mechanism.

.5 Drive sprocket must contain a planetary gear system for increased operational performance, speed ratio control, smoothness of lift, and balance to the chain and shade system.

2.1 ASSEMBLY

.1 Shade unit shall be supplied to site fully assembled in a one piece fully extruded aluminum cassette closed on all four sides, top, back, sides and bottom return with end caps. Removal must not require the disassembly of the shade unit.

MountingTypes: A) Ceiling mounted
B) Wall mounted
C) Mullion mounted : Face or Between

Shade Orientation: A) Regular-roll, shadecloth to roll at window side of roller.
B) Reverse-roll, shadecloth to roll at room side of roller.

2.2 SHADE ROLLER TUBE

.1 Rigid roller tubes shall be all aluminum extruded available in 32mm, or 50mm with reinforced internal ribs to provide maximum span without tube deflection. Tube sizes will depend on shade size – see Manufacturer weights and measures chart.

2.3 TUBE END PLUG

.1 Internal tension idler (I.T.I) limiter automatically adjusts and controls the amount of torque being generated for constant smooth operation of the shade system. The(I.T.I) must automatically release during down-travel, and automatically engage during up-travel of the shade system.

2.4 CHAIN DRIVE

.1 Shall consist of a heavy duty commercial grade sprocket. Drive sprocket must contain a planetary gear system for increased performance, speed ratio, smoothness, and balance to the chain and shade system. Must provide for infinite positioning of shade system.

2.5 OPERATING CHAIN

.1 Shall be no. 10 qualified heavy duty stainless steel bead chain 90 lb load test formed in a continuous loop. With stops at highest and lowest positions to prevent overwinding and unrolling.

2.6 EXTERIOR HEMBAR

.1 Shall be extruded aluminum with recess to secure fabric without visible seams. End plugs shall be screwed securely on ends showing no exposed aluminum. Design allowing shade to be pulled on the hembar. Finish/colour shall match fascia.

2.7 CHAIN HOLD DOWN

.1 Operating chain shall be fully secured to SP chain holder.

.2 Supply chain retainer with bracket in every primary class room to meet safety needs.

.3 Supply 15 m of no. 10 qualified heavy duty stainless steel bead chain 90 lb. load test

2.8 MOUNTING BRACKETS

.1 Shall be 0.60 galvanized steel snap on brackets for ceiling, wall, or recessed mount in ceiling.

2.9 CASSETTE BOX

.1 Cassette design shall be a one piece aluminum extruded box closed on all four sides, top, back, sides, and bottom return. Cassette sections to be square profile. Cassette section with internal groove to accommodate a self cleaning brush to insure fabric maintenance as well as a gap brush on top back side of cassette to provide for a light seal

.2 Finish clear anodized aluminum or custom painted in colour selected by Consultant or Owner.

2.10 FABRICS

.1 Construction of shadeband includes the fabric, the external bottom bar, and the attachment of the shadeband to the roller tube:

.2 Fabric shade cloths shall be woven of .018, vinyl coated polyester yarn consisting of single thickness non-raveling 0.030-inch thick vinyl fabric, comprising of 20-25% polyester and 75-80% reinforced vinyl (PVC), the fabric shall be dimensionally stable.

2.11 SHADING FABRIC SELECTIONS:

.1 For use on windows facing South and West - 3% Openness Factor
For use on windows facing East and North- 5% Openness Factor
Colour to be Limestone Grey or Alabaster as selected by the school.

.2 Flame retardance: Fabric shall be certified by independent laboratory to pass the small scale vertical burn requirements test CAN and ULC-S109-M87 and NFPA 701.

3.0 EXECUTION

3.1 EXAMINATION

.1 Examine substrate and conditions for installation. Notify the Consultant or Owner in writing prior to installation when the project conditions are unacceptable for shade installation. "Beginning of installation" means acceptance of substrate and project condition.

3.2 INSTALLATION

.1 Install units to comply with the Manufacturer's instructions for the type of mounting and operation required. Provide units plumb, true, and securely anchored in place with recommended hardware and accessories to provide smooth operation without binding.

.2 Install units within the following tolerances:

.1 Maximum variation of gap at window opening perimeter: 1/4 inch, per 8 feet (+/- 1/8 inch) of shade height.

.2 Maximum offset from level: 1/8 inch.

.3 Follow Manufacturer's edge-clearance specifications for shades where the width-to-height (W:H) ratio exceeds 1:3.

.4 Locate equipment, controls, switches in locations shown, or if not shown as directed by Consultant or Owner.

3.3 ADJUSTING

.1 Adjust units for smooth operation. Adjust shade and shadecloth to hang flat without buckling or distortion. Replace any units or components which do not hang properly or operate smoothly.

3.4 CLEANING

.1 Touch up damaged finishes and repair minor damage in order to eliminate evidence of repair. Remove and replace work that cannot be satisfactorily repaired.

.2 Clean exposed surfaces, including metal and shadecloth, using non-abrasive materials and methods recommended by the Shadecloth Manufacturer. Remove and replace work which cannot be satisfactorily cleaned.

3.5 DEMONSTRATION

.1 Demonstrate operation method and instruct Owner's personnel in the proper operation and maintenance of the window shade systems.

END OF SECTION