

# Conseil scolaire catholique MonAvenir Daycare Expansion:

ÉEC Saint-Michel, 29 Meadowvale Rd., Scarborough, ON M1C 1R7

## Issued for Tender

PROJECT NO: 60593561

February 2021

# Specifications

**1.1 OWNER:**

**Conseil Scolaire Catholique Monavenir**  
110 Drewry Avenue  
North York, ON M2M 1C8

**1.2 PROJECT:**

**Daycare Expansion Saint-Michel**  
29 Meadowvale Rd., Scarborough, ON M1C 1R7

**1.3 PROFESSIONAL SEALS AND SIGNATURES**

- .1 Professional seals and signatures are provided as required by the Ontario Building Code (latest edition), Ontario Regulation 403/97 **(350/06)**, Subsection 2.3.1 **(Division C, Part 1, Subsection 1.2.1)** and all amendments thereto, for the Project stated above and apply only to those documents and specifications prepared by the respective Architect of Record, in Document 00 01 10, List of Contents. The professional seal and signature stated above are as follows:

**ARCHITECT OF RECORD (A):**

**AECOM Canada Architects Ltd.**

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Whitby, Ontario  
L1N 9J2

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Narges Dehghani  
Architect of Record

60593561- SM Issued for Tender



February 2<sup>nd</sup>, 2021

Date

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**END OF SECTION**

1 General

1.1 GENERAL REQUIREMENTS

- .1 Division 1 requirements apply to all Sections of Work.

1.2 SUMMARY OF WORK

- .1 Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown on Drawings, to make finished work complete and fully operational, consistent with the intent of the Contract Documents.
- .2 Provide all work indicated in Contract Documents, regardless whether located within or outside Owner's property lines.
- .3 The following work is not included in this Contract:
  - .1 Work designated N.I.C. on the Drawings.

1.3 THE CONTRACT DOCUMENTS

- .1 Work will be performed under one Contract; the Contract will be in the form of the Agreement between Owner and Contractor.
- .2 Division 1 General Requirements, of the Specification generally specify work and coordination of the work that is the direct responsibility of the Contractor but shall not be interpreted to define absolutely the limits of responsibility that must be established between the Contractor and his Subcontractors by their separate agreements.
- .3 Ensure that Subcontractors understand that the General Conditions of the Contract, and Division 1 General Requirements, apply to Sections of the Specification governing their work.
- .4 Ensure that the work includes all labour, equipment and products required, necessary or normally recognized as necessary for the proper and complete execution of the work of each trade.
- .5 Work in this Specification is divided into descriptive Sections which are not intended to identify absolute contractual limits between Subcontractor, nor between the General Contractor and his Subcontractors. The Contractor shall organize division of labour and supply of materials essential to complete the Project in all its parts and provide a total enclosure and protection from weather of interior spaces, as established in the General Conditions of the Contract.
- .6 As a result, the Consultant shall not be required to decide on questions arising with regard to agreements or contracts between the Contractor and Subcontractors or Suppliers, nor to the extent of the parts of the Work assigned thereto.
- .7 Further, no extra will be allowed as a result of the failure to coordinate and allocate the Work such that the Work is Provided in accordance with the Contract Documents.
- .8 Wherever the word "building" occurs in the Contract Documents it shall be taken to mean all the buildings included in the Contract.
- .9 Wherever in the Contract Documents the words "approval", "approved", "direction", "directed", "selection", "selected", "request", "requested", "report", and similar words are used, such approvals, directions, selections, requests and reports shall be given by the Consultant in writing unless specifically stated otherwise.
- .10 Wherever in the Contract Documents the word "supply" is used in any form, it shall mean that the work specified to be supplied includes delivery to site and unloading at location directed.

- .11 Wherever in the Contract Documents the word "installed" issued in any form, it shall mean that the work specified for installation includes uncrating, unpacking, etc; moving from stored location to place of installation; and installing to meet specified requirements.
- .12 Wherever in this Specification it is specified that work is to proceed or to meet approval, direction, selection or request of authorities having jurisdiction or others, such approval, direction, selection or request shall be in writing.
- .13 Wherever in this Specification or as directed by the Consultant it is specified that work shall be repaired, made good or replaced, it shall be performed without any additional cost to the Owner.
- .14 Whenever in the Specifications the term "and/or" is used, the Consultant shall decide which of the possible meanings, to be derived at from the sentence where this term occurs shall govern.

#### **1.4 STANDARDS AND CODES**

- .1 Contract forms, codes, specifications, standards, manuals and installation, application and maintenance instructions referred to in these specifications, unless otherwise specified, amended or date suffixed, shall be latest published editions at Contract date.

#### **1.5 METRIC PROJECT**

- .1 This project is based on The International System of Units (SI). 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 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.
- .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.
- .4 Where a material or product cannot be obtained in the metric size specified, provide the next larger imperial size available.
- .5 Where both metric and imperial sizes or dimensions are shown, the metric size or dimension shall govern.

#### **1.6 LAWS, NOTICES, PERMITS AND FEES**

- .1 Comply with codes, by-laws, and regulations of authorities having jurisdiction over the Place of the Work. Codes and regulations form an integral part of the Contract Documents.
- .2 Permits:
  - .1 The Contractor shall obtain and pay for all permits, licenses, deposits and certificates of inspection as part of the Work, including permits for road closures.
  - .2 The Owner has initiated the permit application process for the following, but responsibility for completing the application process, including all associated costs and responsibilities, rests with the Contractor and is included as part of the Work.
  - .3 Obtain permits required to execute work on municipal rights of way. Obtain damage deposits for sidewalks, roads and services, unless otherwise indicated.
- .3 Arrange for inspection, testing and acceptance of the Work required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay costs.
- .4 It is the responsibility of the Contractor to schedule notifications and inspections required by authorities having jurisdiction such that notifications can be properly received and that inspections can be properly undertaken without causing a delay in the Work. The

Contractor, at no additional cost to the Owner, shall be solely responsible for any delay in the Work caused by failure to properly schedule required notifications and inspections.

#### **1.7 DISCREPANCIES AND CLARIFICATIONS**

- .1 Advise Consultant of discrepancies discovered in requirements of the Contract Documents and request clarification from Consultant in written form.
- .2 Advise Consultant when clarifications are required pertaining to meaning or intent of requirements of Contract Documents and request clarification from Consultant in written form.
- .3 Do not proceed with related work until written clarification is provided by Consultant.
- .4 Failure to notify Consultant shall result in Contractor incurring responsibility for resulting deficiencies and expense at no additional cost to the Owner.
- .5 Written instructions issued by Consultant for the purpose of clarification, implicitly supersede applicable and relevant aspects of the Contract Documents irrespective of whether or not these documents are explicitly or specifically cited in clarification requests or clarification instructions.

#### **1.8 WORK PERFORMED UNDER SEPARATE CONTRACTS**

- .1 Work not to be included in the Contract, as noted "NIC" on the Drawings, shall be governed by GC 3.2, Construction by Owner and Other Contractors, of the General Conditions.

#### **1.9 WORK BY OWNER**

- .1 Permit the Owner and/or their contractors to inspect the work at any reasonable time, and to perform such work and install such equipment as the Owner may require.

#### **1.10 ITEMS SUPPLIED BY OWNER**

- .1 Certain items will be supplied by the Owner for installation in, and as part of, the Work. Refer to Schedule of Itemized Prices.
- .2 Install items supplied by Owner during the Work.
- .3 Coordinate shipping with the Owner. Items supplied by the Owner will be made available from the Owner's storage facility located in proximity to the Place of the Work: Contractor to arrange and pay cost of pick-up and shipping to the Place of the Work. Location of Owner's storage facility may change through the course of the Work to another nearby facility.
- .4 Store items supplied by Owner at the Place of the Work and protect from damage in the same manner as items supplied by the Contractor.
- .5 Install completely, and leave in full operating condition, in accordance with manufacturer's directions.
- .6 Items to be supplied by the Owner for installation by the Contractor as part of the Work include:
- .7 Make use of items supplied by Owner before fabricating new stock.
- .8 Salvage and reuse all site furnishings and fixtures which are identified to be relocated on the site. The Consultant shall approve condition of all salvaged site furnishings and fixtures.

#### **1.11 CONSTRUCTION PROGRESS SCHEDULE**

- .1 Meet with Owner and Consultant within five (5) working days of Contract award, to discuss proposed approach for undertaking the Work, inclusive of methodology, sequencing, Construction Equipment, and labour resources to be utilized.

- .2 Submit a preliminary as-planned schedule as indicated in Section 01 32 16 Construction Progress Schedule, within fifteen (15) working days after Contract award.
- .3 Indicate proposed phasing plan within preliminary as-planned schedule, for review and approval. Refer to phasing plan for preliminary schedule.
- .4 Once preliminary as-planned schedule is approved and the final as-planned schedule is created, record "progress to date" on a copy of schedule to be available at the Site. Inspect Work with the Owner and the Consultant at least bi-weekly to establish progress on each current activity.
- .5 The Contractor's schedule is to be updated and resubmitted to the Consultant as a progress schedule at least once per month, on a date to be mutually agreed by the Contractor and the Consultant.

#### 1.12 SITE PROGRESS RECORDS

- .1 Maintain at site a permanent written record of progress of work. Make the record available at all times with copies provided when requested. Include in record each day:
  - .2 Weather conditions with maximum and minimum temperatures.
  - .3 Conditions encountered during excavation. Record quantities pumped for dewatering.
  - .4 Commencement and completion dates of the work of each trade in each area of Project.
  - .5 Erection and removal dates of formwork in each area of Project.
  - .6 Dates, quantities, and particulars of each concrete pour.
  - .7 Dates, quantities, and particulars of waterproofing installation.
  - .8 Dates, quantities, and particulars of roofing installation.
- .9 Attendance of Contractor's and Subcontractor's work forces at Project and a record of the work they perform.
- .10 Dates, status and particulars of submissions, ie. shop drawings, samples, mock-ups and the like.
- .11 Dates, status and particulars of deliveries, ie. manufacturing dates, delivery and installation dates.
- .12 Visits to site by Owner, Consultant, authorities having jurisdiction, testing companies, Contractor, Subcontractors, and suppliers.
- .13 Maintain a progress chart in approved format. Show on chart proposed work schedule and progress of work by Contractor and Subcontractor. The status of delivery items, ie. shop drawings status, manufacture dates - delivery and installation dates.

#### 1.13 DOCUMENTS AT THE PLACE OF THE WORK

- .1 Maintain at the Place of the Work, one copy of each of following:
- .2 Contract Documents including drawings, specifications, addenda, and other modifications to the Contract, including copies of standards and codes referenced in the Contract Documents.
- .3 'Reviewed' or 'Reviewed as Modified' shop drawings. Refer to Section 01 33 00 for details of schedules required.
- .4 Construction, inspection and testing, and submittal schedules.
- .5 Supplemental Instructions, proposed Change Orders, Change Orders, and Change Directives.
- .6 Field Test Reports.
- .7 Consultant's field review reports and deficiency reports.

- .8 Reports by authorities having jurisdiction.
- .9 Building and other applicable permits, and related permit documents.
- .10 Daily log of the Work.
- .11 Project record drawings, recording as-built conditions, instructions, changes, prior to being concealed.
- .12 Make above material available to Consultant upon request.

#### **1.14 TRADEMARK AND LABELS**

- .1 Trademarks and labels, including applied labels, shall not be visible in finished work in finished areas, unless otherwise accepted or indicated by Consultant.

#### **1.15 EXAMINATION**

- .1 Examine site, and ensure that each Section performing work related to site conditions has examined it, so that all are fully informed on all particulars which affect the Project Work (thereon and at the place of the building, and in order that construction proceeds competently and expeditiously).
- .2 Ensure by examination that all physical features at the work, and working restrictions and limitations which exist are known, so that the Owner is not restricted in use of the premises.
- .3 Previously Completed Work:
  - .1 Where dimensions are required for proper fabrication, verify dimensions of completed work in place before fabrication and installation of work to be incorporated with it.
  - .2 Verify that previously executed work and surfaces are satisfactory for installation or application, or both, and that performance of subsequent work will not be adversely affected.
  - .3 Ensure that work installed in an unsatisfactory manner is rectified by those responsible for its installation before further work proceeds.
  - .4 Commencement of work will constitute acceptance of site conditions and previously executed work as satisfactory.
  - .5 Defective work resulting from application to, or installation on, or incorporation with, unsatisfactory previous work will be considered the responsibility of those performing the later work.
- .4 Construction Measurements:
  - .1 Take site dimensions of completed work before installation of work to be incorporated commences.
  - .2 Before commencing installation of work, verify that its layout is accurately in accordance with intent of Drawings, and that positions, levels, and clearances to adjacent work are maintained.
  - .3 Before commencing work, verify that all clearances required by authorities having jurisdiction can be maintained.
  - .4 If work is installed in wrong location, rectify it before construction continues.
  - .5 Where dimensions are not available before fabrication commences, the dimensions required shall be agreed upon between the trades concerned.
  - .6 All measurements shall be Imperial.

#### **1.16 PROTECTION OF WORK, PROPERTY AND PERSONS**

- .1 Include in work necessary methods, materials, and construction to ensure that no damage or harm to work, materials, property and persons results from the work of this Contract. Temporary facilities relating to protection are specified in Section 01 50 00.
- .2 Comply with all instructions and/or orders issued by authorities having jurisdiction.
- .3 Ensure that compulsory wearing of hard hats and safety boots is observed by all persons employed on the work. Provide spare hard hats for visitors, refuse admission to the premises to those refusing to wear same.
- .4 Keep excavations, and pits free of rainwater, ground water, backing up of drains and sewers, and all other water. Pump dry as required.
- .5 Protect adjacent private and public property from damage and, if damaged, make good immediately. Make good private property to match in all details its original condition in material and finishes as approved, and public property in accordance with requirements specified and/or instructed by its Owner or as directed by the Consultant.
- .6 Keep surfaces, on which finish materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.
- .7 Do not apply visible markings to surfaces exposed to view in finished state or that receive transparent finishes.
- .8 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 to the material and surface location. Establish with each Subcontractor the suitability of such protection in each case.
- .9 Brace and shore masonry walls until their designed lateral support is incorporated at both top and bottom, in accordance with safe construction practices.
- .10 Enforce fire prevention methods at site for new work. Maintain existing in accordance with local authorities having jurisdiction. Do not permit bonfires, open flame heating devices or accumulation of debris. Use flammable materials only if proper safety precautions are taken, both in use and storage.
- .11 Do not store flammable materials in the building. Take necessary measures to prevent spontaneous combustion. Place cloths and other disposable materials that are a fire hazard in closed metal containers and remove them from the building every night.
- .12 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.
- .13 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers or in open drain courses.
- .14 Public Utilities and Services:
  - .1 Verify location of and limitations imposed by, existing mechanical, electrical, telephone and similar services, and protect them from damage. If necessary, relocate active services to ensure that they function continuously wherever possible in safety and without risk of damage or down time to the existing buildings.
  - .2 Cap off and remove unused utility services encountered during work after approval is given by the utilities concerned or authorities having jurisdiction, which ever may apply. Relocation, removal, protection and capping of existing utility services shall be performed only by the applicable utility, and of other services by licensed mechanics.
  - .3 Make arrangements and pay for connection charges for services required for the Work.

- .15 Ensure that precautions are taken to prevent leakage and spillage from plumbing and mechanical work that may damage surfaces and materials finished or unfinished.
- .16 Give constant close supervision to roofing/waterproofing membranes following their installation, during the time they are temporarily protected or exposed, to ensure that no damage occurs to them before completion of building.
- .17 Prevent spread of dust beyond the construction site by wetting, or by other approved means, as required or as directed by the Consultant and/or authorities having jurisdiction.
- .18 Make good roads, soft landscaping, walkways, curbs, sidewalks, possessions and property, soiled or damaged due to the Work, to requirements of authorities having jurisdiction and requirements of and Making Good, as applicable.

#### **1.17 WORK ON PUBLIC PROPERTY**

- .1 Include curb cuts and making good of existing property to Provide fully paved and finished approaches to requirements of authorities having jurisdiction.
- .2 Include making good of existing curbs, walks, paving and soft landscaping on adjacent property.

#### **1.18 INSERTS, ANCHORS AND FASTENINGS**

- .1 Include in the work of each Section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work of other Sections, deliver devices in ample time for installation, locate devices for other Sections and co-operate with other Sections as they require.
- .2 Do not install wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on the drawings.
- .3 Do not use fastenings which cause spalling or cracking of materials in which they are installed. Do not use powder actuated fastening devices unless specified or prior written approval is given by the Consultant for each specific use.
- .4 Use only approved driven fasteners.
- .5 Install metal-to-metal fastenings fabricated of the same metal or of a metal which will not set up electrolytic action causing damage to fastenings or components, or both. Use non-corrosive or galvanized steel fastenings for exterior work, and where attached to, or contained within, exterior walls and slabs. Leave steel anchors bare where cast in concrete.
- .6 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, components, and equipment. Space anchors within limits of load-bearing or shear capacity.
- .7 Space exposed fastenings evenly and in an organized pattern. Keep number to a minimum. Provide exposed metal fastenings of same material, texture, colour and finish as metal on which they occur.
- .8 At fastenings that penetrate metal roof deck, ensure that penetrations are sealed airtight with approved sealant.
- .9 Galvanize steel anchors in masonry and at exterior of building, unless otherwise specified elsewhere. Leave steel anchors bare where cast in concrete.

#### **1.19 SMOG ALERT PROTOCOLS**

- .1 The Contractor shall develop and implement a set of smog alert protocols for use in the Work.
- .2 The Contractor's smog alert protocols shall complement the smog alert response plan already in place for City of Scarborough operations.



## 1.20 CLEANING

- .1 Ensure that spatters, droppings, soil, labels, and debris are removed from surfaces to receive finishes, before they set up. Leave work and adjacent finished work in new condition.
- .2 Use only cleaning materials which are recommended for the intended purpose by both the manufacturer of the surface to be cleaned and by the cleaning material supplier.
- .3 Maintain areas "broom clean" at all times during the work. Vacuum clean interior areas immediately before finish painting commences.
- .4 Do not burn or bury waste material at site. Remove as often as required to avoid accumulation.
- .5 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water or other approved materials during removal of same.
- .6 Control lowering of materials. Use as few handlings as possible. Do not drop or throw materials from storeys above grade.
- .7 Ensure that cleaning operations are scheduled to avoid deposit of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.
- .8 Each Section shall supply the Contractor with instructions for final cleaning of his work, and for inclusion in Project Data Book as specified in each trade Section and in Section 01 33 00.
- .9 Final cleaning is to be performed one (1) week prior to opening the project to the public and shall include cleaning of all work as required by each trade. Co-ordinate final cleaning with Owner's
- .10 maintenance staff.

## 1.21 ADJUSTING

- .1 Ensure that all parts of work fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.
- .2 Verify that work functions properly, and adjust it accordingly to ensure satisfactory operation.
- .3 Lubricate products as recommended by the supplier.

## 1.22 SAFETY AND SECURITY

- .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.
- .2 Provide suitable surveillance equipment and/or employ guard services, as required to adequately protect the Work.
- .3 Maintain fire protection for work. Store paints and volatile substances in a separate and controlled location and inspect frequently. Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently. Remove combustible wastes frequently. Prohibit smoking in areas where volatile and flammable substances are used.
- .4 Do not cut, bore or sleeve through any loadbearing member, new or existing without Consultant's written authorization, unless specifically indicated on Drawings.

## 1.23 SALVAGE

- .1 Unless otherwise specified, surplus material resulting from construction, and construction debris shall become the property of Contractor, who shall dispose of it away from site.

- .2 Treasure, such as coins, bills, papers of value, and articles of antiquity, discovered during digging, demolition and cutting at the site shall remain property of Owner, and shall be delivered immediately into his custody.

**1.24 USE OF SITE**

- .1 Accept full responsibility for assigned work areas from the time of Contract award until Substantial Performance of the Work.
- .2 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances or exits. Direct construction traffic and locate access to site as directed by municipality.
- .3 Where encroachment beyond property limits is necessary make arrangement with respective property owners.

**1.25 SIGNAGE**

- .1 All site signage prior to fabrication or installation shall have written approval by the Owner.
- .2 The Contractor shall submit to the owner a layout of all required signage, show types, sizes and locations.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 GENERAL

- .1 Prices included in the Contract shall be complete for the applicable work, and shall constitute the full consideration, payment, compensation and remuneration to the Contractor for all such work. For greater certainty, but without limitation to the foregoing, such prices shall constitute full and complete consideration, payment, compensation and remuneration to the Contractor for the following (subject to adjustment only as specified in the Contract Documents):
  - .1 Expenditures for wages and for salaries of workmen, engineers, superintendents, draftsmen, foremen, timekeepers, accountants, expeditors, clerks, watchmen and such other personnel as may be approved, employed directly under the Contractor and while engaged on the applicable work at the site and expenditures for travelling and board allowances of such employees when required by location of the applicable work or when covered by trade agreements and when approved; provided, however, that nothing shall be included for wages or salary of the Contractor if an individual, or of any member of the Contractor's firm if the Contractor is a firm or the salary of any officer of the Corporation if the Contractor is a corporation, unless otherwise agreed to in writing;
  - .2 Expenditures for material used in or required in connection with the construction of the applicable work including material tests and mix designed required by the laws or ordinances of any authority having jurisdiction and not included under Subparagraph .9.
  - .3 Expenditures for preparation, inspection, delivery, installation and removal of materials, plant, tools and supplies;
  - .4 Temporary facilities as required for the applicable work;
  - .5 Travelling expenses properly incurred by the Contractor in connection with the inspection and supervision of the applicable work or in connection with the inspection of materials prepared or in course of preparation for the applicable work and in expediting their delivery;
  - .6 Rentals of all equipment whether rented from the Contractor or others, in accordance with approved rental agreements including any approved applicable insurance premiums thereon and expenditures for transportation to and from the site of such equipment, costs of loading and unloading, cost of installation, dismantling and removal thereof and repairs or replacements during its use on the applicable work, exclusive of any repairs which may be necessary because of defects in the equipment when brought to the work or appearing within thirty (30) days thereafter;
  - .7 The cost of all expendable materials, supplies, light, power, heat, water and tools (other than tools customarily provided by tradesmen) less the salvage value thereof at the completion of the applicable work;
  - .8 Assessments under the Workplace Safety Insurance Act, the Unemployment Insurance Act, Canada Pension Act, statutes pay or any similar statutes; or payments on account usual vacations made by the contractor to his employees engaged on the applicable work at the site to the extent to which such assessments or payments for vacations with pay relate to the work covered by the specified price; and all sales taxes or other taxes where applicable;
  - .9 The amounts of all Subcontracts related to the specified price;
  - .10 Premiums on all insurance policies and bonds called for under this Contract as related to the specified price;

- .11 Royalties for the use of any patented invention on the applicable work;
- .12 Fees for licences and permits in connection with the applicable work;
- .13 Duties and taxes imposed on the applicable work; and
- .14 Such other expenditures in connection with the applicable work as may be approved; provided always that except with the consent of the Owner, the above items of cost shall be at rates comparable with those prevailing in the locality of the work.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 GENERAL

- .1 Comply with GC 4.1 CASH ALLOWANCES.
- .2 Cash allowances are designated for additional work and services deemed to be necessary by Owner, from time to time, throughout the execution of the Work. Where a cash allowance refers to an item or category of work already included in Contract Documents, it shall be assumed to cover work or services in addition to that indicated, unless specifically indicated otherwise.
- .3 Contractor may be required from time to time to assist in tendering of certain items of work covered by allowance, as directed by Consultant.

1.2 AUTHORIZATION

- .1 Expenditures from allowances included in the Contract must be authorized in writing by the Consultant.
- .2 Work covered by allowances shall be performed for such amounts and by such persons as directed by the Consultant.
- .3 Submit, before application for final payment, copies of all invoices and statements from suppliers and Subcontractors for work which has been paid for from cash allowances.

1.3 CASH ALLOWANCES

- .1 Cash allowances include supply and installation unless specifically indicated otherwise.
- .2 Supply only allowances shall include:
  - .1 Net cost of products
  - .2 Delivery to site
  - .3 Applicable taxes and duties (excluding HST)
- .3 Supply and install allowances shall include:
  - .1 Net cost of products
  - .2 Delivery to site
  - .3 Unloading, storing, handling of products on site
  - .4 Installation, finishing and commissioning of products
  - .5 Applicable taxes and duties (excluding HST)
- .4 Inspection and testing allowances shall include:
  - .1 Net costs of inspection / testing services
  - .2 Applicable taxes (excluding HST)
- .5 Other costs related to work covered by allowances are not covered by the allowance but shall be included separately in Contract.
- .6 Include a total of **\$46,000.00** (Forty-six thousand dollars) in the Contract for the following cash allowances:
  - .1 Independent Testing and Inspection (Concrete, steel and geotechnical) – \$15,000.00
  - .2 Independent Roofing and Building Envelope Inspection - \$8,000.00
  - .3 Interior Signage Package - \$500.00
  - .4 Keying - \$1,000.00
  - .5 Gas metre relocation - \$20,000

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.6 Intrusion alarm - \$1,500.00

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 APPROVED ALTERNATES AND APPROVED EQUALS

- .1 Named Products alternates or equals, indicated by the phrases "or approved alternate by XYZ Manufacturing" or "or approved equal by XYZ Manufacturing", shall be interpreted to mean that named Product alternate or equal, if selected for use in lieu of indicated or specified Product, meets or exceeds performance, appearance, general arrangement, dimensions, availability, code and standards compliance, and colour of specified Product.
- .2 Be responsible for costs and modifications associated with the inclusion of named Product alternate or equal at no additional cost to the Owner.
- .3 The process for proposing and approving alternates or equals, including alternate design solutions, shall be the same process as for proposing and approving substitutions (refer to paragraph 1.2 below).
- .4 Confirm delivery of specified items prior to proposing alternates or equals.

1.2 SUBSTITUTIONS

- .1 Submission of substitutions:
  - .1 Proposals for substitutions of Products and materials must be submitted in accordance with procedures specified in this section.
  - .2 Consultant may review submissions, if directed by Owner, but in any case with the understanding that the Contract Time will not be altered due to the time required by the Consultant to review the submission and by the Contractor to implement the substitution in the Work.
- .2 Submission requirements:
  - .1 Description of proposed substitution, including detailed comparative specification of proposed substitution with the specified Product.
  - .2 Manufacturer's Product data sheets for proposed Products.
  - .3 Respective costs of items originally specified and the proposed substitution.
  - .4 Confirmation of proposed substitution delivery, in writing by Product manufacturer.
  - .5 Compliance with the building codes and requirements of authorities having jurisdiction.
  - .6 Affect concerning compatibility and interface with adjacent building materials and components.
  - .7 Compliance with the intent of the Contract Documents.
  - .8 Effect on Contract Time.
  - .9 Reasons for the request.
- .3 Substitutions submitted on shop drawings without following requirements of this section prior to submission of the affected shop drawings will cause the shop drawings to be rejected.
- .4 Proposed substitutions shall include costs associated with modifications necessary to other adjacent and connecting portions of the Work.
- .5 Consultant's decision concerning acceptance or rejection of proposed substitutions is final. Should it appear to the Consultant that the value of services required to evaluate the substitution exceeds the potential reduction, the Consultant will advise the Owner that the substitution does not merit consideration before proceeding with a full evaluation. If the substitution will produce a reduction commensurate with or exceeding the value of the Consultant's services to evaluate the substitution, the Consultant will request the Owner's direction to proceed with evaluation.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**



1 General

1.1 REQUEST FOR INTERPRETATION - RFI

- .1 A request for interpretation (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents.
- .2 Submittal procedures:
  - .1 RFI form:
    - .1 Submit RFI on "Request for Interpretation" form, appended to this section. The Consultant shall not respond to an RFI except as submitted on this form.
    - .2 Where RFI form does not provide sufficient space for complete information to be provided thereon, attach additional sheets as required.
    - .3 Submit with RFI form necessary supporting documentation.
  - .2 RFI log:
    - .1 Maintain log of RFIs sent to and responses received from the Consultant, complete with corresponding dates.
    - .2 Submit updated log of RFIs with each progress draw submittal.
  - .3 Submit RFIs sufficiently in advance of affected parts of the Work so as not to cause delay in the performance of the Work. Costs resulting from failure to do this will not be paid by the Owner.
  - .4 RFIs shall be submitted only to the Consultant.
  - .5 RFIs shall be submitted only by Contractor. RFIs submitted by Subcontractors or Suppliers shall not be accepted.
  - .6 Number RFIs consecutively in one sequence in order submitted.
  - .7 Submit one distinct RFI per RFI form.
  - .8 Consultant shall review RFIs from the Contractor submitted in accordance with this section, with the following understandings:
    - .1 Consultant's response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Price or Contract Time or changes in the Work.
    - .2 Only the Consultant shall respond to RFIs. Responses to RFIs received from entities other than the Consultant shall not be considered.
  - .9 Allow ten (10) Working Days for review of each RFI by the Consultant.
    - .1 Consultant's review of RFI commences on date of receipt by the Consultant of RFI submittal and extends to date RFI returned by Consultant.
    - .2 When the RFI submittal is received by Consultant before noon, review period commences that day; when RFI submittal is received by Consultant after noon, review period begins on the next Working Day.
  - .10 Contractor shall satisfy itself that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the claim, dispute, or other matters in question relating to the performance of the Work or the interpretation of the Contract Documents cannot be resolved by direct reference to the Contract Documents. Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected.

Contractor's Request for Interpretation

Contractor's Supplemental Instructions

Date	# of Pages
To	From
Co.	Co.
Phone #	Phone #
Fax #	Fax #

Project: \_\_\_\_\_ RFI No.: \_\_\_\_\_  
 Owner: \_\_\_\_\_ Date of \_\_\_\_\_  
 To: \_\_\_\_\_ Request: \_\_\_\_\_  
 \_\_\_\_\_ Contractor: \_\_\_\_\_  
 (Consultant's Representative)  
 Project No.: \_\_\_\_\_ Contractor's Representative: \_\_\_\_\_  
 Consultant's Fax No.: \_\_\_\_\_ Fax No.: \_\_\_\_\_

Interpretation Requested: (Description of request for interpretation and references to relevant portions of Contract Documents)

Attachments: \_\_\_\_\_  
 Requested by: \_\_\_\_\_

Consultant's Supplemental Instruction:

Attachments: \_\_\_\_\_  
 Reply By: \_\_\_\_\_

The work shall be carried out in accordance with these *Supplemental Instructions* issued in accordance with the *Contract Documents* without change in *Contract Price* or *Contract Time*. Prior to proceeding with these instructions, indicate acceptance of these instructions as being consistent with the *Contract Documents* by returning a signed copy to the *Consultant*.

Supplemental Instruction Issued: \_\_\_\_\_ Supplemental Instruction Accepted: \_\_\_\_\_  
 By: \_\_\_\_\_ By: \_\_\_\_\_  
 Consultant Date Contractor Date  
 Cc: ☐ Owner ☐ Consultant ☐ Contractor ☐ Field ☐ Other: \_\_\_\_\_

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2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

**1.1 CHANGES IN THE WORK**

- .1 The following shall govern changes in the work.
- .2 Written instructions, with or without revised Drawings, or drawings additional to the Contract Documents, or both will be issued to the Contractor for proposed changes in the work. The written instructions will indicate whether the changes in the work are to be performed immediately or after the cost of changes is agreed upon. Work which is to proceed immediately shall have a mutual agreed to budget figure where applicable.
- .3 The Contractor shall submit his quotation within ten (10) working days with full documentation for the changes in a detailed breakdown as determined by the Consultant as will allow the Consultant to ascertain the accuracy of amounts involved.
- .4 The Contractor shall review all cost submissions to ensure their accuracy and/or conformance to unit costs if applicable prior to submission to the Consultant.
- .5 In the event of a change to the work carried out by the Contractor's own forces plus the total amount for extras will include the cost, plus 0% for the Contractor's supervision, overhead expenses and profit on additional work by his own forces only after all credits for each item included in the change order have been deducted. The Contractor's mark-up for such subtrade work shall be 0%.
- .6 In the event of a change to the work carried out by Subcontractors where the Contractor submits quotations from his Subcontractors, the Consultant reserves the right to call for detailed breakdowns including material invoices and labour time sheets. The Subcontractors will be permitted to add no more than 10% for overhead and profit on additional work only after all credits for each item included in the change orders have been deducted. The Contractor's mark-up for such subtrade work shall be 0%.
  - .1 The Contractor shall inform all his subcontractors of these terms.
- .7 Overhead for changes in the work shall include all indirect costs, but not restricted to, site superintendence, subtrade attendance, plant and equipment, including operators, site offices, storage compounds, cleaning and the like; first aid; timekeeping; security; all temporary services; office administration; processing correspondence, changes, shop drawings and the like; costing and accounting; payroll; technical staff, building permit and statutory fees; insurance and bonds; scheduling.
- .8 Profit for changes in the work is the remuneration to the Contractor and the Subcontractors and is to apply to the sum of the actual cost and overhead.
- .9 Where provided for, unit prices for additions and deletions to the work shall be those as approved by the Owner. Unit prices include all overhead and profit changes.
- .10 Where the Contractor or any Subcontractor proceeds with any change on a time and material basis, daily time sheets and material slips shall be submitted. The application for a final change order must be accompanied by these time sheets, materials slips, and a breakdown.
- .11 Where the Owner and Contractor cannot mutually agree upon the cost or evaluation of a given change, the Contractor, upon receiving written directions from the Owner, shall proceed with the required change without delaying the work and the evaluation of the change will be submitted for arbitration at the completion of the Project.
- .12 Owner and Consultant shall have twenty-one (21) working days in which to review and approve Contractor's quotations for changes to the work.

- .13 The Consultants at time to time may issue job instructions solely for the purposes of clarifying drawings and specifications. As such Contractor shall not be permitted to apply costs against these job instructions.
- .14 In the event of large scope changes, the Contractor and Subcontractors agree to negotiate the unit prices to a lesser amount than those previously tendered.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 DESCRIPTION

- .1 Coordination of the work of all Sections of the Specification is the responsibility of the Contractor.
- .2 The Contractor will be deemed to possess the necessary technical skills to carefully evaluate all requirements of the Contract, and to have included in the Price all costs for the proper implementation of these requirements.
- .3 The Contractor's responsibility includes, but is not restricted to, co-ordination specified in this Section, except where otherwise specified.

1.2 RELATED MECHANICAL AND ELECTRICAL WORK

- .1 Coordination of the installation of systems specified in Divisions 21, 22, 23 and 26, including the interrelating operation and functioning between components of a system and between systems, is the responsibility of those performing the work of Divisions 21, 22, 23 and 26, with final coordination the responsibility of the Contractor.
- .2 Provide interference drawings as herein specified to ensure proper co-ordination of subtrade work. No extras will be considered for work not properly coordinated prior to installation.
- .3 Ensure that service poles, pipes, conduit, wires, fill-pipes, vents, regulators, meters and similar Project service work is located in inconspicuous locations. If not indicated on Drawings, verify location of service work with Consultant before commencing installation.

1.3 QUALITY ASSURANCE

- .1 Requirements of Regulatory Agencies:
  - .1 Coordinate requirements of authorities having jurisdiction.
- .2 Quality Control:
  - .1 Ensure that work meets specified requirements.
  - .2 Schedule, supervise and coordinate inspection and testing as specified in Section 01 45 00.
- .3 Job Records:
  - .1 Maintain job records and ensure that such records are maintained by Subcontractors.

1.4 SUPERINTENDENCE

- .1 Provide superintendent and necessary supporting staff personnel who shall be in attendance at the Place of the Work while Work is being performed, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.
- .2 The Contractor shall appoint a superintendent at the Place of the Work who shall have overall authority at the Place of the Work and shall speak for the Contractor and represent the Contractor's interest and responsibilities at meetings at the Place of the Work and in dealings with the Consultant and the Owner.
- .3 Supervise, direct, manage and control the work of all forces carrying out the Work, including subcontractors and suppliers. Carry out daily inspections to ensure compliance with the Contract Documents and the maintenance of quality standards. Ensure that the supervisory staff includes personnel competent in supervising all Sections of Work required.
- .4 Arrange for sufficient number of qualified assistants to the supervisor as required for the proper and efficient execution of the Work.

## **1.5 SUBMITTALS**

- .1 Provide a complete set of all required Contract Documents, together with instructions for changes to the work which are issued, to each firm preparing shop drawings.
- .2 Schedule and expedite submission of specified submittals.
- .3 Review submittals and make comments as specified in Section 01 33 00.
- .4 Ensure that each original submission, and their subsequent revisions and resubmissions are made on schedule.

## **1.6 PRODUCT DELIVERY, STORAGE AND HANDLING**

- .1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or accepted alternatives, which have been bid, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier, and ensure no delay in the progress of the work
- .2 Provide equipment delivery schedule, coordinated with construction and submittals schedule, showing delivery dates for major and/or critical equipment. Provide delivery access and unloading areas.
- .3 Make available areas for storage of products and construction equipment to meet specified requirements, and to ensure a minimum of interference with progress of the work and relocation.
- .4 Make access available for transference of stored products and construction equipment to work areas.
- .5 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.
- .6 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.
- .7 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.
- .8 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.

## **1.7 JOB CONDITIONS**

- .1 Ensure that conditions within the building are maintained and that work proceeds under conditions meeting specified environmental requirements.
- .2 Ensure that protection of adjacent property and the work is adequately provided and maintained to meet specified requirements.

## **1.8 WARRANTIES**

- .1 Ensure that warranties are provided, as indicated in Section 01 78 36 Warranties.
- .2 Coordinate warranty conditions of interconnected work to ensure that full coverage is obtained.

## **1.9 CO-ORDINATION**

- .1 Review Contract Documents and advise the Consultant of possible conflicts between parts of the work before preparation of shop drawings, ordering of products or commencement of affected work.

- .2 Coordinate and be responsible for layout of all work in each area and work on which subsequent work depends to facilitate mutual progress, and to prevent conflict between parts of the work.
- .3 No addition to the Total Price will be allowed because of interference between the parts of the work of a trade or between the work of different trades unless such interference was brought to the attention of the consultant in writing prior to the start of construction.
- .4 Ensure that each Section makes known, for the information of the Contractor and other Sections, the environmental and surface conditions required for the execution of its work; and that each Section makes known the sequences of others' work required for installation of its work.
- .5 Ensure that each Section, before commencing work, knows requirements for subsequent work and that each Section is assisted in the execution of its preparatory work by Sections whose work depends upon it.
- .6 Ensure that work to be enclosed within ceiling and/or wall spaces can be so accommodates without interference and with other parts of the work.
- .7 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, 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.
- .8 Deliver materials supplied by one Section to be installed by another well before the installation begins, as per Construction Progress Schedule.
- .9 Sections giving installation information in error, or too late to incorporate in the work, shall be responsible for having additional work done which is thereby made necessary.
- .10 Remove and replace work installed in error which is unsatisfactory for subsequent work.
- .11 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided.
- .12 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.
- .13 Ensure that clearance required by authorities having jurisdiction and for proper maintenance are indicated on Drawings.
- .14 Distribute coordination drawings well in advance of fabrication and installation of work affected. Place no orders for affected equipment without submission of coordination drawings to the supplier.

#### **1.10 COOPERATION**

- .1 Provide forms, templates, anchors, sleeves, inserts and accessories required to be fixed to or inserted in the Work and set in place or instruct separate Subcontractors as to their location.
- .2 Supply items to be built in, as and when required together with templates, measurements, shop drawings and other related information and assistance.
- .3 Pay the cost of extra work and make up time lost as a result of failure to provide necessary information and items to be built in.

#### **1.11 PROJECT RECORD DRAWINGS**

- .1 Record, as the work progresses, work constructed differently than shown on Contract Documents. Record all changes in the work caused by site conditions; by Owner, Consultant, sub-consultants, Contractor, and Subcontractor originated changes; and by site instructions, supplementary instructions, field orders, change orders, addendums, correspondence, and directions of authorities having jurisdiction. Accurately record location of concealed structure, and mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar



- work not clearly in view, the position of which is required for maintenance, alteration work, and future additions. Do not conceal critical work until its location has been recorded.
- .2 Dimension location of concealed work in reference to building walls, and elevation in reference to floor elevation. Indicate at which point dimension is taken to concealed work. Dimension all terminations and offsets of runs of concealed work.
  - .3 Make records in a neat and legibly printed manner with a non-smudging medium.
  - .4 Identify each record drawing as "Project Record Copy". Maintain drawings in good condition and do not use them for construction purposes.
  - .5 After completion of the work, purchase a complete set of white prints from the Consultant and transfer the information recorded on the white prints accurately, neatly in red ink with dimensions, as applicable. Return these marked-up as-built white prints plus two additional sets of white prints to the Consultant for his review. Any subsequent changes found by the Consultant shall remain the responsibility of the contractor and new white prints will be issued for these changes and re-submitted back to the Consultant at no charge to the Owner.
  - .6 Maintain Project record drawings in a state current to Project. Such state will be considered a condition precedent for validation of applications for payment. The Consultant's visual inspection will constitute proof that record drawings are current.
  - .7 Provide Consultant with accurate red-marked record drawings for their transfer to latest version of AutoCad with application for Certificate of Substantial Performance. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

#### 1.12 DETAIL FINISHING DRAWINGS

- .1 During the course of the work, the Owner will provide the Contractor with detail drawings showing the interior finishes and furnishings of the building. The Contractor shall read these drawings in conjunction with the Contract Documents. The Contractor shall check the detail drawings against the Contract Documents and shall report any discrepancies to the Consultant.

#### 1.13 CUTTING AND PATCHING

- .1 Before cutting, drilling, or sleeving structural load-bearing elements, obtain approval of location and methods from the Structural Engineer and the General Contractor.
- .2 Do not endanger work or property by cutting, digging, or similar activities. No Section shall cut or alter the work of another Section unless such cutting or alteration is approved by the latter Section and the General Contractor.
- .3 Cut and drill with true smooth edges and to minimum suitable tolerances.
- .4 Fit construction tightly to ducts, pipes and conduits to stop air movement completely. The Section performing work that penetrates a fire, air, vapour, moisture, thermal or acoustic separation of the building shall pack voids tightly with rock wool, fibreglass or fire stop material as may be required; seal air, vapour and moisture barriers; and caulk joints as may be required to ensure that no air movement through the penetration is possible.
- .5 Cutting, drilling and sleeving of work shall be done only by the Section who has installed it. The Section requiring drilling and sleeving shall inform the Section performing the work of the location and other requirements for drilling and sleeving.
- .6 Replace, and otherwise make good, all damaged work, as identified by the Consultant or Contractor.
- .7 Cutting and Patching for Holes Required by Mechanical and Electrical work:
  - .1 Include under mechanical or electrical work for cutting or provision of holes up to and including 50 square inches and related patching, except as otherwise indicated.

- 
- .2 Include under work of this Division holes and other openings larger than 50 square inches, and chases, bulkheads, furring and required patching. This Section shall be responsible for determination of work required for holes in excess of 50 square inches.
- .8 This Section shall be responsible for all cutting and patching in addition to that specified for mechanical and electrical work, and shall directly supervise performance of cutting and patching by other Sections.
- .9 Patching or replacement of damaged work shall be done by the Subcontractor under whose work it was originally executed, and at the expense of the Subcontractor who caused the damage.
- .10 Make patches as invisible as possible in final assembly to the approval of the Consultant/Owner. Unacceptable work will be replaced at no charge to the Owner.
- 2 Products
- Not Used**
- 3 Execution
- Not Used**
- END OF SECTION**

1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer meetings every 2 weeks (or more frequently as required) with the Consultant throughout the progress of the Work. Schedules to be updated with the Consultant every 2 weeks for distribution at each meeting.
- .2 Prepare agenda for such meetings.
- .3 The Contractor shall administer such meetings and prepare minutes within three (3) days after the meeting date for distribution to the Owner and the Contractor.
- .4 Distribute written notice of each meeting four (4) days in advance of meeting date to the Consultant and the Owner and other affected parties.
- .5 Representatives of parties attending meetings shall be authorized to act on behalf of the parties they represent. Subcontractors and Suppliers do not attend meetings unless authorized by the Consultant and the Owner.
- .6 Prepare and distribute monthly progress reports in accordance with Section 01 32 16, and containing updated schedules, construction photos in accordance with Section 01 33 00, shop drawing logs, requests for interpretation logs, submittals and budget.

1.2 CONTRACT START-UP MEETING

- .1 Within five (5) days after award of Contract, request a meeting of parties in Contract to discuss and resolve administrative procedures and responsibilities prior to the commencement of the Work.
- .2 The Owner, the Consultant, the Contractor, site superintendent(s), inspection and testing company, and authorities having jurisdiction, as applicable and at their discretion, will be in attendance.
- .3 Agenda to include the following:
  - .1 Appointment of official representative of participants in the Project.
  - .2 Status of permits, fees and requirement of authorities having jurisdiction. Action required.
  - .3 Review of standard project forms.
  - .4 Requirements for Contract modification and interpretation procedures, including, but not limited to: requests for interpretation, proposed Change Orders, Change Orders, Change Directives, Supplemental Instructions, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .5 Requirements for notification for reviews. Allow a minimum of two (2) Working Days notice to Consultant for review of the Work.
  - .6 Review of schedules and scheduling procedures and requirements in accordance with Section 01 32 16.
  - .7 Appointment of inspection and testing agencies or firms, Section 01 45 00.
  - .8 Requirements for temporary facilities, signs, offices, storage sheds, utilities; Section 01 50 00.
  - .9 Security requirements at and for the Place of the Work, Section 01 50 00.
  - .10 Record drawings, Section 01 33 00.
  - .11 Maintenance manuals, Section 01 33 00.
  - .12 Take-over procedures, acceptance, Section 01 78 00.
  - .13 Warranties, Section 01 78 36.

- .14 Progress claims, administrative procedures, holdbacks.
- .15 Insurances, transcripts of policies.
- .16 Contractor's safety procedures.
- .17 Cleaning/staging area for vehicles.
- .18 Workplace Safety and Insurance Board Certificate.
- .4 The Contractor shall organize and chair the contract start-up meeting. Contractor shall record minutes of the contract start-up meeting and distribute a copy to each participant within ten (10) days of meeting.

### 1.3 PRE-INSTALLATION MEETINGS

- .1 During the course of the Work prior to Substantial Performance of the Work, schedule pre-installation meetings as required by the Contract Documents and coordinated with the Consultant.
- .2 As far as possible, pre-installation meetings shall be scheduled to take place on the same day as regularly scheduled progress meetings.
- .3 Agenda to include the following:
  - .1 Appointment of official representatives of participants in the Project.
  - .2 Review of existing conditions and affected work, and testing thereof as required.
  - .3 Review of installation procedures and requirements.
  - .4 Review of environmental and site condition requirements.
  - .5 Review of schedules and scheduling procedures and requirements of the applicable portions of the Work in accordance with Section 01 32 16, in particular:
    - .1 Schedule of submission of samples, mock-ups, and items for Consultant's consideration.
    - .2 Delivery schedule of specified equipment.
    - .3 Requirements for notification for reviews. Allow a minimum of two (2) Working Days notice to Consultant for review of the Work.
  - .6 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences, Section 01 50 00.
  - .7 Requirements for inspections and tests, as applicable.
    - .1 Schedule and undertake inspections and tests in accordance with Sections 01 32 16 and 01 45 00.
  - .8 Special safety requirements and procedures.
- .4 The following shall be in attendance:
  - .1 Contractor.
  - .2 Subcontractors affected by the work for which the pre-installation meeting is being conducted.
  - .3 Consultant.
  - .4 Manufacturer's representatives, as applicable.
  - .5 Inspection and testing company, as applicable.

#### 1.4 PROGRESS MEETINGS

- .1 During the course of the Work prior to Substantial Performance of the Work, schedule progress meetings as directed by the Consultant.
- .2 In advance of progress meetings, Contractor shall submit to the Consultant a two week look ahead schedule of items of work to be undertaken in the two weeks subsequent to the progress meeting. Two week look ahead schedule will be reviewed at the meeting and recorded in the minutes of the meeting. Refer to Section 01 32 16 for requirements for look ahead schedule.
- .3 Attendees at progress meetings shall include the following:
  - .1 Contractor.
  - .2 Contractor's site superintendent(s).
  - .3 Consultant.
  - .4 Owner.
- .4 Agenda to include the following:
  - .1 Review, approval of proceedings of previous meeting.
  - .2 Review of items arising from proceedings.
  - .3 Review of progress of the Work since previous meetings.
  - .4 Review of schedules in accordance with Section 01 32 16, including:
    - .1 Revisions to construction schedule.
    - .2 Progress and schedule for subsequent period of the Work: Two (2) week look-ahead.
    - .3 Problems that impede compliance with construction schedule.
    - .4 Review of off-site fabrication delivery schedules.
    - .5 Review of material delivery dates/schedule.
    - .6 Corrective measures and procedures to regain construction schedule.
    - .7 Review of submittal schedules: expedite as required.
  - .5 Field observations, problems, conflicts.
  - .6 Review status of submittals.
  - .7 Maintenance of quality standards.
  - .8 Pending changes and substitutions.
  - .9 Review of Contract modifications and interpretations including, but not limited to: requests for interpretation and log, proposed Change Orders, Change Orders, Change Directives, Supplemental Instructions, for effect on construction schedule and on Contract Time.
  - .10 Review of status of as-built documents.
  - .11 Other business.

#### 1.5 PRE-TAKEOVER MEETING

- .1 Prior to application for Substantial Performance of the Work, schedule a pre-takeover meeting.
- .2 Agenda to include the following:
  - .1 Review, approval of proceedings of previous meeting.
  - .2 Review of items arising from proceedings.

- .3 Review of procedures for Substantial Performance of the Work, completion of the Contract, and handover of the Work.
- .4 Field observations, problems, conflicts.
- .5 Review of outstanding Contract modifications and interpretations including, but not limited to: requests for interpretation and log, proposed Change Orders, Change Orders, Change Directives, Supplemental Instructions, for effect on construction schedule and on Contract Time.
- .6 Problems which impede Substantial Performance of the Work.
- .7 Review of procedures for deficiency review. Corrective measures required.
- .8 Progress, schedule, during succeeding period of the Work.
- .9 Review submittal requirements for warranties, manuals, and all demonstrations and documentation required for Substantial Performance of the Work.
- .10 Review of status of as-built documents and record drawings.
- .11 Other business.

#### 1.6 POST-CONSTRUCTION MEETING

- .1 Prior to application for completion of Contract, schedule a post-construction meeting. Four days prior to date for meeting, Consultant shall confirm a date for meeting based on evaluation of completion requirements.
- .2 Agenda to include the following:
  - .1 Review, approval of proceedings of previous meeting.
  - .2 Confirmation that no business is arising from proceedings.
  - .3 Confirmation of completion of the Contract, and handover of reviewed documentation from the Consultant to the Owner.
  - .4 Confirmation of completion of proposed Change Orders, Change Orders, Change Directives, and Supplemental Instructions.
  - .5 Problems that impede Contract completion.
  - .6 Identify unresolved issues or potential warranty problems.
  - .7 Confirmation of completion of deficiencies.
  - .8 Corrective measures required.
  - .9 Confirm submittal requirements for warranties, manuals, and demonstrations and documentation for Contract completion are in order.
  - .10 Review of procedures for communication during post-construction period.
  - .11 Handover of reviewed record documents by the Consultant to the Owner.
  - .12 Handover of Contract completion insurance policy transcripts by Contractor.
  - .13 Submission of final application for payment.
  - .14 Review and finalize outstanding claims, pricing, and allowance amounts.
  - .15 Status of commissioning and training.
  - .16 Demobilization and the Place of the Work restoration.
  - .17 Review of requests for interpretation log.

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

**1.1 PLANNING, SCHEDULING AND MONITORING - GENERAL**

- .1 This section includes requirements for the preparation, monitoring and revision of construction schedules.
- .2 The purpose of the schedules and reports mandated in this section is to:
  - .1 Ensure adequate planning and execution of the Work by the Contractor;
  - .2 Establish the standard against which satisfactory completion of the project will be judged;
  - .3 Assist the Owner and the Consultant in monitoring progress;
  - .4 Assess the impact of changes to the Work.
- .3 The Contractor has the obligation and responsibility at all times to plan and monitor all of its activities, anticipating and scheduling its staff, materials, plant and work methods in a manner that is likely to ensure completion of the Work in accordance with the terms and conditions of the Contract and at a rate that will allow the Work to be completed on time.

**1.2 CONSTRUCTION SCHEDULE**

- .1 Within five (5) days of Contract award, submit in format acceptable to Consultant, minimum three (3) copies of Contractor's critical path construction schedule.
- .2 Set up format to permit plotting of actual construction progress against scheduled progress.
- .3 Schedule shall show:
  - .1 Commencement and completion dates of Contract.
  - .2 Commencement and completion dates of construction stages/phases, if any.
  - .3 Commencement and completion dates of each trade. Major trades shall be further broken down as directed by Consultant; generally follow Specification format.
  - .4 Order and delivery dates for major or critical equipment.
  - .5 Critical dates for shop drawing/sample submissions.
  - .6 Any other information relating to orderly progress of Contract, considered by Contractor or Consultant to be pertinent.
- .4 The total number of activities and the distribution of activities shall reflect the complexity of the Work and shall be finite, measurable, identify a specific function and identify a trade responsible for its completion.
- .5 Prepare a narrative to accompany the preliminary construction schedule that provides a detailed description of the labour, materials, plant, means and methods that the Contractor intends to utilize in carrying out the Work to achieve the planned rates of production required to support the activity durations shown in the schedule. The narrative shall also provide explanations supporting the use of lead-lag relationships and, where permitted, constrained dates.
- .6 Consultant, together with Contractor shall review construction progress once a month during or immediately following regular site meeting, or more often as directed by Consultant.
- .7 Update construction schedule, whenever changes occur, in manner and at times acceptable to Consultant.

**1.3 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Schedules shall be submitted to the Consultant in electronic forms. Electronic schedule submissions shall be in an original scheduling software data file type that permits modification of



the layouts and data, and PDF (Portable Document Format). In case of a discrepancy between an electronic copy of the schedule and the corresponding PDF schedule, the PDF of the schedule that has been formally submitted and reviewed in accordance with the requirements of Section 01 33 00 shall govern.

- .3 Include costs for execution, preparation and reproduction of schedule submittals in tendered price.
- .4 Submission of the schedules referred to in this Section shall constitute the Contractor's representation that:
  - .1 Contractor and its Sub-Contractors intend to execute the Work in the sequence indicated on such schedule;
  - .2 Contractor has distributed the proposed schedule to its Sub-Contractors for their review and comment, and has obtained their concurrence;
  - .3 All elements of the Work required for the performance of the Contract are included. Failure to include any such element shall not excuse the Contractor from completing the Work within the Contract Time and within any other constraints specified in the Contract;
  - .4 Seasonal weather conditions have been considered and included in the planning and scheduling of the Work influenced by high and low ambient temperatures and/or precipitation;
  - .5 Contractor has thoroughly inspected the Site and has incorporated any other special conditions in planning the Work such as specified or required non-work periods, etc.
- .5 Cash flow diagram:
  - .1 Contractor shall submit an updated cash flow diagram quarterly.
  - .2 Cash flow diagram shall be in format acceptable to the Owner.
  - .3 Cash flow diagram shall represent Contractor's anticipated invoicing.

#### **1.4 PROGRESS RECORD**

- .1 Maintain permanent record of progress of work. Updated record shall be open to inspection by Consultant at all times and updated copy shall be furnished to Consultant upon request.
- .2 This record shall show weather conditions, dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to erection and removal of forms, pouring of concrete, installation of roofing and other critical or major components as well as number of employees of various trades and type and quantity of equipment employed daily, shall be noted.
- .3 Display a hard copy of the construction schedule in the site office from start of construction to completion. Superimpose actual progress of work on schedule at least once each week.

#### **1.5 PROGRESS MONITORING**

- .1 Monitor progress of Work in detail to ensure integrity of critical path, by comparing actual completions of individual activities with their scheduled completions, and reviewing progress of activities that have started but are not yet completed. Monitoring should be undertaken sufficiently often so that causes of delays are immediately identified and removed if possible.
- .2 On an ongoing basis, record "progress to date" schedule to be available at the Site and upon consultant's request. Inspect Work with the Owner and the Consultant at least bi-weekly to establish progress on each current activity.

#### **1.6 UPDATES AND REVISIONS TO SCHEDULE**

- .1 The Contractor's schedule is to be updated and resubmitted to the Consultant as a progress schedule at least once per month, on a date to be mutually agreed by the Contractor and the Consultant, together with the related data and reports required by this Section. Updated schedule is to include a 2 week look-ahead schedule in the form of a bar chart.

- .2 Each progress schedule shall record and report actual completion and/or start dates for each completed or in-progress activity, activity percent complete for in-progress activities and forecast completion dates for all activities that are not yet complete. Do not automatically update actual start and finish dates by using default mechanisms found in scheduling software. The progress schedule will show the projected completion date of the Work based on the progress information inserted into it, without changes to the schedule logic or the original duration of any activity. The Contractor shall use the retained logic option when executing schedule calculations. The final as-planned schedule (or an approved revision thereto) will be shown as a target schedule to indicate whether the current progress schedule remains on target, has slipped or is ahead of schedule.
- .3 The Contractor may then, in a second and subsequent update to the progress schedule, incorporate any logic and duration changes that represent its revised planning, provided all such changes are identified and documented in the schedule narrative required to accompany the progress schedule, and are agreed to by the Consultant.
- .4 If it appears that the progress schedule submitted by the Contractor no longer represents the actual sequencing and progress of the Work, the Consultant may instruct the Contractor to revise the progress schedule.
- .5 In order to improve the schedule, eliminate unforeseen problems or reduce the time required for an activity, modifications to the schedule may be suggested by the Contractor, Sub-Contractors, Owner or Consultant during the execution of the Contract, and such modifications may be implemented by mutual agreement. The Contractor shall submit to the Consultant for acceptance proposed adjustments to the final as-planned schedule or any subsequent updates that will not change the Contract Time.
- .6 If, at any time, the work is behind schedule with respect to the progress schedule currently in force, and if the Consultant believes there is a risk of the Work not being completed within the Contract Time as a result of such delay, the Contractor shall take all necessary measures to make up for such delay either by increasing staff, plant or facilities, or by amending its work methods, whichever is applicable.
- .7 In all cases of delay or potential delay, the Contractor shall keep the Owner and the Consultant informed of its intentions with regard to mitigation of such delay and the Owner's Consultant may, if it is deemed necessary, require the Contractor to revise all or part of its current progress schedule.
- .8 The current Contract Schedule can only be revised as agreed with the Owner and the Consultant by Change Order or an accepted revision to the logical sequence of described construction operations.
- .9 Once accepted, the revised schedule will become the current Contract Schedule against which progress is reported and to which subsequent updates will be compared. The new Contract Schedule will be clearly identified to show it as the current Contract Schedule.
- .10 Where the progress schedule shows completion of the Contract, or of any interim milestone, later than the Contract or milestone completion dates, acceptance of such progress schedules and of the monthly progress report will not constitute acceptance of the delay by the Consultant or the Owner.

#### 1.7 RECORD DRAWINGS

- .1 Obtain and keep on site at all times a complete and separate set of black line white prints.
- .2 Note clearly, neatly, accurately and promptly as the work progresses all architectural, structural mechanical and electrical changes, revisions and additions to the work and deviations from the Contract Documents.
- .3 Accurate location, depth, position, size and type of concealed and underground services, both inside and outside shall be included as part of these record drawings.
- .4 Record drawings shall be available for review at each site meeting.

- .5 Refer to Section 01 31 13 for requirements on submission of record drawings.

## 1.8 PROGRESS PHOTOGRAPHS

- .1 Concurrently with monthly application for payment submit photographs in accordance with section 01 33 00 Submittal procedures.

## 1.9 PRODUCT DELIVERY CONTROL

- .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.
- .2 Provide equipment delivery schedule, coordinated with construction and submittals' schedule, showing delivery dates for major and/or critical equipment.
- .3 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 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.
- .5 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.
- .6 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.

## 2 Products

**Not Used**

## 3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 GENERAL

- .1 Provide submittals as requested by the Contract Documents, as specified herein, and in accordance with the conditions of the Contract.
- .2 In addition to submittals specifically requested by the Contract Documents, provide other submittals as may be reasonably requested by the Consultant, or as are required to coordinate the Work and to provide the Owner with choices available, within the scope of Contract Documents.
- .3 Contractor's review of submittals:
  - .1 Review submittals for conformity to Contract Documents before submitting to Consultant. Submittals shall bear stamp of Contractor and signature of a responsible official in Contractor's organization indicating in writing that such submittals have been checked and coordinated by Contractor. Contractor's review shall be performed by qualified personnel who have detailed understanding of those elements being reviewed and of the conditions at the Place of the Work proposed for installation.
  - .2 Check and sign each submittal and make notations considered necessary before submitting to Consultant for review. Where submittal is substantially and obviously in conflict with requirements of Contract Documents, reject submittal without submitting to Consultant and request resubmission. Note limited number of reviews of each submittal covered under Consultant's services as specified below.
  - .3 Contractor shall assume sole responsibility for any conflicts occurring in the Work that result from lack of comparison and coordination of submittals required for the Work.
  - .4 Submittals that have not been reviewed, checked, and coordinated by Contractor prior to submission to Consultant, will be rejected.
  - .5 Notify Consultant in writing of changes made on submittals from Contract Documents. Consultant's review of submittals shall not relieve Contractor of responsibility for changes made from Contract Documents not covered by written notification to Consultant.
- .4 Consultant's review of submittals:
  - .1 Review of submittals by Consultant is for the sole purpose of ascertaining conformance with the general design concepts and the general intent of the Contract Documents. This review shall not mean that Consultant approves the detail design inherent in the submittals, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the submittals, or responsibility for meeting requirements of Contract Documents.
  - .2 Contractor shall be responsible for dimensions to be confirmed and correlated at the Place of the Work for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the Work.
  - .3 As part of their scope of work, Consultant shall review shop drawings no more than twice. Should three or more reviews be required due to reasons of Contractor omissions causing resubmission requests, then Contractor shall reimburse the Consultant for time expended in these extra reviews. Time shall be invoiced to the Owner (to be deducted from monies due to the Contractor and paid to Consultant by Owner) at rates recommended by Consultant's professional association and disbursements shall be invoiced at Consultant's cost. The Contractor shall cover directly costs and administration associated with courier services and the like for these extra shop drawing reviews.
  - .4 Consultant's review and markings on submittals do not authorize changes in the Work or the Contract Time.

- .5 Submittals received but not required by the Contract Documents or requested by the Consultant will not be reviewed by the Consultant and will be marked 'NOT REVIEWED' by the Consultant and returned to the Contractor.
- .5 Make submittals with reasonable promptness and in an orderly sequence so as to cause no delay in the Work. Be responsible for delays, make up time lost and pay added costs, at no additional cost to the Owner, incurred because of not making submittals in due time to permit proper review by Consultant.
- .6 Submittals that contain substitutions will be rejected.
- .7 Do not proceed with work affected by a submittal, including ordering of Products, until relevant submittal has been reviewed by Consultant.
- .8 Prepare submittals using SI (metric) units.
- .9 Contractor's responsibility for errors and omissions in submittals is not relieved by Consultant's review of submittals.
- .10 Contractor's responsibility for deviations in submittal from requirements of Contract Documents is not relieved by Consultant's review of submittal, unless Consultant gives written acceptance of specific deviations.
- .11 Engineered submittals:
  - .1 Submittals for items required to be sealed by professional engineer (or as otherwise indicated as engineered), shall be prepared under the direct control and supervision of a qualified professional engineer registered in the Place of the Work, and having minimum professional liability insurance required in accordance with the General Conditions, as amended.
  - .2 Design includes life safety, sizing of supports, anchors, framing, connections, spans, and as additionally required to meet or exceed requirements of applicable codes, standards, regulations, and authorities having jurisdiction.
  - .3 Engineered submittals shall include design calculations, complete with references to codes and standards used in such calculations, supporting the proposed design represented by the submittal. Prepare calculations in a clear and comprehensive manner so that they can be easily reviewed. Incomplete or haphazard calculations will be rejected.
  - .4 The professional engineer responsible for the preparation of engineered submittals shall undertake periodic field review, including review of associated mock-ups, at locations wherever the work as described by the engineered submittal is in progress, during fabrication and installation of such work, and shall submit a field review report after each visit. Field review reports shall be submitted to the Consultant, to authorities having jurisdiction as required, and in accordance with the building code.
  - .5 Field reviews shall be at intervals as necessary and appropriate to the progress of the work described by the submittal to allow the engineer to be familiar with the progress and quality of such work and to determine if the work is proceeding in general conformity with the Contract Documents, including reviewed shop drawings and design calculations.
  - .6 Upon completion of the parts of the Work covered by the engineered submittal, the professional engineer responsible for the preparation of the engineered submittal and for undertaking the periodic field reviews described above, shall prepare and submit to the Consultant and authorities having jurisdiction, as required, a letter of general conformity for those parts of the Work, certifying that they have been Provided in accordance with the requirements both of the Contract Documents and of the authorities having jurisdiction over the Place of the Work.
  - .7 Costs for such field reviews and field review reports and letters of general conformity are included in the Contract Price.

- .12 Keep copies of reviewed submittals at the Place of the Work in a neat, orderly condition. Only submittals that have been reviewed by the Consultant's and are marked with Consultant's review stamp, as applicable, are permitted at the Place of the Work.
- .13 The Work shall conform to reviewed submittals subject to the requirements of this section. Remove and replace materials or assemblies not matching reviewed submittals at no increase in the Contract Time and at no additional cost to the Owner.

## 1.2 SUBMISSION PROCEDURES

- .1 Coordinate each submittal with requirements of the Work and Contract Documents. Individual submittals will not be reviewed until related information is available.
- .2 Distribute copies of submittals to parties whose work is affected by submittals except Consultant and Owner before final submission for review by Consultant.
- .3 Submit all submittals other than samples as one (1) single electronic PDF file.
  - .1 Name Submittal PDF files as follows:
    - .2 Submittal#\_Spec.Section\_Revision#\_Descriptor\_Type of Submission
    - .3 (e.g. Submittal#001\_092116\_R3\_Gypsum Wallboard\_ProductData)
  - .1 Revision number within file name is to reflect the number of submissions with zero indicating the first submission.
  - .2 Submittals returned to the Contractor will have added text to the end of the file name indicating the review status of the Submittal. If the Submittal is to be resubmitted, maintain the original file name revising only the revision number.
- .4 Accompany submittals with transmittal letter containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each submittal.
  - .5 Other pertinent data.
- .5 Make any changes in submittal that Consultant may require, consistent with Contract Documents, and resubmit as directed by Consultant.
- .6 Notify Consultant, in writing, when resubmitting, of any revisions other than those requested by Consultant.
- .7 After Consultant's review, distribute copies to affected parties.

## 1.3 PRODUCT DATA SHEETS

- .1 Submit Product data sheet prints; in electronic pdf (portable document format) to Consultant.
- .2 Submit Product data sheets for requirements requested in the Contract Documents and as the Consultant may reasonably request where shop drawings will not be prepared due to a standardized manufacture of a Product. Manufacturers' catalogue cuts will be acceptable in such cases, providing that they are 8-1/2" x 11" originals, and that they indicate choices including sizes, colours, model numbers, options and other pertinent data, including installation instructions. Submissions showing only general information are not acceptable.
- .3 Where requirements of Contract Documents are more stringent than design proposed on Product data sheets, the requirements of the Contract Documents take priority.
- .4 Upon completion of review by Consultant, one (1) marked set of Product data sheets will be returned to Contractor for reproduction and distribution.

- .5 Retain one (1) complete set of reviewed Product data sheets for issuance to Owner immediately prior to Substantial Performance of the Work in Maintenance manual.

#### 1.4 SHOP DRAWINGS

- .1 Submit shop drawings for which submission is required in other Sections of this Specification. Include in final shop drawing submissions detailed information, templates and installation instructions required for incorporation and connection of the work concerned, and other details as may be specified in other Sections.
- .2 In addition to shop drawings specified in other Sections, submit shop drawings required by authorities having jurisdiction in accordance with their requirements.
- .3 The General Contractor shall check, sign, and make notations he considers necessary on shop drawings before each submission to the Consultants for their review.
- .4 Indicate on each submission changes from the Contract Drawings and Specification that have been incorporated in the shop drawings. The Contractor shall be responsible for changes made from the Contract Drawings and Specification which are not indicated or otherwise communicated in writing with the submission.
- .5 Shop drawing review by Consultant or sub-consultants is for the sole purpose of ascertaining conformance with the general design concept and as a precaution against oversight or error. This review shall not mean that Consultant and sub-consultants approve the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents. No review of design shall be assumed made when such design is a responsibility of the Contractor included in the work. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all Subcontractors.
- .6 Show on shop drawings all pertinent information required for materials and installation, and for proper integration of this installation with work of others.
- .7 The shop drawings shall show, but not necessarily be limited to the following:
  - .1 Clear and obvious notes of any proposed changes from Drawings and Specifications.
  - .2 Fabrication and erection dimensions.
  - .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 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 interconnected work.
  - .10 Assumed design loadings, and dimensions and material specifications for load bearing members.
  - .11 Dimensions and dimensioned locations of proposed chases, sleeves, cuts and holes in structural members.
- .8 Submit copies of engineering data sheets, catalogue cuts and standard diagrams may be substituted for shop drawings where applicable of each drawing are required.

- .9 Shop drawings which require extensive correction or are in substantial disagreement with intent of contract documents will be sent back for revisions and resubmission.
- .10 Otherwise, shop drawings will be sent back with review comments only.
- .11 Conform to review comments and stamped instructions of each shop drawings reviewer.
- .12 Only drawings noted for revision and resubmission need be resubmitted. Include revisions required by previous reviews before resubmission of shop drawings.
- .13 Do not add new details or information to shop drawings after they have been reviewed, unless requested by the reviewer, requiring a re-submission.
- .14 Do not proceed with work dependent on shop drawing information until approval is given and verification received from Contractor. The Contractor shall be responsible for work performed prior to receipt of reviewed shop drawings. No review comments shall be construed as authorization for Changes in the work.
- .15 Fabricate work exactly as shown on shop drawings. If shop practice dictates revisions, revise drawings and resubmit.
- .16 File one (1) copy of each finally revised and corrected shop drawing on site.
- .17 Provide shop drawings as called for in the Trade Sections of this Specifications.

#### 1.5 SAMPLES

- .1 Submit samples for which submission requirement is specified in Trade Sections of this Specification.
- .2 Submit samples in triplicate of adequate size to represent the material in its intended use on Project. Submit an extreme range of samples when the degree of marking or colour cannot be represented by a single sample.
- .3 Label samples with Project name, number, Contractor, and date.
- .4 Include in the work cost of delivery and handling, assembly, and return to supplier of samples.
- .5 If sample is disapproved, two samples will be returned. If sample is approved, one sample will be returned, marked "Approved".
- .6 Approved samples shall serve as a model against which the products incorporated in the work shall be judged.
- .7 Each product incorporated in the work shall be precisely the same in all details as the approved sample.
- .8 Should any change of material, colour, texture, finish, dimensions, performance, function, operation, construction, joining, fastening, fabrication techniques, service characteristics, and other qualities be made to a product after approval has been given, submit for approval of the revised characteristics in writing and resubmit samples of the product for approval if requested.
- .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.
- .10 Provide samples as called for in the Trade Sections of this Specifications.

#### 1.6 MOCK-UPS

- .1 Where required by the Contract Documents or as may reasonably be requested by the Consultant during the course of the Work, Provide field or shop erected example of work complete with specified materials and workmanship.
- .2 Erect mock-ups at locations as specified and as acceptable to Consultant. Do not proceed with work for which mock-ups are required prior to Consultant's review of mock-ups.



- .3 Modify or remove and replace mock-ups as many times as required to secure acceptance of the Consultant. Such removal and replacement shall be done at no increase in either the Contract Price or the Contract Time.
- .4 Protect and maintain mock-ups until directed to be removed. Commence work demonstrated in mock-up only after review and acceptance of workmanship. If possible, mock-up may become part of finished work, at sole discretion, and with prior written acceptance, of Consultant.
- .5 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be compared.
- .6 Remove and replace materials or assemblies not matching reviewed mock-ups.
- .7 Resubmit mock-ups until written acceptance is obtained from Consultant.

#### **1.7 INSERT LOCATION DRAWINGS**

- .1 Submit insert location drawings which are required for installation of work.
- .2 Indicate on insert location drawings the location and size of sleeves, anchor bolts, openings and miscellaneous items to be incorporated in the work.
- .3 Submit insert location drawings well in advance of construction of work incorporating built-in work.

#### **1.8 COORDINATION DRAWINGS**

- .1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided.
- .2 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.
- .3 Ensure that clearance required by authorities having jurisdiction and for proper maintenance are indicated on Drawings.
- .4 Distribute coordination drawings well in advance of fabrication and installation of work affected. Place no orders for affected equipment without submission of coordination Drawings to the supplier.

#### **1.9 PROJECT RECORD DRAWINGS**

- .1 Submit Project Record Drawings specified under work of Section 01 31 13 with application for Certificate of Substantial Performance. Final acceptance of the work will be predicted on receipt and approval of record drawings.

#### **1.10 WARRANTIES**

- .1 The Contractor shall submit all the warranties as herein specified, in an approved uniform format as indicated in Section 01 78 36 Warranties.

#### **1.11 MAINTENANCE MANUAL AND OPERATING INSTRUCTIONS**

- .1 Submit two (2) hard copies and one (1) digital copy of Maintenance Manuals at completion of Project on application for Certificate of Substantial Performance, Maintenance Manual shall consist of shop drawings, extended warranties and Project Data Book.
- .2 Include in Maintenance Manual one copy of each final approved shop drawing issued for Project of which have been recorded changes made during fabrication and installation caused by unforeseen conditions.
- .3 Submit extended warranties together in one report binder, properly titled and with a typed table of contents.
- .4 Maintenance manual – hard copy:
  - .1 Consist of a hard-cover, black, vinyl-covered, loose-leaf, letter size binder.

- .2 Have a title sheet, or sheets preceding data on which shall be recorded Project name, date, list of contents, and Contractors' and Subcontractors' names and addresses.
- .3 Be organized into applicable sections of work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.
- .4 Contain only typed or printed information and notes, and neatly drafted drawings.
- .5 Contain maintenance instructions as specified in various Sections and as referenced in Section 01 78 00.
- .6 Contain brochures and parts lists on all equipment.
- .7 Contain a list of manufacturers and trade names of finishes and coatings applied.
- .8 Contain sources of supply for all proprietary products used in the work.
- .9 Contain lists of supply sources for maintenance of all equipment in Project of which more detailed information is not included above.
- .10 Contain finished hardware schedule.
- .11 Contain charts, diagrams and reports indicated on Mechanical and Electrical Drawings.
- .5 Maintenance manual – Electronic copy:
  - .1 Provide one copy of in bound PDF (Portable Document Format) including list of items described for hard copy.
  - .2 PDF document to include bookmarks and text to be searchable.

#### **1.12 EXTRA MATERIALS**

- .1 Supply extra materials at completion of Project as specified in Trade Sections of this Specification.
- .2 Deliver extra materials to location designated by the Owners representative.

#### **1.13 INSPECTION COMPANY REPORTS**

- .1 Submit copies of test and verification reports as specified in Section 01 45 00 and in other Sections of the Specifications of "Source Quality Control" and "Field Quality Control" immediately they are completed.
- .2 Submit one copy of each report unless specified otherwise and signed by a responsible officer of the inspection and testing company to the Owner and Consultant.
- .3 Submit an additional report directly after it is completed to:
  - .4 Applicable design engineer.
  - .5 The Contractor.
  - .6 Authorities having jurisdiction when such reports are required by them.
- .7 Each report shall include:
  - .1 Date of issue.
  - .2 Project name and number.
  - .3 Name and address of inspection and testing company.
  - .4 Name and signature of inspector or tester.
  - .5 Date of inspection or test.
  - .6 Identification of product and Specifications Section covering inspected or tested work.
  - .7 Location of inspection or from which tested material was derived.
  - .8 Type of inspection or test.

.9 Remarks and observations on compliance with Contract Documents.

#### 1.14 PROGRESS PHOTOGRAPHS

- .1 Concurrently with monthly application for payment submit colour, digital photographs, and photo log as follows:
  - .1 Consultant may request up to ten (10) photographs from positions determined by Consultant.
  - .2 Photographs shall be properly exposed and in focus; views shall be unobstructed.
  - .3 Photo to be in .jpg format, minimum 6 megapixel resolution. Indicate in file name; date of exposure, Consultant project number, description of view as follows:
    - .1 [YYMMDD]\_[Project#]\_[description of view].jpg
  - .4 Include short log describing camera position, also direction of view for each photo and a constant location number.

#### 1.15 PROGRESS BILLING

- .1 Coordinate progress billing with cost breakdown.
- .2 Include value of work completed during billing period.
- .3 Include running total of value of work completed by the end of the billing period.
- .4 Format of progress billing shall be as requested by and approved by the Owner.
- .5 Progress billings shall be dated and submitted on the 25th day of each month.
- .6 Progress billings shall be discussed as part of the preconstruction meeting.

#### 1.16 PRICING OF CHANGES TO WORK

- .1 Submit with quotations for changes to work detailed estimate sheets showing initial and revised quantities of labour, materials and equipment, and the related unit costs.
- .2 Payment for use of small tools, travelling, out-of-town accommodations and preparation of price change submittals will be considered a part of overhead as specified in the Supplementary Conditions.
- .3 Submit quotations within ten (10) days of issuance of the contemplated change for changes to work with full documentation to Consultant.

#### 1.17 WASTE MANAGEMENT

- .1 Contractor shall prepare and submit waste audit and reduction plan in compliance with the requirements of Ontario Regulations 102/94, Waste Audits and Waste Reduction Workplans and 103/94, Industrial, Commercial and Institutional Source Separation Programs under the Environmental Protection Act of Ontario. For definitions refer to Ontario Regulation 105/94, Definitions.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

**1.1 PERMITS, LICENCES, FEES**

- .1 Comply with requirements of GC 10.2.
- .2 Where permits, licences and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by particular subtrade responsible for that work.
- .3 Review building permit set with Consultant immediately following receipt of building permit and jointly determine whether or not changes to Contract are required.
- .4 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.
- .5 Report to the Consultant in writing any condition which would prohibit granting of any permit or approval before work affecting such items is commenced.
- .6 Give notice of completion of project prior to occupancy, as required by applicable legislation.

**1.2 BUILDING CODE, BY-LAWS, REGULATIONS**

- .1 Carry out work in accordance with requirements of the Ontario Building Code, latest issue, including all amendments and revisions.
- .2 Comply with requirements, regulations and ordinances of other jurisdictional authorities.
- .3 Where it is necessary to carry out work outside property lines, such as sidewalks, paving or concrete curbs, comply with applicable municipal requirements.
- .4 Promptly submit written notice to Consultant, of observed variance of Contract Documents from requirements of Building Code and authorities having jurisdiction. Assume responsibility for work known to be contrary to such requirements and performed without notifying Consultant.

**1.3 AUTHORITIES HAVING JURISDICTION**

- .1 Where references are made to "authorities having jurisdiction", it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of the building.

**1.4 REQUIREMENTS OF REGULATORY AGENCIES**

- .1 Work shall include protection measures consisting of materials constructions and methods, and first-aid equipment and personnel, required by the latest edition of The Occupational Health and Safety Act, and the Workplace Safety and Insurance Board (WSIB) Regulations, of the Province of Ontario, and as otherwise imposed by authorities having jurisdiction to save persons and property from harm.
- .2 Ensure that pollution, noise pollution and environmental control of construction activities are exercised as required during the work.
- .3 Except where special permission is obtained, maintain clear access for roads and sidewalks on public property.
- .4 Maintain all (Municipal and Provincial) roads and sidewalks clear of construction materials and debris, including excavated material. Clean roads and sidewalks as frequently as required to ensure that they are cleared of materials, debris and excavated material.
- .5 Remove snow and ice from sidewalks as required and to the standards acceptable by the Municipality.

**1.5 CONSTRUCTION SAFETY**

- .1 Comply with requirements of GC 3.6.

- .2 Be governed by pertinent safety requirements of Federal or Provincial Governments and of municipal bodies having authority, particularly the Ontario Construction Safety Act, and regulations of Ontario Ministry of Labour, and work in conjunction with proper safety associations operating under the authority of Ontario Workers' Compensation Act.
- .3 Do not, in the performance of the work, in any manner endanger the safety or unlawfully interfere with the convenience of the public.
- .4 Notify the Ontario Ministry of Labour of intended work of this Contract as required by the Occupational Health and Safety Act. One copy of the "Notice of Project" shall be handed to Consultant.

## 1.6 FIRE PROTECTION

- .1 Refer to technical Sections of Specifications and Drawings for fire protection requirements.
- .2 Test methods used to determine fire hazard classification and fire endurance rating shall be as required by Ontario Building Code.
- .3 Upon request, furnish Consultant with evidence of compliance with project fire protection requirements.
- .4 Materials and components used to construct fire rated assemblies and materials requiring fire hazard classification shall be listed and labelled, or otherwise approved, by fire rating authority. Labelled materials and their packaging shall bear fire rating authorities label showing product classification.
- .5 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 Materials having a fire hazard classification shall be applied or installed in accordance with fire rating authority's printed instructions.
- .7 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.
- .8 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.
- .9 Fill and patch voids and gaps around openings and penetrations in and at perimeter of assemblies so as to maintain continuity and to produce a fire resistant smoke tight seal, acceptable to jurisdictional authorities and Consultant.

## 1.7 HAZARDOUS MATERIALS

- .1 Comply with provisions of the Occupational Health and Safety Act as amended to include WHMIS (Workplace Hazardous Materials Information System).
- .2 Ensure that Material Safety Data Sheets (MSDS) are available on site prior to first delivery to site of any controlled material or substance.
- .3 Maintain on site for duration of Contract a hazardous materials log containing all required MSDS.
- .4 Log shall be open for inspection for Owner, Consultant and all personnel on site.
- .5 Ensure that workers are instructed in the purpose and content of MSDS.

## 1.8 WASTE MANAGEMENT

- .1 Comply with applicable regulations of the Ministry of Environment and Energy governing waste management.
- .2 Prepare and submit waste audit, waste reduction and source separation plans in accordance with applicable regulatory requirements.

## 2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 REFERENCE STANDARDS

- .1 Where edition date is not specified, consider that references to manufacturer's and, published codes, standards and specifications are made to the latest edition (revision) approved by the issuing organization, current at the date of this Specification.
- .2 Reference standards and specifications are quoted in this Specification to establish minimum standards. Work of quality or of performance characteristics that exceeds these minimum standards will be considered to conform.
- .3 Should the Contract Documents conflict with specified reference standards or specification, the General Conditions of the Contract shall govern.
- .4 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information or 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.
- .5 Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in the Specifications, always available at construction site.
- .6 Standards, specifications, associations, and regulatory bodies are generally referred to throughout the specifications by their abbreviated designations. These are as follows:

ABBREVIATION	MEANING
AA	ALUMINUM ASSOCIATION
AAMA	ARCHITECTURAL ALUMINUM MANUFACTURERS' ASSOCIATION
AASHO	AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
ACI	AMERICAN CONCRETE INSTITUTE
AGA	AMERICAN GAS ASSOCIATION
AIA	AMERICAN INSTITUTE OF ARCHITECTS
AIMA	ACOUSTICAL & INSULATING MATERIALS ASSOCIATION
AISC	AMERICAN INSTITUTE OF STEEL CONSTRUCTION
AISI	AMERICAN IRON AND STEEL INSTITUTE
AMCA	AIR MOVING AND CONDITIONING ASSOCIATION INC.
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
ASHRAE	AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIRCONDITIONING ENGINEERS
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
AWI	ARCHITECTURAL WOODWORK INSTITUTE (USA)
AWMAC	ARCHITECTURAL WOODWORK MANUFACTURERS ASSOCIATION OF CANADA
AWS	AMERICAN WELDING SOCIETY
CCA	CANADIAN CONSTRUCTION ASSOCIATION
CCRC	CANADIAN CODE FOR RESIDENTIAL CONSTRUCTION
CEC	CANADIAN ELECTRICAL CODE
CFUA	CANADIAN FIRE UNDERWRITERS ASSOCIATION
CGA	CANADIAN GAS ASSOCIATION
CGSB	CANADIAN GENERAL STANDARDS BOARD
CIQS	CANADIAN INSTITUTE OF QUANTITY SURVEYORS
CISC	CANADIAN INSTITUTE OF STEEL CONSTRUCTION
CITC	CANADIAN INSTITUTE OF TIMBER CONSTRUCTION
CLA	CANADIAN LUMBERMEN'S ASSOCIATION
CMHC	CANADA MORTGAGE & HOUSING CORPORATION
COFI	COUNCIL OF FOREST INDUSTRIES OF BRITISH COLUMBIA

CPCI	CANADIAN PRESTRESSED CONCRETE INSTITUTE
CRCA	CANADIAN ROOFING CONTRACTORS ASSOCIATION
CSA	CANADIAN STANDARDS ASSOCIATION
CSC	CONSTRUCTION SPECIFICATIONS CANADA
CSI	CONSTRUCTION SPECIFICATIONS INSTITUTE (USA)
CSPI	CORRUGATED STEEL PIPE INSTITUTE
CSSBI	CANADIAN SHEET STEEL BUILDING INSTITUTE
CUA	CANADIAN UNDERWRITERS' ASSOCIATION
CWB	CANADIAN WELDING BUREAU
CWC	CANADIAN WOOD COUNCIL
DND	DEPARTMENT OF NATIONAL DEFENCE, CANADA
FM	FACTORY MUTUAL ENGINEERING CORPORATION
FS	FEDERAL SPECIFICATION (USA)
IES	ILLUMINATING ENGINEERING SOCIETY
IGMAC	INSULATED GLASS MANUFACTURERS ASSOCIATION OF CANADA
LTIC	LAMINATED TIMBER INSTITUTE OF CANADA
MIA	MARBLE INSTITUTE OF AMERICA
MPMDD	MODIFIED PROCTOR MAXIMUM DRY DENSITY
NAAMM	NATIONAL ASSOCIATION OF ARCHITECTURAL METAL MANUFACTURERS (USA)
NBFU	NATIONAL BOARD OF FIRE UNDERWRITERS
NBC	NATIONAL BUILDING CODE OF CANADA
NBS	NATIONAL BUREAU OF STANDARDS (USDC)
NEMA	NATIONAL ELECTRICAL MANUFACTURERS' ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION ASSOCIATION
NHLA	NATIONAL HARDWOOD LUMBER ASSOCIATION (USA)
NLGA	NATIONAL LUMBER GRADES AUTHORITY
NRC	NATIONAL RESEARCH COUNCIL
OBC	ONTARIO BUILDING CODE
OHSA	OCCUPATIONAL HEALTH AND SAFETY ACT
OPSS	ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
PCA	PORTLAND CEMENT ASSOCIATION
PCI	PRESTRESSED CONCRETE INSTITUTE
RAIC	ROYAL ARCHITECTURAL INSTITUTE OF CANADA
SDI	STEEL DECK INSTITUTE
SMACNA	SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION
SPMDD	STANDARD PROCTOR MAXIMUM DRY DENSITY
SSPC	STEEL STRUCTURES PAINTING COUNCIL
TTMAC	TERRAZZO, TILE & MARBLE ASSOCIATION OF CANADA
ULC	UNDERWRITERS' LABORATORIES OF CANADA
ULI	UNDERWRITERS' LABORATORIES, INC. (USA)
USAS	UNITED STATES OF AMERICA STANDARDS INSTITUTE
WSIB	WORKPLACE SAFETY AND INSURANCE BOARD

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**



1 General

1.1 GENERAL

- .1 Related Requirements Specified Elsewhere:
  - .1 Inspections and testing required by the laws, ordinances, rules and regulations of authorities having jurisdiction:
    - .1 General Conditions of the Contract.
  - .2 Verification by certification that specified products meet requirements of reference standards:
    - .1 In applicable Sections of the Specification.
  - .3 Testing, balancing and adjusting of equipment:
    - .1 In applicable mechanical and electrical Sections of the Specification.
  - .4 Cutting and Patching:
    - .1 Section 01 31 13.
  - .5 Submission of Inspection and Testing Reports:
    - .1 Section 01 33 00.

1.2 TOLERANCES FOR INSTALLATION OF WORK

- .1 Unless acceptable tolerances are otherwise specified in a Section or a reference standard 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 3mm in 3048mm (1/8" in 10').
  - .2 "square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.
  - .3 "straight" shall mean within 3mm (1/8") under a 3048mm (10') long straight edge.

1.3 CONSTRUCTION REVIEW

- .1 The Consultant and his sub-consultants may carry out construction review during the progress of the work. The Consultant's general review during construction, and inspection and testing by independent inspection and testing companies reporting to the Consultant, are both undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve him of contractual responsibility.

1.4 QUALITY CONTROL

- .1 Bring to the attention of the Consultant any defects in the work or departures from the Contract Documents which may occur during construction. The Consultant will decide upon corrective action and state his recommendations in writing.
- .2 The Consultant may appoint and direct inspection and testing companies to review completed work in addition to inspection and testing specified for inclusion in the work under Source and Field Quality Control in other Sections.

1.5 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 Specification.
  - .2 Do not include in work of this Section responsibilities and procedures that relate solely to an inspection and testing company's function under the direction of the Owner and that

are specified in another Section which is paid for directly by the Owner. Such information is included in this Section for only the Contractor's information.

- .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 Payment for Inspection and Testing Services:
  - .1 Payment for specified inspection and testing will be made by the Contractor, as required by each applicable Section.
  - .2 Payment for reinspection and retesting of defective and rejected work shall be made by the Owner and backcharged to the Contractor.
  - .3 Contractor to engage approved company(s) for inspections and tests for additional inspections and tests as may be performed for the Contractor's own purposes and convenience. Include cost of this inspection and testing in the Stipulated Price Contract.
  - .4 Include cost in the Stipulated Price Contract for tests of reinforcing steel for which no mill tests are submitted.

#### **1.6 INSPECTION AND TESTING SERVICES AND REFERENCE STANDARDS**

- .1 Qualifications of Inspection and Testing Companies:
  - .1 Companies engaged for inspection and testing shall provide equipment, methods of recording and evaluation, and knowledgeable personnel to conduct tests precisely as specified in reference standards.
  - .2 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.
  - .3 Inspection and testing of concrete and concrete materials will be carried out by a CSA Certified testing laboratory to CSA A283, for review in accordance with CSA A23.1/A23.2.
- .2 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.

#### **1.7 SUBMITTALS**

- .1 Submit inspection and testing reports in accordance with Section 01 33 00.

#### **1.8 RESPONSIBILITIES OF THE CONSULTANT**

- .1 The Contractor will submit a list of Inspection and Testing companies to the Consultant for his review.
- .2 The Consultant and Contractor will direct inspection and testing companies in the type and extent of inspection and testing to be undertaken.
- .3 The Consultant will receive submitted reports of inspections and tests for evaluation and will decide upon any actions that may be required.
- .4 The Consultant will provide Drawings and Specifications required by inspection and testing companies.

#### **1.9 RESPONSIBILITIES OF THE CONTRACTOR**

- .1 Inspection and testing performed by firms engaged for Source and Field Quality Control specified in other Sections shall not relieve the Contractor from responsibility of performing his work in accordance with the Contract Documents.
- .2 Provide access for inspection and testing personnel to work in progress and to fabricator's operations.

- .3 Provide samples of materials to be tested in required quantities at locations testing is performed.
- .4 Submit copies of mill test reports in accordance with Section 01 33 00.
- .5 Provide labour and facilities:
  - .1 To facilitate inspections and tests.
  - .2 For storing of specimens at required temperature and free from vibration, in conformance with reference standard and inspection and testing company instructions.
  - .3 For obtaining, handling and transporting of samples at site and plant.
- .6 Notify Consultant, and inspection and testing company at least 48 hours before work to be inspected and tested commences.
- .7 When it is discovered on inspection that work is proceeding with incorrect materials or methods, ensure that corrections are immediately made and that improperly completed work is replaced.
- .8 Inspect all work done by subtrades prior to application of final cover materials i.e. pressure plates, drywall ceilings, concrete slab pours and the like.

#### **1.10 RESPONSIBILITIES OF INSPECTION AND TESTING COMPANIES**

- .1 Determine from Specifications and Drawings the extent of inspection and testing required for work of contract as directed by Consultant. Notify Consultant of any omissions or discrepancies in the work inspected and/or tested.
- .2 Perform applicable inspection and testing described in the Specification 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 co-operate with the Consultant and Contractor to expedite the work.
- .4 Inform the Consultant of intended scheduling of inspections and of each visit of inspection personnel to the work site and fabricator's operations.
- .5 Notify the Consultant and Contractor of deficiencies and irregularities in work immediately they are observed in course of inspections and tests.
- .6 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.

#### **1.11 INSPECTION AND TESTING PROCEDURES**

- .1 Perform specified inspection and testing only in accordance with specified reference standards, or as approved.
- .2 Observe and report on compliance of 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 work is being performed in accordance with the Contract Documents.
- .4 Identify samples.
- .5 Identify sources of materials.
- .6 Review and report on progress of work. Report on count of units fabricated and inspected at fabricator's operations.
- .7 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 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.
- .8 Include in reports all information critical to inspection and testing.
- .9 Ensure that only materials from the work and intended for use therein are tested.
- .10 Determine locations for work to be tested.

#### **1.12 DEFECTIVE WORK**

- .1 Where factual evidence exists that defective workmanship has occurred or that work has been carried out incorporating defective materials, the Consultant may have tests, inspections or surveys performed, analytical calculation of structural strength made, and the like, in order to help determine whether the work must be replaced. Testing, retesting, inspections or surveys carried out under these circumstances will be made at the Contractor's expense, regardless of their results, which may be such that, in the Consultant's opinion, the work may be acceptable.
- .2 All testing shall be conducted in accordance with the requirements of the Consultant.
- .3 Defective work discovered before expiration of the warranty period specified in the General Conditions of the Contract, as may be extended in this Specification, will be rejected, whether or not it has been previously inspected. If rejected, defective materials or work incorporating defective materials or workmanship shall be promptly removed and replaced or repaired to the satisfaction of the Consultant, at no expense to the Owner.

#### **1.13 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 Provide control joints in exterior building components of design and spacing which will permit expansion and contraction of components without causing distortion, failure of joint seals, undue stress, cracking, bowing or other defects detrimental to appearance and performance. Review design and location of control joints with Consultant prior to start of work and follow directions given by Consultant.
- .4 Anchor exterior cladding components to structure in manner suitable to accommodate structural deflection and creep. 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 that air spaces on the outside of vertical air barrier/vapour retarder (walls) are constructed with adequate drainage provisions to the exterior.

#### **1.14 DRAINAGE**

- .1 Lay out and construct work to ensure that positive drainage is provided to roof drains, floor drains, 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.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

1.1 GENERAL

- .1 Include in the work construction of temporary facilities as required for the performance of the work as construction aids and as required by authorities having jurisdiction, or as otherwise specified. Install to meet needs of construction as work progresses. Maintain construction and temporary facilities during use, repair them when damaged, relocate them as required by the work, remove them at completion of need, and make good adjacent work and property affected by their installation.
- .2 Include in the work, construction of temporary facilities to provide for construction safety such as: fences, barricades, bracing, supports, storage, sanitation and first aid facilities, fire protection, stand pipes, electrical supply, temporary heat, steam supply, ventilation, construction equipment with its supports and guards, stairs, ramps, platforms, runways, ladders, scaffolds, guardrails, temporary flooring, rubbish chutes, and walkway, morality and guard lights, all as required of the Construction by the Occupational Health and Safety Act of the Province of Ontario, latest edition, as well as all other regulations of the authorities having jurisdiction.
- .3 Construct temporary work of new materials unless otherwise approved.
- .4 Ensure that structural, mechanical, and electrical characteristics of temporary facilities are suitable and adequate for the use intended. Be responsible that no harm is caused to persons and property by failure of temporary facilities because of placing, locations, stability, protection, structural sufficiency, removal, or any other cause.
- .5 Prepare shop drawings and specifications of temporary work, and submit for approval of authorities having jurisdiction if so required. Submit duplicate copy to Consultant for his information.
- .6 Locate temporary facilities where shown on Drawings or as directed.
- .7 Apply two coats of paint, in approved colours, to temporary constructions, such as storage sheds; offices; supports; bracing and back side of signs; barricades; and where otherwise specified.
- .8 Temporary Electric Service:
  - .1 Provide and maintain an adequate temporary electrical service for performance of the Work including, but not limited to, operation of electric pumps, motors, vibrators and other power tools, hoisting and related construction and general illumination during the Work. Provide power at temporary storage sheds and field office when required.
  - .2 Make connections available to any part of the work within distance of a 3048mm (10') extension. Each Subcontractor shall be responsible for their own extension cords.
  - .3 Contractor shall provide and be responsible for payment of temporary power required for all equipment for construction use in excess of available existing sources.
  - .4 Provide and maintain any components and equipment necessary to transform supply power to necessary temporary power voltage.
  - .5 Contractor will be permitted use of existing power for construction purposes at no cost to the Contractor. Provide additional temporary power for individual tasks required by the technical sections
- .9 Temporary Lighting:
  - .1 Install lighting for the following:
    - .1 Emergency evacuation, safety and security throughout the Project at intensity levels required by authorities having jurisdiction.
    - .2 Performance of work throughout work areas as required, evenly distributed, and at intensities to ensure proper installations and applications are achieved.

- .3 Performance of finishing work in areas as required, evenly distributed, and of an intensity of at least 30 foot candles.
- .2 Permanent lighting may be used during construction, provided lamps, fluorescent tubes and ballasts that are so used are replaced with new at time work is turned over to Owner.
- .10 Temporary Heating and Ventilation:
  - .1 Provide and pay for temporary heating, cooling and ventilating required for the Work, including attendance, maintenance and fuel.
  - .2 Provide temporary heat and ventilation as required to:
    - .1 Facilitate continuous uninterrupted progress of the Work.
    - .2 Protect the Work and Products against damage and defacement caused by weather, harmful levels of temperature, humidity, and moisture.
    - .3 Provide ambient temperatures and humidity levels for proper storage, installation and curing of materials, in accordance with specified standards and manufacturer's requirements.
    - .4 Provide adequate ventilation to meet health regulations for safe working environment.
  - .3 Maintain work areas at not less than 7 deg C. Increase temperatures in isolated areas to 20 deg C as required by various sections of the specifications or by Product manufacturers.
  - .4 Solid fuel salamanders will not be permitted.
  - .5 Provide temporary heat or adequate protection by means of straw or other coverings to floor slabs, footings, or any part of building not specifically designed to withstand frost penetration.
  - .6 Furnish other temporary heating as required by various sections of the specifications or by Product manufacturers.
  - .7 Replace with new, any work damaged due to failure to provide adequate heat at no cost to Owner.
  - .8 If possible, and when approved by the Owner, the permanent heating and ventilation system may be used during construction. If approved, the Contractor shall be responsible for its operation, and for replacing and repairing damage it may suffer, and shall assume operation and maintenance of the system in all its parts and payment for fuel consumed.
  - .9 Operation and maintenance shall include inspection at least every two weeks of thermostats, valves, switches, lubrication, fan, belt and motor adjustment, cleaning and/or replacement of filters, and replacement of filters and re-servicing of system at completion of work.
  - .10 Connect electric motors only to permanent source of power, or otherwise provide proper source with correct design characteristics and with no fluctuation in voltage.
  - .11 Commence warranty period after re-servicing and from time the Owner takes over the premises.
- .11 Temporary Water Supply:
  - .1 Provide water of potable quality for all construction purposes, at one location at least, on each floor area.
  - .2 Extend supply pipe or pipes from nearest available sources and maintain in good condition until no longer required.

- .3 If possible, and when approved by the Owner, the permanent site water source be used to provide water during construction.
- .12 Temporary Sanitary Facilities:
  - .1 Provide sanitary facilities for persons on the work site as approved by the authorities having jurisdiction. Install them in sufficient number and maintain them in a sanitary condition.
  - .2 Do not permit construction personnel to use washroom and toilet facilities on premises which have been installed as part of the new work or which are part of the existing building for use by non-construction personnel.
- .13 Temporary First-Aid Facilities:
  - .1 Provide site equipment and medical facilities necessary to supply first-aid service to injured personnel in accordance with regulations of the Workers' Compensation Act. Maintain facilities for duration of Contract.
- .14 Connections to Utilities:
  - .1 Make arrangements for connections to water, sewer, gas, electric, and telephone utilities as required for temporary use during construction.
  - .2 The Owner is responsible for payment of final connection charges that are part of service contracts between him and each utility.

## 1.2 CONSTRUCTION AIDS

- .1 Hoists and Cranes:
  - .1 Each Subcontractor is responsible for providing his own hoisting and crane operations. Equipment shall be operated by qualified hoist and/or crane operators.
  - .2 Where multiple trades are involved in high level work, the Contractor shall co-ordinate the hoisting and trade requirements.
- .2 Building Enclosure:
  - .1 Include in work, temporary enclosures for building as required to protect it, 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. Design enclosures to withstand wind pressures required for the building by authorities having jurisdiction.
  - .2 Use structural framing of building for support of temporary enclosure framing only upon verification that the load limits of the building frame will not be exceeded. Erect enclosures to allow complete accessibility for installation of materials during the time enclosures remain in place.
- .3 Scaffolding:
  - .1 Each Subcontractor shall provide his own scaffolding.
  - .2 Scaffolding shall be erected clear of walls, and to ensure that it does not interfere with continuing work.
  - .3 Subcontractor shall be responsible for its examination for sufficiency of his scaffolding and be responsible for accidents due to its insufficiency.
  - .4 The Contractor will be responsible for co-ordination of scaffold work if multiple trade usage can be achieved from one installation.
- .4 Provide temporary stairs, ladders, ramps required for movement and placing of materials, equipment and personnel.

## 1.3 TEMPORARY BARRIERS



- .1 Provide temporary hoarding and fencing as specified in Section 01 56 26 Temporary Fencing and Barriers and complying with the local Building Code, all other by-laws of the municipality and all other authorities having jurisdiction.

#### 1.4 PROTECTION

- .1 Provide temporary protection to construction as required by the Work, to protect it from damage.
- .2 Box with wood or otherwise protect from damage, by continuing construction, finished sills, jambs, corners, and the like.
- .3 Adequately protect the Work at all stages of operations and maintain protection until the Work is completed. Remove and replace, at no additional cost to Owner, damaged Work and materials that cannot be repaired or restored to the approval of the Consultant.
- .4 Provide spare safety helmets for and enforce their use by Owner, Consultants, and representatives and authorized visitors to the site.
- .5 In addition to requirements of authorities having jurisdiction, provide temporary protection and safeguards adequate to protect against:
  - .1 Accident or injury to workers and other persons on the site or adjacent work and properties.
  - .2 Damage to any part of the Work and to any adjoining or adjacent structure, property, services, and other similar items, by overloading, weather, frost, any other cause resulting from the execution of the Work.
  - .3 Protect work, existing property, adjacent tenant and public property from damage during performance of Work. Should any part of the Work or any buildings, services or similar items on or surrounding the areas of the work and adjacent to any road leading thereto become damaged or disfigured due to lack or failure of such protection, they shall be made good with material identical with the existing and adjoining surfaces, to the satisfaction of the authorities having jurisdiction and the Owner.
  - .4 Damaged work shall be made good by those performing work originally, or workers experienced or skilled in that particular type of work, at expense of those causing damage.
  - .5 Provide and maintain necessary temporary enclosures, hoardings, fences, gates, barriers, guards, hoists, cranes, stairs, ladders and scaffolding, walks, platforms, staging as necessary for the Work and protection of workers, public and others from injury, and for public access to adjacent buildings. All such apparatus shall meet requirements of the authorities having jurisdiction.
  - .6 Provide secure, rigid guard railings, hoardings and barricades around openings, as required by authorities having jurisdiction and to maintain safety.
  - .7 Provide proper guard devices, signs, signals and lights for the prevention of accidents.
  - .8 Maintain at night, sufficient and suitable warning lights to prevent accidents and injuries to persons and/or property.
  - .9 Alter, remove and relocate or replace hoardings, barriers and entrances as required by the Work. Hazards requiring such protection shall be eliminated as soon as possible and protection devices removed. Maintain protection until state of construction allows their removal.
  - .10 Provide and maintain temporary weathertight protection for all exterior openings in walls, floors and roofs until the building is closed in.
  - .11 Close off floor areas where walls are not finished, seal off openings and enclose building interior work area. Polyethylene or other approved translucent material shall be framed in or around wall openings. Provide temporary doors, frames, hinges, locks, keys and bolts as required.

- .12 Should the work be stopped for any cause, provide protection and bracing for the Work.
- .6 Lay protective 13mm (1/2") plywood over completed areas of roof on which other trades are to work.

### 1.5 PUBLIC PROTECTION

- .1 Provide fencing, barricades, hoarding, notices and warning boards and maintain lights and signals for protection of workers engaged on the Work, for protection of adjoining property and for protection of the public.
- .2 Such protective measures shall be finish painted to Owner's approved colour, when visible to the public.
- .3 Where any special hazard exists from which it is not possible to protect the public safety by other means, watchpersons shall be employed to preserve public safety until the area of special hazard no longer poses a risk to public safety.

### 1.6 PLANT PROTECTION

- .1 Protect all existing trees and landscaping which is to remain at the Place of the Work, using methods and materials recommended by the Canadian Nursery Trades Association and as approved by the Consultant.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2440 mm (8').
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Provide minimum 1.8 m high chain link fencing outside of dripline of trees or groups of trees and other plants. 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.
- .5 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.
- .6 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.
- .7 Where necessary give plants an overall pruning to restore the balance between roots and top growth and/or to restore appearance.
- .8 Minimize stripping of topsoil and vegetation.
- .9 Restrict tree removal to areas indicated or designated by Consultant.

### 1.7 FIRE SAFETY REQUIREMENTS

- .1 Comply with fire and safety regulations required by the authorities having jurisdiction.
- .2 Take necessary precautions to eliminate fire hazards and to prevent damage to Work, building materials, equipment and other property both public and private having to do with Work. Inspect Work at minimum weekly intervals for this purpose.
- .3 Store and locate products and equipment packed in cardboard cartons, wood crates and other combustible containers in orderly and accessible manner.
- .4 Tarpaulins shall be fire-resistant.
- .5 Open fires and burning of rubbish are not permitted on the site.
- .6 Provide and maintain in working order, ULC labelled fire extinguishers or other approved fire extinguishing equipment, locate in prominent positions, in accordance with requirements of authorities having jurisdiction and insurance companies having jurisdiction, codes, regulations and bylaws in the building until the permanent fire protection system in the building is available.

- .7 Provide temporary standpipe system, when required by authorities having jurisdiction.
- .8 Except as otherwise specified herein, soldering, welding and cutting operations shall be carried out in areas free of combustible and flammable contents, with walls, ceilings and floors of noncombustible construction or lined with noncombustible materials.
- .9 When it is not practicable to undertake welding, soldering and cutting operations in areas described in the previous paragraph, combustible and flammable materials shall either be removed minimum of 9144mm (30') from the work area or otherwise protected against ignition by sheet metal or other noncombustible material.
- .10 When welding, soldering, or cutting is to be carried out near piping containing flammable gas, the section of piping located within 914mm (3') of the torch or other source of combustion shall be covered with wet, noncombustible insulating material at least 6mm (1/4") thick.
- .11 Prior to initiating any open flame work or welding operation, discuss the proposed work with the Consultant and take necessary precautions to prevent inadvertent activation of the existing fire alarm system. Have sufficient suitable hand operated fire extinguishers on hand near the work area. Ensure that an additional person is readily available to operate fire extinguishers should the need arise.

#### 1.8 PERSONAL HEALTH AND SAFETY REQUIREMENTS

- .1 Comply with all requirements of the Occupational Health and Safety Act, Ministry of Labour, Construction Safety Association and all other authorities having jurisdiction in the place of the Work.
- .2 Contractor shall submit company safety policy for review by Owner and Consultant. The policy must meet or exceed the requirements of the authorities having jurisdiction.
- .3 Contractor shall employ and pay for services of safety supervisor in accordance with the requirements of the authorities having jurisdiction. Safety supervisor shall have training with the Construction Safety Association.
- .4 Alcohol and/or drugs will not be allowed on the site. Anyone found in possession of alcohol and/or drugs shall be dismissed from the site immediately and without notice, maybe subject to civil and/or criminal proceedings.
- .5 WHMIS program shall be fully enforced.
- .6 Contractor shall be prepared to sign the "Guidelines For The Structure and Function Of The Joint Occupational Health and Safety Committee", if requested by the Owner.
- .7 When carrying out soldering, welding or cutting procedures, be it in shop or in the field, ensure that workers comply with the following:
  - .1 Wear appropriate protective clothing such as gloves, leather aprons and/or arm spark guards.
  - .2 Wear suitable goggles or face shields as appropriate.
  - .3 Protect co-workers from eye or other injuries through the use of fire resistant portable shielding devices.
  - .4 Provide and use a portable fume eliminator at all times during welding, soldering, or cutting operations within the existing building.

#### 1.9 SECURITY

- .1 Maintain security of construction site by control of access through enclosing barricades, and hoardings during times work is in progress, and by locking hardware.
- .2 Properly close and lock the construction site at nights, Sundays, holidays and other occasions when the Work is not in progress.
- .3 The Owner assumes no responsibility for the safeguarding of tools or equipment from theft.

- .4 Take precautions to guard construction site, premises, materials and the public during and after working hours. During regular working hours, maintain watch to guard construction site and contents.
- .5 Maintain security at all times construction is shut down because of a strike or a lockout.
- .6 Provide security guards and security lighting during all after hour work.
- .7 Provide personnel to direct traffic as required during working hours.

#### **1.10 ACCESS ROADS, WALKS AND PARKING**

- .1 Access Roads and Walks:
  - .1 All construction vehicles and personnel required for construction shall use existing access roads and walks as determined at later date by Owner. When no longer required, or at completion of Work, make good disturbed surfaces. Maintain roads and walks, removing dirt, mud, debris, ice, snow and other obstructions during use.
  - .2 Provide for access of emergency vehicles at all times.
- .2 Parking:
  - .1 Parking for Contractor's, subcontractors, suppliers and/or their employee's vehicles shall be limited to restricted area as designated by the Owner.
  - .2 The Owner, property management and their employees will not be responsible for parking fines incurred by the Contractor, Subcontractors, suppliers and/or their employees.

#### **1.11 SITE SIGNS**

- .1 No signs, bills or posters will be allowed on the site, other than site signs as follows:
  - .1 Project construction sign shall be supplied and installed by Owner under work of separate Contract.
  - .2 Place only specified project construction sign and notices regarding safety, caution, or instructions on or near site.
  - .3 No unauthorized signs, bills, posters or advertisements of any kind are permitted. Should such unauthorized advertisements be applied to the temporary hoarding by the public or anyone else, upon discovery of such, the Contractor shall remove them on a weekly basis.
  - .4 Erect all notices as directed by Owner.
  - .5 Remove all notices on completion of the Contract.

#### **1.12 FIELD OFFICES AND SHEDS**

- .1 Field Offices:
  - .1 Provide temporary offices for Owner's, Consultant's and Contractor's use. They shall contain facilities as required for Contractor, a conference table and chairs for site meetings, and facilities for the Owner and the Consultants.
  - .2 Temporary field offices shall be designated on site until such time where an area located inside the constructed building, can be designated by the Owner. No other location shall be used for temporary field office. Temporary site office shall not exceed 3048mm (10') x 15240mm (50').
  - .3 Facilities shall consist of: an office desk and chair, a two drawer filing cabinet, two chairs, use of a telephone, use of facsimile machine, and a layout table for drawings located so that when drawings are spread out their orientation is same as that of building under construction.
  - .4 Heat, cool and light offices to minimum code requirements for office buildings.

- .5 Keep temporary field office clean and remove all rubbish at the end of each work day.
- .6 Include construction and operating hardware, with security locks, as required by the Owner.
- .2 Site Storage:
  - .1 Until such time where an area can be located inside the constructed building, designated by the Owner as a temporary site storage, provide storage trailers or construct weather-tight storage sheds for storage of materials that may be damaged or defaced by weather, in locations indicated by the Owner.
  - .2 Provide floors raised 150 mm (6") clear of ground for storage of Products.
  - .3 Include security locks, as required.
  - .4 Install lighting in storage areas and heat in those storage areas containing materials damaged by low temperature.
  - .5 Provide separate shed located where directed in writing by Consultant for storage of volatile materials.
  - .6 Owner is not responsible for securing Products or materials at the Place of the Work.
  - .7 Handle and store materials so as to prevent damage or defacement to the Work and surrounding property.

#### 1.13 DUST CONTROL

- .1 Provide dust tight screens or barriers to localize dust generating activities for the protection of tenants, employees, equipment, adjacent and finished areas of Work, and the public. Maintain and relocate protection until Work is complete. Respond immediately to complaints of dust received from the public, authorities having jurisdiction, Owner and Consultant.
- .2 Obtain Consultant's approval of installed dustproof screens and protection methods before proceeding with construction/alteration work.
- .3 Painted gypsum wallboard and metal stud dustproof screens shall extend to underside of structure, and shall be erected to protect adjoining areas and rooms. Apply bead of sealant or other acceptable seal continuously around periphery of each face of partitioning to seal gypsum board/structure junction where dustproof screens abut fixed building components. Seal perimeter of cutouts, around fixtures and fittings and other penetrations. Tape or seal between adjacent boards. Separate construction areas from occupied areas.
- .4 Provide protection for existing equipment sensitive to dust and noise. Co-ordinate location of dust barriers and dust tight doors with Consultant.
- .5 Install temporary packing at bottom of doors to areas where demolition/construction shall be performed to prevent dust seepage into existing spaces. Do not permit dust and dirt to escape beyond area being constructed/altered.
- .6 Provide daily vacuuming of construction dust from existing areas as work progresses; this shall be considered a minimum requirement, increase vacuuming as necessary. The Owner may have vacuuming work done by others and cost deducted from Contractor's progress payments if this requirement is not fulfilled.
- .7 Provide locked doors in barriers to permit access by Consultant, Owner and Owner's security personnel to construction areas and to areas under Contractor's custody. Supply padlocks and construction cores.
- .8 Remove dustproof screens at completion of work in areas and make good damaged or blemished areas. Patch and make good to access, altered and damaged areas caused by work and screens. Maintain integrity of fire or sound separation.

- .9 Prevent nuisance to adjacent areas near the work from dust by taking additional appropriate anti-dust measures at such times as found necessary, and at other times complaints of dust are received from the Owner's representative and others.

#### **1.14 NOISE AND VIBRATION CONTROL**

- .1 Take measures to control noise and vibration generated by the Work.
- .2 Take appropriate noise and vibration control measures at times found necessary, and at other times complaints of noise are received from the public, authorities having jurisdiction, Owner and Consultant.
- .3 These requirements are for the consideration of the public, tenants and employees. Requirements shall not be construed as cause for elimination or restriction of Contractor's working schedule, claims for delay of work nor additional costs.

#### **1.15 COLD WEATHER WORKING**

- .1 Particular attention is drawn to the requirement that the Contractor shall commence work immediately the Contract is awarded and shall continue full scale operations throughout the winter months and thereafter until the work is completed and accepted by the Consultant.
- .2 It is understood that the Contract Price includes sufficient funds for the provisions of temporary heating, temporary shelters and all other necessary cold weather measures to enable all trades to proceed without delay regardless of weather.

#### **1.16 SNOW REMOVAL**

- .1 Allow no accumulation of ice and snow within the Place of the Work. There shall be no use of salt for de-icing in areas of building work.
- .2 Remove snow from access routes to the Work to maintain uninterrupted progress of the Work.

#### **1.17 PEST CONTROL**

- .1 Provide rodent control and other pest control programs during the Work in accordance with the requirements of authorities having jurisdiction.

#### **1.18 FIRES**

- .1 Open burning fires on site will not be permitted.

#### **1.19 FIRST AID SERVICES**

- .1 Provide and maintain First Aid services as required by the authorities having jurisdiction, the Workplace Safety and Insurance Board (WSIB) and Union Agreements.

#### **1.20 TRAFFIC CONTROL**

- .1 Do not block roads or impede traffic. Keep construction traffic to designated roads only. Provide flag-person to direct traffic as required.
- .2 Provide a hard surface area at the Place of the Work for cleaning down trucks prior to entry onto municipal roads or private roads outside of the Place of the Work.
- .3 Keep public and private roads free of dust, mud and debris resulting from truck, machinery and vehicular traffic related specifically to this Project, for the duration of Work.
- .4 Clean roads regularly, public or private. Wash down and scrape flush roads at least daily when earth moving operations take place. Maintain public property in accordance with requirements of authorities having jurisdiction.

#### **1.21 ENVIRONMENTAL/POLLUTION CONTROL/SITE CLEANING**

- .1 Prevent the escape of untreated effluent, be it liquid or gaseous substance or any liquid or solid wastes, being objectionable or detrimental to adjoining areas of the construction site.
- .2 Burning or burying of rubbish, waste, and the like is not permitted on construction site.

- .3 Only fires for heating bitumen and temporary heaters as specified are permitted on site.
- .4 Take care to prevent staining or smoke damage to structure or materials. Replace stained or damaged work.
- .5 Make every effort to provide environmental protection, take precautionary measures to prevent excessive noise, sounds, vibrations, dust, air pollution, smoke, etc., which may become objectionable to people occupying adjacent areas.
- .6 Keep building site clean and free of unsightly collection of waste materials and debris. Provide for temporary storage and collection of waste materials, and dispose to local authorities having jurisdiction recommendations at intervals to maintain a clean site condition.
- .7 Confine apparatus, the storage of materials and the operations of workers to the site. Do not unreasonably encumber the premises with construction materials.

#### 1.22 TEMPORARY DRAINAGE AND DEWATERING

- .1 The Work includes the removal of collected groundwater and surface water accumulating from precipitation and groundwater infiltration throughout the course of the Work until date of Substantial Performance of the Work.
- .2 Keep drainage lines and gutters open. No flow of water shall be directed across or over pavements except through pipes or properly constructed troughs. Keep portions of the Work properly and efficiently drained during construction and until completion. Be responsible for disturbances, dirt and damage which may be caused by or result from water backing up or flowing over, through, from or along any part of the Work, or due to operations which may cause water to flow elsewhere.
- .3 Keep trenches and other excavations free of water. Remove water in a manner that will prevent loss of soil, and maintain the stability of existing soils.
- .4 Dispose of such water in a manner that will not be hazardous to public health and safety, private property, or to the Work.
- .5 Drainage of trenches or other excavation through storm drainage pipe will be allowed only with the express permission of the authority having jurisdiction.
- .6 When drainage is permitted in writing to be directed to existing catch basins, regularly and at Substantial Performance of the Work inspect such catch basins and remove accumulated debris and sediment.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

**1.1 SECTION INCLUDES**

- .1 Requirements for temporary hoarding.

**1.2 PERMITS**

- .1 Arrange and pay for necessary permits for proper execution and completion of the work of this section.

**1.3 SUBMITTALS**

- .1 Shop Drawings:
  - .1 Submit shop drawings for temporary barriers and enclosures in accordance with Section 01 33 00.
  - .2 Clearly indicate details of construction, profiles, jointing, fastening and other related details.

**1.4 HOARDING DESIGN**

- .1 Design hoarding to meet bylaws and regulations of authorities having jurisdiction and obtain approvals from authorities having jurisdiction.
- .2 Location and types of hoarding as indicated on Drawings.
- .3 Design and install hoarding to withstand wind loads at the Place of the Work without collapse, permanent deformation, or other failure of the hoarding system.

2 Products

**2.1 HOARDING MATERIALS**

- .1 Plywood Hoarding:
  - .1 Provide rough hardware required for the work of this section.
  - .2 Framing lumber and posts: Unless otherwise specified or indicated, NLGA No. 2 Construction SPF.
  - .3 Reused material may be used.
  - .4 Dimensions as follows, unless otherwise indicated or required by authorities having jurisdiction:
    - .1 Vertical posts: 89 mm x 89 mm (3-1/2" x 3-1/2").
    - .2 Horizontal rails: 39 mm x 89 mm (1-1/2" x 3-1/2").
    - .3 Hoarding: Plywood, 1220 mm x 2440 mm x 13 mm thick (4' x 8' x 1/2"), sheathing grade conforming to CSA 0141-M1978.
    - .4 Reused material may be used.
    - .5 Hoarding to be painted in accordance with Section 09 90 00. Colour: As selected by the Consultant.
- .2 Chain Link Hoarding:
  - .1 Fence fabric: 3.75 mm diameter (No. 9 gauge) steel wire woven in a 50 mm (2") mesh, hot dipped galvanized after weaving and knuckled finish top and bottom selvage edges.
  - .2 Galvanized fabric to have a minimum zinc application of 490 g/m<sup>2</sup> of surface area.
  - .3 Posts: CLFMI (Chain Link Fence Manufacturer Institute) Type 1, standard butt welded Schedule 40, ASTM F1083-10 standard weight, galvanized pipe.



- .4 Provide prefabricated panelized chain link and post galvanized metal hoarding system.
- .3 Signage: Provide suitable sized notice signs at entrance to the Place of the Work with contrasting text "RESTRICTED ACCESS - CONSTRUCTION SITE" complete with the name of Contractor.

3 Execution

**3.1 HOARDING FABRICATION**

- .1 Provide hoarding immediately upon award of Contract.
- .2 Erect framing members and install hoarding panels at the perimeter of the Place of the Work as indicated or required by authorities having jurisdiction to fully enclose the Place of the Work and as follows, unless otherwise indicated or required by authorities having jurisdiction:
  - .1 Height of hoarding: 2440 mm (8') minimum, unless otherwise indicated, above grade at any point.
  - .2 Vertical posts spaced 2440 mm (8') on centre, maximum.
  - .3 Vertical posts: Set a minimum of 1220 mm (4') in the ground.
  - .4 Horizontal rails securely nailed or screwed to vertical posts at top, bottom, and intermediate locations at 610 mm (24") on centre.
  - .5 Erect panels around objects as required.
  - .6 Hoarding shall contain no opening more than 100 mm (4") wide or less than 914 mm (3') above the bottom of the fence except where required for access to and from the Place of the Work.
  - .7 Provide no rails, other horizontal or diagonal bracing, attachments, or pattern of openings on the outside that would facilitate climbing.
  - .8 At access openings: Provide gates that provide performance and safety at least equivalent to hoarding and contain wire mesh of sufficient openness to provide visibility for traffic entering or exiting the Place of the Work.
- .3 Provide overhead protection hoarding where public access is required.
- .4 Provide hoarding, access gates, access doors, in conformance with the Contract Documents and authorities having jurisdiction.
- .5 Incorporate silt control fabric from 200 mm (8") below existing grade and attach to hoarding to provide silt control to requirements of authorities having jurisdiction and Owner.
- .6 Mesh fencing: Erect metal posts at 3050 mm (10') on centre maximum with tensar mesh.
- .7 Hoarding hardware: Provide rough and finish hardware as required.

**3.2 DESIGN AND SAFETY REQUIREMENTS FOR TEMPORARY WORK**

- .1 Be responsible for design, erection, operation, maintenance and removal of temporary structural and other temporary facilities, barriers, and enclosures.
- .2 Engage and pay for registered professional engineering personnel skilled in the appropriate disciplines to perform these functions where required by law or by the Contract Documents; and in cases where such temporary facilities and their method of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results.
- .3 Engage and pay for professional engineer(s) registered in Place of the Work to design and supervise construction and maintenance of hoardings, covered ways, protective canopies and project sign(s). Designs provided by Consultant or Owner for such work cover general appearance only.

END OF SECTION

1 General

1.1 GENERAL

- .1 Products refer to materials, manufactured components and assemblies, fixtures and equipment incorporated in the work.
- .2 Use only products of Canadian manufacture unless such products are not manufactured in Canada, are specified otherwise, or are not competitive.
- .3 Products for use in the Project and on which the Bid was based shall be in production at time of tender date, with a precise model and shop drawings available for viewing.
- .4 Where equivalent products are specified, or where alternatives are proposed, these products claimed by the Contractor as equivalent shall be comparable in construction, type, function, quality, performance, and, where applicable, in appearance. Where specified equivalents are used in the Stipulated Price for the work, they shall be subject to final approval.
- .5 Incorporate products in the work in strict accordance with Manufacturers' directions, instructions and specifications, where reference is made to them, shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, and other matters concerning the materials that are pertinent to their use and their relationship to materials with which they are incorporated.
- .6 Products delivered to the Project site for incorporation in the work shall be considered the property of the Owner. Maintain protection and security of products stored on the site after payment has been made for them.
- .7 Do not install permanently incorporated labels, trademarks and nameplates, in visible locations unless required for operating instructions or by authorities having jurisdiction.

1.2 PRODUCT HANDLING

- .1 Manufacture, pack, ship, deliver and store products so that no damage occurs to structural qualities and finish appearance, nor in any other way detrimental to their function or appearance, or both.
- .2 Ensure that products, while transported, stored or installed, are not exposed to an environment which would increase their moisture content beyond the maximum specified.
- .3 Schedule early delivery of products to enable work to be executed without delay. Before delivery, arrange for receiving at site.
- .4 Deliver and store products at site where directed by the Contractor.
- .5 Brace work such as door frames, large window units and similar products to prevent distortion or breakage in handling.
- .6 Deliver packaged products, and store until use, in original unopened wrapping or containers, with manufacturer's seals and labels intact.
- .7 Label packaged products to describe contents, quantity and other information as specified.
- .8 Label fire-rated products to indicate approval of Underwriters' Laboratories.
- .9 Product handling requirements may be repeated, and additional requirements specified, in other Sections.

1.3 STORAGE AND PROTECTION

- .1 Store products on site with secure protection against all harmful environmental conditions. Prevent damage, adulteration, staining and soiling of materials while stored.
- .2 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup. Protection shall be easily removable without damage to finishes.

- .3 Store manufactured products in accordance with manufacturers' instructions.
- .4 Store steel, lumber, masonry units, and similar products on platforms raised clear of ground.
- .5 Store finished products and woodwork under cover at all times.
- .6 Do not store products at locations or in such a manner that they damage previously completed work.
- .7 Storage and special protection requirements may be repeated and additional requirements specified, in other Sections.

#### 1.4 SCHEDULING OF PRODUCT DELIVERY

- .1 Verify that products supplied by all Sections are ordered from suppliers in sufficient time to ensure delivery for incorporation in the work within the time limits established by approved construction schedule.
- .2 Obtain confirmed delivery dates from product suppliers.
- .3 Immediately inform the Consultant should supplier's confirmation of delivery dates indicate that Project completion may be delayed.
- .4 Submit copies of purchase orders and confirmations of delivery dates for products as may be requested.
- .5 A schedule of product delivery shall be established and reviewed at each job site meeting.
- .6 When deemed necessary, plant visits shall occur by the General Contractor to ensure delivery dates given are true and accurate.

#### 1.5 DEFECTIVE PRODUCTS AND WORK

- .1 Products and work found defective; not in accordance with the Specifications; or defaced or injured through negligence of the Contractor, his employees or Subcontractors, or by fire, weather or any other cause will be rejected for incorporation in the work whether or not incorporated in the work.
- .2 Remove rejected products and work from the premises immediately.
- .3 Replace rejected products and work with no delay after rejection. Provide replacement products and execute replacement work precisely as required by the Specifications for the defective work replaced. Previous inspection and payment shall not relieve the Contractor from the obligation of providing sound and satisfactory work in compliance with the Specifications.
- .4 Testing and retesting of any part of the work as directed by the Owner, Consultant or Contractor to establish its conformance to the Contract Documents shall be performed at no addition to the Contract Price.

#### 1.6 WORKERS, SUPPLIERS AND SUBCONTRACTORS

- .1 Assign work only to workers, suppliers, and Subcontractors who have complete knowledge, not only of the conditions of the Specifications, but of jurisdictional requirements, and reference standards and specifications.
- .2 Give preference to use of local workers, suppliers and Subcontractors wherever possible.
- .3 Certified and qualified installers of a specific product line shall be used when called for in these Specifications.

### 2 Products

#### 2.1 SPECIFIED PRODUCTS

- .1 Products used for temporary facilities may have been previously used, providing they are sound in structural qualities.

- .2 Specified Options: The Work is based on materials, Products and systems specified by manufacturer's catalogued trade names, references to standards, by prescriptive specifications and by performance specifications.
  - .1 Where only one manufacturer's catalogued trade name is specified for a Product, the Product is single sourced and shall be supplied by the specified manufacturer.
  - .2 Where more than one manufacturer's catalogue trade name is specified for a Product, supply the Product from any one of those manufacturers specified.
  - .3 When a Product is specified by reference to a standard, select any Product from any manufacturer that meets or exceeds the requirements of the standard.
  - .4 When a Product or system is specified by prescriptive or performance specifications, Provide any Product or system which meets or exceeds the requirements of the prescriptive or performance specifications.
  - .5 The onus is on the Contractor to prove compliance with governing published standards, prescriptive specifications and with performance specifications.
- .3 Products, materials, equipment and articles (referred to as Products throughout the Contract Documents) incorporated in the Work shall be new, not damaged or defective, and of the quality standards specified, for the purpose intended. If requested, furnish evidence as to type, source and quality of Products Provided.
- .4 Where Contract Documents list acceptable Products or acceptable manufacturers, select as applicable, any one Product from any one manufacturer meeting performance of specifications.
- .5 Where Contract Documents require design of a Product or system, and minimum material requirements are specified, the design of such Product or system shall employ materials specified within applicable section. Where secondary materials or components are not specified, augment with materials meeting applicable code limitations, and incorporating compatibility criteria with adjacent work.
- .6 Defective Products, whenever identified prior to completion of the Work, will be rejected, regardless of previous reviews. Review of the Work by the Consultant or inspection and testing companies does not relieve the Contractor of the responsibility for executing the Work in accordance with the requirements of the Contract Documents, but is a precaution against oversight or error. Remove and replace defective Products and be responsible for delays and expenses caused by rejection at no additional cost to the Owner.
- .7 Should any dispute arise as to quality or fitness of Products, the decision rests strictly with Consultant based upon the requirements of the Contract Documents.
- .8 Unless otherwise indicated in the Contract Documents, maintain uniformity of manufacturer for any like item, material, equipment or assembly for the duration of the Work.
- .9 Products exposed in the finished work shall be uniform in colour, texture, range, and quality, and be from one production run or batch, unless otherwise indicated.
- .10 Permanent labels, trademarks and nameplates on Products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical, electrical, machinery or like rooms.
- .11 Owner retains right to select from choices available within specified Products for colours, patterns, finishes or other options normally made available. Submit full range of Product options in accordance with 01 33 00 for such selection.
- .12 Quality Control:
  - .1 Implement a system of quality control to ensure compliance with Contract Documents.
  - .2 Notify Consultant of defects in the Work or departures from intent of Contract Documents that may occur during construction. Consultant will recommend appropriate corrective action in accordance with requirements of the Contract.

3 Execution

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in the Contract Documents, install or erect Products in accordance with manufacturer's printed instructions. Do not rely on labels or enclosures supplied with Products. Obtain printed instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between the Contract Documents and manufacturer's instructions.
- .3 Improper installation or erection of Products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no additional cost to the Owner.
- .4 Manufacturers' representatives shall have access to the Work at all times. Contractor shall render assistance and facilities for such access in order that the manufacturers' representatives may properly perform their function.

**3.2 GALVANIC/DISSIMILAR METAL CORROSION**

- .1 Insulate dissimilar metals from each other by suitable plastic strips, washers or sleeves to prevent galvanic corrosion where conductive liquid or electrolyte exists.

**3.3 WORKMANSHIP**

- .1 General:
  - .1 Execute the Work using workers experienced and skilled in the respective duties for which they are employed.
  - .2 Do not employ an unfit person or anyone unskilled in their required duties.
  - .3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with Consultant, whose decision is final.
  - .4 Upon request by the Consultant, submit proof, in the form of CCDC 11 - Contractor's Qualification Statement, of qualifications of Subcontractors to verify Subcontractor's qualifications and experience meet or exceed the requirements of the Contract Documents.
    - .1 If, upon review of the Contractor's Qualification Statement, it is found that the Subcontractor does not meet the qualification requirements specified in the Contract Documents pertaining to the parts of the Work for which the Subcontractor has been retained, the Contractor shall replace the unqualified Subcontractor with a qualified Subcontractor, satisfactory to the Contractor and the Owner, at no additional cost to the Owner and at no increase in the Contract Time.
- .2 Coordination:
  - .1 Ensure cooperation of workers in layout of the Work. Maintain efficient and continuous supervision.
  - .2 Be responsible for coordination and placement of openings, sleeves and accessories.
- .3 Cutting and Remedial Work:
  - .1 Perform cutting and remedial work required to make parts of the Work come together. Coordinate the Work to ensure this requirement is maintained. Obtain permission from Consultant before commencing any cutting.
- .4 Fastenings:
  - .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
  - .2 Prevent electrolytic action and corrosion between dissimilar metals and materials.

- .5 Protection of work in progress:
  - .1 Take reasonable and necessary measures, including those required by authorities having jurisdiction, to Provide protection.
  - .2 Adequately protect parts of the Work completed or in progress. Parts of the Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Consultant, at no additional cost to the Owner.
  - .3 Do not cut, drill or sleeve any load bearing structural member without written permission of Consultant, unless specifically indicated.
  - .4 Keep floors free of oils, grease or other materials likely to discolour them or affect bond of applied surfaces.
  - .5 Protect work of other Subcontractors from damage while doing subsequent work. Damaged work shall be made good by appropriate Subcontractors but at expense of those causing damage.
  - .6 Protect existing buildings, curbs, roads and lanes. If, during the Work, any buildings, curbs, roads or lanes are damaged, bear costs for repairs.
- .6 Existing Utilities:
  - .1 When breaking into or connecting to existing services or utilities, execute the Work at times approved by Owner, with a minimum of disturbance to Owner's ongoing operations, the Work, and traffic.
  - .2 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in a manner approved by authority having jurisdiction and stake or otherwise record location of capped service.
- .7 Operational requirements: Operable Products shall be Provided fully operational and ready for intended use.

**END OF SECTION**

1 General

1.1 LAYOUT AND SURVEY

- .1 Lines, Levels and Locations for Building:
  - .1 Existing grades, lines, and site conditions shown on drawings were taken from survey information established by persons engaged directly by Owner. The accuracy of survey information is not the Consultant's responsibility.
  - .2 The Owner will establish location of property lines. The Contractor shall establish necessary lines and levels, and provide batter boards and other means to control the accurate positioning of all building elements.
- .2 Work Adjacent to Public Property:
  - .1 Verify before commencing work at adjacent public property, that no plans for altering clearances, set-backs, easements, grades, or otherwise have been made by local authorities having jurisdiction, subsequent to their approval of Contract Documents, and which would affect the original intent.

1.2 SUBMITTALS

- .1 Submit qualification data for land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- .2 Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- .3 Submit two (2) copies of certified survey signed by registered land surveyor.
- .4 Submit two (2) copies of final property survey showing the Work performed and record survey data.
- .5 Submit a Certificate of Compliance at completion of site grading stating the "As Constructed" grading elevations, and whether or not they differ from design grades.

1.3 DRAINAGE

- .1 Ensure that positive drainage is provided to roof, floor and site drains and catch basins, as set in their final positions. Provide constant slopes for drained surfaces to drains and drainage courses.
- .2 Ensure that allowable construction tolerances and structural tolerances do not permit ponding of water.
- .3 Verify the extent of each area served by a drain, or drainage course, to eliminate possible undrained surfaces. Coordinate the work of involved Sections before each proceeds.

1.4 RECORD DRAWINGS

- .1 Prepare interference and equipment placing drawings to scale to ensure that all components will be properly accommodated within the spaces provided.
- .2 Ensure that clearances required by authorities having jurisdiction and/or for easy maintenance of equipment will be shown on the above drawings.
- .3 Interference drawings shall be prepared before any orders for equipment and/or materials are released to suppliers.

1.5 SURVEY REFERENCE POINTS AND LEGAL SURVEY MARKERS

- .1 Verify existing base horizontal and vertical control points designated on drawings.
- .2 Locate, confirm and protect control points and legal survey markers prior to starting site work; preserve permanent reference points during construction.



- .3 Make no changes or relocations without prior written notice to Consultant.
- .4 Report to Consultant when a reference point or legal survey marker is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Replace control points in accordance with original survey control.
- .6 Replace legal survey markers lost or destroyed as a result of construction activities.

#### 1.6 SURVEY LAYOUT

- .1 Coordinate with Contractor for layout and protection of grade controls.
- .2 Establish permanent bench mark(s) as required, referred to established bench marks by survey control points; record locations, with horizontal and vertical data.
- .3 Establish lines and levels, locate and layout, by instrumentation.
- .4 Stake for grading, cuts and fills, slopes.
- .5 Replace grade controls lost or destroyed as a result of construction activities.

#### 1.7 CONSTRUCTION LAYOUT

- .1 Verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. Notify Consultant promptly if discrepancies are discovered.
- .2 Engage a land surveyor to lay out the Work using accepted surveying practices:
  - .1 Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - .2 Establish dimensions within tolerances indicated; do not scale Drawings to obtain required dimensions.
  - .3 Inform installers of lines and levels to which they must comply.
  - .4 Check the location, level and plumb, of every major element as the Work progresses.
  - .5 Notify Consultant when deviations from required lines and levels exceed allowable tolerances.
  - .6 Verify accuracy of site dimensions shown on drawings.
  - .7 Verify that present, or known future restrictions, are not violated by construction on the site or lines of traverse to all public utilities.
  - .8 Verify accurately the final underground location on site of all buried storm, sanitary, water and electrical duct banks, when applicable.
  - .9 Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- .3 Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- .4 Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Consultant when requested.

#### 1.8 FIELD ENGINEERING

- .1 Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations:

- 
- .1 Do not change or relocate existing benchmarks or control points without prior written approval of Consultant.
  - .2 Report lost or destroyed permanent benchmarks or control points promptly.
  - .3 Report the need to relocate permanent benchmarks or control points to Consultant before proceeding.
  - .4 Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
  - .5 Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - .6 Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - .7 Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
  - .2 Provide as-built site survey information after completion of demolition and excavation operations ready for construction.
    - .1 Survey grade elevations shall be on a 9 m grid or as required to locate property lines and new building structural grid lines.
- 2 Products
- Not Used**
- 3 Execution
- Not Used**
- END OF SECTION**

1 General

1.1 EXAMINATION

- .1 Examine the site, existing premises and surrounding areas and be fully informed as to the conditions and limitations under which the work has to be executed. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to bid closing.
- .2 Prior to commencement of work, make careful examination of previously executed work, existing conditions, levels, dimensions and clearances. Promptly advise Consultant of unsatisfactory preparatory work and substrate conditions; commencement of work implies acceptance of conditions.

1.2 PROTECTION

- .1 Ensure that no damage is caused to existing structures, buildings, foundations, pavement, fences, curbs, grounds, plants, property, utilities, services, finishes during the progress of Work. Repair and make good any damage caused at no extra cost to Owner to the complete satisfaction of the respective property owners and authorities having jurisdiction. Do not proceed with repairs or remedial work without written permission of the Consultant. Only trades specifically capable of performing the work will be allowed to make remedial or repair work.
- .2 Keep surfaces to receive finished flooring dry and free from oil and grease. Stockpiling of damp or wet building materials and use of mixing boxes or water buckets without protecting floors from moisture gain by approved means, is prohibited.
- .3 Keep municipal roads clean of mud and debris resulting from construction traffic.
- .4 Prevent soiling of pavement due to spillage, mixing of material or any other cause. Make good any damage caused.
- .5 Protect new work from damage with suitable protective coverings.
- .6 Protect work during periods of suspension, regardless of reason for suspension.

1.3 SERVICES AND UTILITY SYSTEMS

- .1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.
- .2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of their responsibility to determine the exact number and location of existing services.
- .3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.
- .4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.
- .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.
- .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.

1.4 SLEEVES, SUPPORTS, AND FASTENERS

- .1 Unless specified in other Sections, furnish, set and secure inserts, hangers, sleeves, fasteners, adhesives, anchors and other supports and fittings required for proper installation of work.
- .2 Use exposed metal fastenings and accessories of same texture, colour and finish as base metal on which they occur.

- .3 Select appropriate type of anchoring and fastening devices and in sufficient quantity and in such manner as to provide positive permanent anchorage of unit to be anchored in position. Keep exposed fasteners to a minimum, evenly spaced and neatly laid out.
- .4 Fasteners shall be of permanent type. Do not use wood plugs.
- .5 Fasteners which cause spalling or cracking of material to which anchorage is being made shall not be used.

#### **1.5 CONCEALMENT**

- .1 Conceal ductwork, piping, conduit and wiring located in finished areas, in ceiling spaces and furred construction unless specifically noted to be exposed.
- .2 If any doubt arises as to means of concealment, or intent of Contract Documents in this connection, request clarification from Consultant before proceeding with portion of work in question.

#### **1.6 CUTTING AND PATCHING**

- .1 Regardless of which Section of work is responsible for any portion of cutting and patching, in each case tradesmen qualified in work being cut and patched shall be employed to ensure that it is correctly done.
- .2 Any cost caused by omission or ill-timed work shall be borne by party responsible therefore.
- .3 Do not endanger any work by cutting, digging or otherwise altering, and do not cut nor alter any loadbearing element without written authorization by Consultant. Provide bracing, shoring and temporary supports as required to keep construction safely supported at all times.
- .4 Cut holes carefully and not larger than required after they are located by Sections requiring them, using suitable equipment and tools.
- .5 Patching and making good work shall be undetectable in finished work.

#### **1.7 WORKMANSHIP**

- .1 All work shall be carried out in accordance with the best trade practice, by mechanics skilled in the type of work concerned.
- .2 Products, materials, systems and equipment shall be applied, installed, connected, erected, used cleaned and conditioned in accordance with the applicable manufacturer's printed directions.
- .3 Where specified requirements are in conflict with manufacturer's written directions, follow manufacturer's directions, but inform Consultant in writing prior to proceeding with affected work. Where specified requirements are more stringent than manufacturer's directions, comply with specified requirements.

#### **1.8 LINES AND LEVELS**

- .1 Verify all elevations, lines, levels and dimensions as indicated and report errors, any conflicts, or inconsistencies to the Consultant before commencing work or as soon as discovered.
- .2 Arrange to have building base lines laid out by an Ontario Land Surveyor.
- .3 Accurately lay out work and establish lines and levels in accord with requirements of Contract Documents.
- .4 Set up, maintain and protect permanent reference points and provide general dimensions and elevations for all Sections of Work.

#### **1.9 DIMENSIONS**

- .1 Check and verify dimensions wherever referring to work. Dimensions, when pertaining to work of another Section, shall be verified with Section concerned. Details and measurements of work which is to fit or conform with work installed shall be taken at site.

- .2 Do not scale Drawings. If there is ambiguity, lack of information or inconsistency, immediately consult Consultant for directions. Be responsible for extra costs involved through the disregarding of this notice.
- .3 Walls, partitions and screens shall be considered as extending from floor to underside of structural deck unless specifically indicated otherwise on Drawings.

#### 1.10 LOCATION OF FIXTURES

- .1 Location of fixtures, apparatus, equipment, fittings, outlets, conduits, pipes and ducts shown or specified, but not dimensioned, shall be considered approximate.
- .2 Request direction from Consultant to establish exact location. Any relocation caused by Contractor's failure to request direction from Consultant shall be done by Contractor at no extra cost. Where job conditions require reasonable changes in indicated locations and arrangements, make changes at no additional cost.
- .3 Conserve space and coordinate with work of other Sections to ensure that ducts, pipes, conduits and other items will fit into allocated wall and ceiling spaces, while ensuring adequate space for access and maintenance.
- .4 Where ducts, piping and conduits are permitted to be exposed they shall be neatly and uniformly laid out parallel to adjacent building lines and parallel to each other where they run in the same direction. Review exposed installations with Consultant prior to start of work. At no cost to Owner make changes to exposed work as directed by the Consultant where such work is not installed in accordance with Consultant's prior review.
- .5 Except where locations are specifically noted on Drawings, install exposed mechanical and electrical fixtures including outlets, switches, thermostats, panels and other items, located on walls, in orderly and neatly laid out manner, lining up with each other and grouped together where possible. Review installation with Consultant prior to start of rough-in work. Relocate at no cost to Owner any work which does not meet this requirement.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

**1.1 GENERAL**

- .1 Be responsible for cleanliness of assigned work areas to satisfaction of Consultant. Maintain work areas in neat and orderly condition at all times.
- .2 Periodically, or when directed by the Consultant, remove from work areas rubbish and waste materials.
- .3 Burning or burying of rubbish and waste materials on site is not permitted.
- .4 Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- .5 Use cleaning material only on surfaces recommended by cleaning material manufacturer.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination and Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the work occurring onsite. Provide a clear delineation of responsibilities for each sub-trade.
- .2 Sequencing: Ensure that the sub-trades mobilized onsite have access to the necessary bins to facilitate the separation of solid waste streams.
- .3 Scheduling: Remove full bins in a timely fashion, and ensure that empty and partially full bins are properly labeled to minimize cross-contamination.

**1.3 CLEANING DURING CONSTRUCTION**

- .1 Remove debris, packaging and waste materials frequently.
- .2 Keep dust and dirt to an acceptable level, as directed.
- .3 Remove oily rags, waste and other hazardous substances from premises at close of each day, or more often if required.
- .4 Clear sidewalks of snow and ice, adjacent to construction site.

**1.4 FINAL CLEANING**

- .1 Upon completion of work, or, where work is phased, upon completion of each phase, thoroughly clean all surfaces and components. Provide professional cleaning by a recognized, established cleaning company, to allow Owner to complete final cleaning and floor preparation / build-up.
- .2 Remove stains, dirt and smudges from finished surfaces.
- .3 Clean exposed finished surfaces in accordance with respective material manufacturer's recommendations.
- .4 Clean mechanical and electrical fixtures and other fittings of labels, wrappings, paper and other foreign material.
- .5 Replace heating, ventilation and air conditioning filters if units were operated during construction. Clean inside of ducts, blowers and coils.
- .6 Remove from work areas all waste and surplus materials from all areas, including roofs and ceiling spaces.
- .7 Steam clean existing masonry which becomes an interior exposed wall surface.
- .8 Remove snow and ice from driveways, parking areas and walks.
- .9 Power wash paved surfaces.

**1.5 WASTE COLLECTION AND DISPOSAL**

- .1 All waste materials and debris resulting from the work of this Contract shall belong to the Contractor and shall be removed from the site and legally disposed.
- .2 Periodically, or when directed by the Consultant remove waste material and debris.
- .3 Construction Waste:
  - .1 Designate an area onsite for the separation and storage of waste materials. Allow enough space to accommodate multiple bins.
  - .2 At a minimum, provide storage bins onsite for concrete, metal, wood, cardboard, plastic, gypsum board and mixed waste. Landclearing debris, asphalt and concrete can be stockpiled onsite, as opposed to being placed in bins, for further processing.
  - .3 Provide signage on each bin to identify the specific waste streams that can be placed in each.
  - .4 The waste separation and storage area and bins are to be kept neat, and clean, and clearly marked in order to avoid contamination of materials.
  - .5 Hazardous waste and hazardous materials are not within the scope of this Section and must be handled in accordance with the requirements stipulated by local regulations.
- .4 Domestic Recyclables
  - .1 "Blue Box" receptacles shall be placed in close proximity all site trailers, and throughout the building, to collect recyclable material generated by workers. At minimum, provide receptacles for metal and glass beverage and food containers and paper products.
  - .2 Make arrangements with the Municipality or a receiving facility to have domestic recyclables picked up regularly.
  - .3 Adjacent to each "Blue Box" receptacle, provide a mixed waste receptacle in order to avoid contamination of recyclables.
- .5 Separate and salvage materials suitable for recycling from general waste stream and transport to recognized recycling facility.
- .6 Burying, burning, selling waste materials on site is prohibited.
- .7 Disposal of liquid wastes into waterways, sewers is prohibited.

## 1.6 SCHEDULING

- .1 Ensure that an appropriately sized bin is provided onsite for each new waste stream that is introduced onsite.
- .2 Arrange for the prompt collection by, or delivery to, the appropriate recycling or reuse facility when a bin is full, or nearly full.

## 1.7 ONSITE QUALITY CONTROL

- .1 Waste Handling:
  - .1 Clean and strip materials (as stipulated by the receiving facility) prior to placing in collection containers. Deliver materials free of dirt, adhesives, solvents, and petroleum contamination.
- .2 Ensure that no cross-contamination has occurred in bins and receptacles. Should bins become cross-contaminated, the Contractor shall separate the waste streams prior to removal from the site. The only exception to this is if a qualified off-site sorting facility is responsible for separating the waste streams.
- .3 Ensure that signage is in place and clearly visible on all bins and receptacles.
- .4 Ensure that bins and receptacles are easily accessible by workers and waste haulers. Supplies, equipment and materials must never restrict access.

- .5 Ensure site is free and clear of accumulated debris. If materials are being stockpiled prior to removal from the site, ensure they are located away from the building, and out of the way of typical traffic patterns.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**



1 General

**1.1 GENERAL INSTRUCTIONS**

- .1 The procedures for completing Contract and acceptance by the Owner shall be in accordance with the methods prescribed by Owner.
- .2 Stages will be reviewed at the Contract start-up meeting to ensure that parties understand their responsibilities. Refer to Section 01 31 19 for procedures and requirements for Contract start-up meeting.
- .3 Within four (4) weeks of commencement of the Work, submit to the Consultant a list of closeout submittals required by the Contract Documents.
- .4 Note that entities other than the Owner may be involved in the closeout procedures described herein, including attendance at any operation and/or maintenance training sessions required. The Owner will coordinate such attendance as required.

**1.2 FINAL CLEANING**

- .1 Co-ordinate final clean-up with the Owner's representatives and opening requirements.
- .2 In addition to requirements for cleaning-up specified in the General Conditions of the Contract, and in Section 01 11 00, include in work final cleaning by skilled cleaning specialists on completion of construction.
- .3 Remove temporary protections and make good defects before commencement of final cleaning.
- .4 Replace glass and mirrors that have been broken, damaged and/or etched during construction, or which are otherwise defective.
- .5 Remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building. Perform cleaning in accordance with installer's instructions for each material. Final cleaning shall include:
  - .1 Washing of interior concrete floors.
  - .2 Cleaning and polishing of:
    - .1 glass;
    - .2 mirrors;
    - .3 porcelain, enamel, and finish metals;
    - .4 washroom accessories.
  - .3 Vacuum cleaning of ceilings, walls and floors.
  - .4 Cleaning of glazed wall surfaces.
  - .5 Cleaning of hardware, mechanical fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components.
  - .6 Removing of visible labels left on materials, components, and equipment.
  - .7 Maintain cleaning until Owner has taken possession of building or portions thereof.

**1.3 CLOSE-OUT SUBMITTALS**

- .1 Collect reviewed submittals, and assemble required closeout submittals executed by Subcontractors, Suppliers, and manufacturers. Prior to submitting closeout submittals to the Consultant, undertake the following:
  - .1 Review maintenance manual contents (operating, maintenance instructions, as-built drawings, materials) for completeness.

- .2 Review in relation to Contract Price, Change Orders, Change Directives, holdbacks and other adjustments to the Contract Price.
- .3 Review inspection and testing reports to verify conformance to intent of Contract Documents and that changes, repairs or replacements have been completed.
- .4 Execute transition of performance bond and labour and materials payment bond to warranty period requirements.
- .5 Submit a final statement of accounting giving total adjusted Contract Price, previous payments, and monies remaining at time of application for completion of the Contract. Consultant will issue a final change order reflecting approved adjustments to Contract Price not previously made, if any.
- .2 No later than then (10) working days prior to submitting request for Consultant's review to determine if Substantial Performance of the Work has been achieved, submit to the Consultant the closeout submittals specified in this section, including, but not limited to, reviewed shop drawings, Product data sheets, samples, operating instructions, as-built records, and fully executed warranties and guarantees.
- .3 For items of the Work delayed materially beyond date of Substantial Performance of the Work, provide updated closeout submittals within ten (10) working days after acceptance, listing date of acceptance as start of warranty period.
- .4 Neither the Consultant's review to determine if Substantial Performance of the Work has been achieved, nor acceptance of the Work, will take place until receipt, by the Consultant, of acceptable copies of the closeout submittals required herein and by the Contract Documents.
- .5 Maintenance materials:
  - .1 Deliver to a location and at a time specified by the Owner, organize items in Owner's storage area as directed by the Owner, and as follows:
    - .1 Use unbroken cartons, or if not supplied in cartons, material shall be strongly packaged.
    - .2 Clearly mark cartons or packaging as to contents, project name, and Supplier.
    - .3 If applicable give colour and finish, room number or area where material is used.
  - .2 Replace incorrect or damaged maintenance materials delivered to Owner, including damage through shipment.
  - .3 Provide a typed inventory list of maintenance materials prior to Substantial Performance of the Work application. List all items, complete with quantities, and storage locations.
  - .4 Establish a master list identifying maintenance materials and maintain a log of when materials are turned over to Owner and signing authority for acceptance of materials on behalf of Owner. Master list and log shall be in a format acceptable to the Owner.
- .6 Owner communication material:
  - .1 Deliver Owner communication material that was applied to hoarding and/or temporary barriers and enclosures during the Work. Salvage such material in accordance with Section 01 11 00.

#### 1.4 SUBSTANTIAL PERFORMANCE OF THE WORK

- .1 Deficiency review:
  - .1 Neither Owner nor Consultant will be responsible for preparation or issuance of extensive lists of deficiencies. Contractor assumes prime responsibility for ensuring that items shown and described in the Contract Documents are complete. Any reviews to approve the certificate of Substantial Performance of the Work will be immediately cancelled if it becomes obvious to the Consultant that extensive deficiencies are outstanding.

- .2 The Contractor shall conduct an inspection of the Work to identify deficiencies and defects, which shall be repaired. When the Contractor considers that the Work is substantially performed, the Contractor shall prepare and submit to the Consultant a comprehensive list of items to be completed or corrected and apply for a review of the Work by the Consultant to determine if Substantial Performance of the Work has been achieved.
- .3 The Contractor's request described above shall include a statement by Contractor that the Work to be reviewed by Consultant for deficiencies is, to the best of the Contractor's knowledge, in compliance with Contract Documents, reviewed shop drawings, and samples, and that deficiencies and defects previously noted by Consultant have been repaired.
- .4 No later than fifteen (15) working days after the receipt of the Contractor's request described above, but contingent upon the prior receipt, by the Consultant, of the closeout submittals in the manner and form specified in this section, the Consultant and the Contractor will review the Work to identify any defects or deficiencies. If necessary, the Contractor shall tabulate a list of deficiencies to be corrected prior to Substantial Performance of the Work being certified by the Consultant.
- .5 During review, the Consultant and the Contractor will decide which deficiencies or defects must be rectified before Substantial Performance of the Work can be certified, and which defects are to be treated as warranty items.
- .6 Provide a schedule of planned deficiency review having regard to the foregoing.
- .2 Certification of Substantial Performance of the Work:
  - .1 When the Consultant considers that the deficiencies and defects have been completed and that it appears that the requirements of the Contract Documents have been substantially performed, the Consultant shall issue a certificate of Substantial Performance of the Work to the Contractor, stating the date of Substantial Performance of the Work.
  - .2 The certificate of Substantial Performance of the Work shall be prepared in form required by Construction Lien Act.
- .3 Final Inspection for completion of the Contract:
  - .1 Deficiencies and defects shall be made good before the Contractor submits a written request for final review of the Work and before the Contract is considered complete.
  - .2 When Contractor is satisfied that the Work is complete, and after the Contractor has reviewed the Work to verify its completion in accordance with the requirements of the Contract Documents, the Contractor shall submit a written request for a final review by the Consultant, who in turn will notify the Owner.
  - .3 If there are any deficiencies identified as a result of this review, they shall be listed by the Consultant and submitted to the Contractor. This list shall be recognized as the final deficiency list for purposes of acceptance of the Work under the Contract.
  - .4 Such deficiencies shall be corrected by a date mutually agreed upon between Consultant and the Contractor, unless a specific date is required by Contract, and a further review by the Consultant shall be called for by the Contractor following his own review to take place within seven (7) days from date of request.
  - .5 Contractor shall thereafter submit invoice for final payment.
  - .6 Money shall be withheld for deficiency work and will be released only when all deficiencies have been completed. No partial payment to be recognized until all work is completed.

- .4 If the Contractor needs to return to the Place of the Work to complete deficiencies after the Owner has taken possession, the Contractor shall provide the Owner with a minimum of one (1) week's prior notice of such requirement.

#### **1.5 WARRANTY PERIOD**

- .1 Provide on-going review and attendance to call-back, maintenance and repair problems during the warranty periods.
- .2 At the beginning of the 12th month after Substantial Performance of the Work, the Owner, Contractor and Consultant, along with key Subcontractors as designated, shall carry out a complete review of the built project to determine which deficiencies are to be rectified under the warranty.
- .3 Contractor shall be responsible for timely written notification of Owner, and Consultant a minimum of three (3) months prior to such end of warranty period inspection and any delay in such notification shall extend such warranty period until proper notification is received by Owner, and Consultant.

#### **2 Products**

**Not Used**

#### **3 Execution**

**Not Used**

**END OF SECTION**

1 General

**1.1 WARRANTIES**

- .1 Warranties shall be in accordance with the General Conditions, as amended, and as follows:
  - .1 Warranties shall commence at date of Substantial Performance of the Work.
  - .2 Submit warranties for applicable items, signed by the applicable company responsible for each warranty.
  - .3 Submit warranties on form approved by Owner including, but not limited to, the following information:
    - .1 Name and address of Project.
    - .2 Warranty commencement date (date of Substantial Performance of the Work).
    - .3 Duration of warranty.
    - .4 Clear indication of what is being warranted and what remedial action will be taken under warranty.
    - .5 Authorized signature and seal of company providing each warranty.
  - .4 Owner shall be named in manufacturer's Product warranties. Submit on relevant Product manufacturer's standard warranty or guarantee form.

2 Products

**Not Used**

3 Execution

**Not Used**

**END OF SECTION**

1 General

**1.1 DESCRIPTION**

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel **[four]** weeks prior to date of Substantial Performance.
- .2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

**1.2 QUALITY ASSURANCE**

- .1 Instructor Qualifications: Factory authorized service representative, experienced in operation and maintenance procedures and training.
- .2 Pre-Instruction Meeting: Conduct meeting at Project site to review methods and procedures related to demonstration and training including, but not limited to, the following:
  - .1 Inspect and discuss locations and other facilities required for instruction.
  - .2 Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - .3 Review required content of instruction.
  - .4 For instruction that must occur outdoors, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

**1.3 SUBMITTALS**

- .1 Instruction Program: Submit three copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - .1 At completion of training, submit three complete training manuals for Owner's use.
- .2 Attendance Record: For each training module, submit list of participants and length of instruction time.

**1.4 COORDINATION**

- .1 Coordinate training schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- .2 Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- .3 Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Consultant.

**1.5 CONDITIONS FOR DEMONSTRATIONS**

- .1 Equipment has been inspected and put into satisfactory operation.
- .2 Testing, adjusting, balancing and commissioning have been performed and equipment and systems are fully operational.

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2 Products

**2.1 INSTRUCTION PROGRAM**

- .1 Program Structure: Develop an instruction program that includes individual training modules for all systems and equipment not part of a system, including and not limited to:
  - .1 Motorized doors.
  - .2 Electrically operated equipment.
  - .3 Fire-protection systems.
  - .4 Security systems.
  - .5 Conveying systems.
  - .6 Heat generation.
  - .7 Refrigeration systems.
  - .8 HVAC systems.
  - .9 HVAC instrumentation and controls.
  - .10 Electrical service and distribution.
  - .11 Packaged engine generators.
  - .12 Lighting equipment and controls.
  - .13 Communication systems.
- .2 Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following, as applicable:
  - .1 Operational Requirements and Criteria:
    - .1 System, subsystem, and equipment descriptions.
    - .2 Performance and design criteria if Contractor is delegated design responsibility.
    - .3 Operating standards.
    - .4 Regulatory requirements.
    - .5 Equipment function.
    - .6 Operating characteristics.
    - .7 Limiting conditions.
    - .8 Performance curves.
  - .2 Emergencies:
    - .1 Instructions on meaning of warnings, trouble indications, and error messages.
    - .2 Instructions on stopping.
    - .3 Shutdown instructions for each type of emergency.
  - .3 Operations:
    - .1 Startup procedures.
    - .2 Equipment or system break-in procedures.
    - .3 Routine and normal operating instructions.
    - .4 Operating instructions for conditions outside of normal operating limits.

- 
- .5 Regulation and control procedures.
  - .6 Control sequences.
  - .7 Safety procedures.
  - .8 Normal shutdown instructions.
  - .9 Operating procedures for system, subsystem, or equipment failure.
  - .10 Seasonal and weekend operating instructions.
  - .11 Required sequences for electric or electronic systems.
  - .4 Adjustments:
    - .1 Alignments.
    - .2 Checking adjustments.
    - .3 Noise and vibration adjustments.
    - .4 Economy and efficiency adjustments.
  - .5 Troubleshooting:
    - .1 Diagnostic instructions.
    - .2 Test and inspection procedures.
  - .6 Maintenance:
    - .1 Inspection procedures.
    - .2 Types of cleaning agents to be used and methods of cleaning.
    - .3 List of cleaning agents and methods of cleaning detrimental to product.
    - .4 Procedures for preventive maintenance.
    - .5 Procedures for routine maintenance.
    - .6 Instruction on use of special tools.
  - .7 Repairs:
    - .1 Diagnosis instructions.
    - .2 Repair instructions.
    - .3 Disassembly; component removal, repair, and replacement; and reassembly instructions.
    - .4 Instructions for identifying parts and components.
    - .5 Review of spare parts needed for operation and maintenance.
- 3 Execution
- 3.1 PREPARATION**
- .1 Verify that conditions for demonstration and instructions comply with requirements.
  - .2 Verify that designated personnel are present.
- 3.2 DEMONSTRATION AND TRAINING**
- .1 Delivery demonstration and training of each item of equipment at scheduled times, at the designated location.
  - .2 Instruct Owner's personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.



- 
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
  - .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

### **3.3 EVALUATION AND CLEANUP**

- .1 Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance based test.
- .2 Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions and Division 01 apply to this Section.

**1.2 RELATED REQUIREMENTS**

- .1 Section 04 20 00: Unit Masonry  
.2 Section 05 41 00: Structural Metal Stud Framing  
.3 Section 05 50 00: Metal Fabrications  
.4 Section 31 50 00: Excavation Support and Protection

**1.3 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI):  
.1 ANSI A10.8-2011, Safety Requirements for Scaffolding and Comparison Document  
.2 Canadian Standards Association (CSA):  
.1 CSA S350- M1980 (R2003), Code of Practice for Safety in Demolition of Structures.  
.3 National Fire Protection Association (NFPA):  
.1 NFPA 241-2013, Standard for Safeguarding Construction, Alteration, and Demolition Operations  
.4 Provincial Legislation:  
.1 Legislation specific to Authority Having Jurisdiction for work governed by this Section

**1.4 DEFINITIONS**

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.  
.2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.  
.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.  
.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

**1.5 DESCRIPTION**

- .1 Review drawings, site conditions, and other specification sections to ascertain the extent and nature of work of this section.  
.2 The Work of this Section includes the following:  
.1 Demolish and removal of existing windows and doors.  
.2 Demolish and removal of partitions, ceilings, wall and floor finishes, as indicated on drawings.  
.3 Demolish and removal of retaining wall, concrete stairs and metal guardrail, as indicated on drawings.  
.4 Demolish and removal of exterior stucco ceiling, light fixtures and ductwork, in locations as indicated on drawings.  
.5 Disconnect/cap existing service in areas of demolition.  
.6 Dispose of demolished materials except where required to be salvaged or reused.

- .7 Refer to demolition notes indicated on drawings.

## 1.6 EXAMINATION

- .1 Visit and examine the site and note all characteristics and irregularities affecting Work of this Section. Submit a pre-demolition inspection report. Ensure the Owner of premises being inspected is represented at inspection.
- .2 Where appropriate prepare a photographic or video record of existing conditions, particularly of existing work scheduled to remain.
- .3 Where applicable, examine adjacent tenancies not part of the scope of work. Determine extent of protection required to areas and related components not subject to demolition.

## 1.7 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Prepare schedule in conjunction with overall project schedule, and outline proposed methods in writing. Obtain approval before commencing demolition work, and indicate the following:
    - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity
    - .2 Interruption of utility services
    - .3 Coordination for shutoff, capping, and continuation of utility services

## 1.8 QUALITY ASSURANCE

- .1 Conform to requirements of all authorities having jurisdiction.
- .2 Comply with applicable requirements of CSA S350-M "Code of Practice for Safety in Demolition of Structures".
- .3 Work of this Contract shall be executed by an approved company having a minimum of five (5) years continuous experience and able to deploy adequate equipment and skilled personnel to complete work expeditiously in an efficient and orderly manner.
- .4 Perform cutting and coring, where applicable, by a firm specializing in this type of work, able to produce evidence of successful completion of similar work over a period of at least five (5) years immediately prior to date of contract.
- .5 Apply for, secure, arrange and pay for all permits, notices and inspections necessary for proper execution and completion of work in this Section.

## 1.9 PROTECTION

- .1 Prevent movement or settlement of adjacent work. Provide and place bracing or shoring and be responsible for safety and support of such work. Be liable for any such movement or settlement, and any damage or injury caused.
- .2 Cease operations and notify Consultant if safety of any adjacent work or structure appears to be endangered. Take all precautions to support the structure. Do not resume operations until reviewed with the Consultant.
- .3 Prevailing weather conditions and weather forecasts shall be considered. Demolition work shall not proceed when weather conditions constitute a hazard to the workers and site.
- .4 Prevent damage of surrounding vegetation by construction. Install tree protection barriers to trees that are scheduled to remain, as detailed on the drawings.
- .5 Prevent debris from blocking surface drainage inlets and mechanical and electrical systems which remain in operation.

- .6 Temporarily suspended work that is without continuous supervision shall be closed to prevent entrance of unauthorized persons.

#### **1.10 REMAINING AND ADJACENT STRUCTURES**

- .1 Do not interfere with, encumber, endanger or create nuisance, from any cause due to demolition work, to public property or any adjacent attached and/or detached structures in possession of Owner or others, which are to remain, whether occupied or unoccupied during this work.
- .2 Make good damage to such structures resulting from work under this Section at no cost to Owner. Make good adjacent building surfaces damaged by work of this Section.

#### **1.11 PROTECTION OF SERVICES AND STRUCTURES**

- .1 Take necessary precautions to guard against movement, settlement or collapse of existing adjacent utility services, public property and/or structures, whether to remain or not. If these or other unforeseen conditions develop, take immediate emergency measures, report to Consultant, confirm in writing, and await instructions before proceeding with any further related demolition work.
- .2 Prior to saw cutting or core drilling of existing concrete slabs, use ground penetrating radar (GPR) to detect utilities and structural reinforcing. Concrete X-Rays can be used when access to both sides of concrete slab is accessible for placement of required x-ray film.

#### **1.12 EXISTING SERVICES**

- .1 Prior to start of demolition disconnect all electrical and telephone service lines in the areas to be demolished. Post warning signs on all electrical lines and equipment which must remain energized to serve other areas during period of demolition. Disconnect electrical and telephone service lines in demolition areas to the requirements of local authority having jurisdiction.
- .2 In each case, notify the affected utility company in advance and obtain approval where required before commencing with the work on main services.
- .3 Arrange with utility companies for locating of such services and for disconnection of existing services owned by utility companies and which will be disconnected by said utility companies, provided such services do not interfere with adjacent tenancy operators.
- .4 Remove sewer and water lines where required within existing building as deemed necessary, and cap to prevent leakage, in accordance with authorities having jurisdiction.
- .5 Existing services are to be maintained where required for normal tenant operation during regular hours of operation and/or as deemed necessary by Owner.

### **2 Products**

#### **2.1 DEBRIS, SALVAGED MATERIAL AND EQUIPMENT DISPOSAL**

- .1 All materials and or equipment salvaged from demolition work becomes property of demolition Contractor unless designated otherwise.
- .2 At no cost to Owner repair or replace material and/or equipment scheduled to remain which is damaged by demolition work. Do not sell any salvaged material or equipment directly from project site.
- .3 Remove waste debris continually and entirely from project site during demolition work. Do not load vehicles transporting such debris beyond their safe capacity or in a manner which might cause spillage on public or private property. If spillage does occur, clean up immediately to prevent traffic hazards or nuisance.

## 2.2 PROTECTION

- .1 Temporary Protection:
  - .1 Erect temporary hoarding protection, as indicated in Section 01 56 26, to enclose openings in exterior walls, and/or provide security to partially occupied interior spaces.
  - .2 Erect temporary dust screens, as indicated in Section 01 50 00, to prevent dust and debris to enter areas of the building which are not scheduled for demolition. Remove temporary dust screens when no longer required.

## 2.3 REPAIR MATERIALS

- .1 Use repair materials identical to existing materials:
  - .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - .2 Use a material whose installed performance equals or surpasses that of existing material.
  - .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Floor Patching and Levelling Compounds: Cement based, trowelable, self-levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section; in accordance with Section 03 35 00.
- .3 Terrazzo Floor Patching: Install new terrazzo floor finish to match adjacent floor finish, as approved by the Consultant, once demolition in the area has been completed.
- .4 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.
- .5 Brick: Install brick and mortar, cut and trimmed to fit existing opening to be filled, once demolition of hollow metal door and frame is completed. Match brick and mortar to existing adjacent materials as approved by the Consultant. Provide ties and accessories as required to complete the installation.
- .6 Gypsum Board Patching Compounds: Joint compound to ASTM C475, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 – Gypsum Board Assemblies.
- .7 Fireproofing: Patch and repair all fireproofing damaged during demolition of adjacent surfaces with compatible fireproofing materials. Provide test reports from fireproofing manufacture warranting installation, adhesion and compatibility between existing and new fireproofing materials.

## 2.4 EXISTING MATERIALS

- .1 Items to be salvaged and returned to the Owner for future use include, but are not limited to the following:
  - .1 Writing surfaces
  - .2 Equipment scheduled to be moved
  - .3 Furniture.
  - .4 Confirm with Consultant any materials that appear to be in re-usable condition prior to disposal.
  - .5 Confirm with Consultant any materials scheduled for re-use that are not in re-usable condition prior to installation.

3 Execution

**3.1 GENERAL**

- .1 Exercise caution in dismantling, disconnecting of work adjacent to existing work designated to remain.
- .2 Carry out demolition in a manner to cause as little inconvenience to the adjacent properties as possible.
- .3 Carry out demolition in an orderly and careful manner.
- .4 Demolition by explosives is not permitted.
- .5 Selling or burning of materials on site is not permitted.
- .6 Sprinkle exterior debris with water to prevent dust. Do not cause flooding, contaminated run-off or icing. Do not allow waste material, rubbish, and windblown debris to reach and contaminate adjacent properties.
- .7 Lower waste materials in a controlled manner; do not drop or throw materials from heights.
- .8 At end of each day's work, leave in safe condition so that no part is in danger of toppling or falling.

**3.2 SAFETY AND SECURITY**

- .1 Maintain security of the building at all times during demolition work.
- .2 Provide and maintain fire prevention equipment and alarms accessible during demolition.

**3.3 ACCESS ROUTES**

- .1 Restrict operations to designated access routes.
- .2 Do not obstruct roads, parking lots, sidewalks, hydrants and the like.

**3.4 SELECTIVE DEMOLITION**

- .1 Provide necessary shoring and supports to assure safety of structure prior to cutting and coring.
- .2 Where practical, sawcut and remove material as required.
- .3 Where sawcutting is not appropriate, use suitable hand tools.
- .4 Demolish, cut-out and remove from site all other work noted on drawings or required to permit new construction.
- .5 Do not allow water to accumulate or flow beyond work area. Provide receptacles and mop-up as work proceeds.
- .6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.
  - .1 Provide bond beams in new openings cut into existing concrete masonry unit walls.
  - .2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.
- .7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.
- .8 Demolish existing flooring and wall finishes, and adhesive remnants as follows:
  - .1 Floor and wall substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through new flooring and wall finishes.
- .9 Demolish completely all ceiling panels and grid as indicated.

- .10 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.
- .11 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
  - .1 Prepare existing surfaces schedule to receive new finish by grinding, filling, over-coating, stripping, washing, etching, shot blasting or other chemical or mechanical means, as required to ensure satisfactory installation of new finish.

### 3.5 PATCHING AND REPAIRING

- .1 Floors and Walls:
  - .1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
  - .2 Provide an level and smooth surface having uniform finish colour, texture, and appearance.
  - .3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
  - .4 Patch with durable seams that are as invisible as possible.
  - .5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - .6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
  - .7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- .2 Ceilings: patch, repair, or re-hang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
- .3 Exterior Walls: Where existing doors and/or windows are schedule to be removed during demolition, patch and repair exterior walls using similar wall construction techniques as adjacent wall construction. Ensure compatibility between insulation, air barrier and vapour retarder, providing continuous air and vapour control and wall R-Value between existing and new construction. Provide exterior and interior finish materials, matching existing adjacent materials, to provide an even-plane surface of uniform appearance.

### 3.6 EXCESSIVE DEMOLITION

- .1 Where excessive demolition occurs, be responsible for cost of replacing such work.
- .2 Consultant shall determine extent of such 'over-demolition' and method of rectification.

### 3.7 COMPLETION

- .1 Leave project site as directed, reasonably clean and presentable, free from above grade debris, any salvaged material and/or equipment except those designated to remain.
- .2 Maintain access to exits clean and free of obstruction during removal of debris.

**END OF SECTION**

1 General

1.1 SUMMARY

- .1 Hazardous materials have been identified as being present in the building; abatement and removal form a part of the Work of the Project.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 19: Selective Demolition

1.3 REFERENCE STANDARDS

- .1 Environment Canada:
  - .1 Canadian Environmental Protection Act, 1999 (CEPA)
  - .2 Export and Import of Hazardous Waste Regulations (SOR/2002-300), including amendments
- .2 Health Canada:
  - .1 Material Safety Data Sheets (MSDS)
  - .2 Workplace Hazardous Materials Information System (WHMIS)
- .3 Transport Canada:
  - .1 Transportation of Dangerous Goods Act, 1992 (TDG)
  - .2 Transportation of Dangerous Goods Regulations, including amendments

1.4 DEFINITIONS

- .1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .4 Workplace Hazardous Materials Information System (WHMIS): Canada wide system designed to give employers and workers information about Hazardous Materials used in workplace. Under WHMIS, information on Hazardous Materials is provided on container labels, material safety data sheets (MSDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Construction Meeting: Conduct a meeting at Project site in accordance with requirements listed in Section 01 31 19, to confirm extent of Hazardous Materials abatement and removal to review Contractor's project requirements, site safety concerns and scheduling requirements and to establish procedures for the following:
  - .1 Asbestos Abatement, Removal and Disposal
  - .2 Lead Removal and Disposal Specification
  - .3 Mercury Removal and Disposal Specification
  - .4 Ozone Depleting Substances Removal and Disposal Specification
  - .5 Polyvinyl-Biphenyl Ballast Removal and Disposal Specification



- .2 Coordination: Coordinate Hazardous Materials work so that work of this Section adheres to criteria indicated in the Hazardous Materials Report appended to this Section.

#### 1.6 EXAMINATION

- .1 Visit and examine the site and note all characteristics and irregularities affecting Work of this Section. Submit a pre-demolition inspection report. Ensure the Owner of premises being inspected is represented at inspection.
- .2 Where appropriate prepare a photographic or video record of existing conditions, particularly of existing work scheduled to remain.
- .3 Where applicable, examine adjacent tenancies not part of the scope of work. Determine extent of protection required to areas and related components not subject to demolition.

#### 1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this section in accordance with environmental, fire, health and safety acts, codes and regulations as established by the Authority Having Jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Consultant:
  - .1 Abatement and Removal Personnel: Use contractors, subcontractors or personnel who have specific training and experience with the abatement and removal of Hazardous Materials identified as being present at the project site; train personnel in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
  - .2 Insurance: Use a hazardous materials abatement company that has adequate insurance for performing work of this Section.
  - .3 Equipment: Use equipment, storage containers and other temporary facilities appropriate to the level of risk presented by the Hazardous Materials identified as being present at the project site and that are acceptable to the Authority Having Jurisdiction.

#### 1.8 SITE CONDITIONS

- .1 Hazardous materials identified in the Hazardous Materials report are for the Contractor and Subcontractor's information only, and does not represent a warranty by the Consultant of actual site conditions; use of this information is at Contractor and Subcontractor's own risk.
- .2 Visit site to become acquainted with site conditions before submitting Bids to derive an opinion on the results of the information presented by the Hazardous Materials Report and the extent of work required to complete the requirements of this Section.
- .3 The Consultant and Owner recognize that conditions indicated in the Hazardous Materials Report actually encountered during construction may differ from the information presented in the Hazardous Materials Report; where this occurs the changed conditions will be administered as a change in accordance with the Contract.

#### 1.9 DELIVERY, STORAGE AND HANDLING

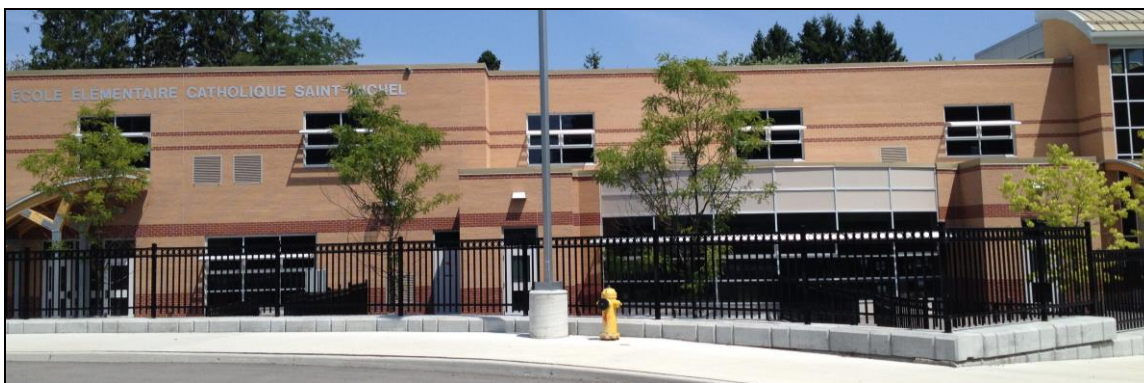
- .1 Storage and Handling Requirements: Store and handle Hazardous Materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines and as follows:
  - .1 Store and handle flammable and combustible materials in accordance with current Fire Code requirements
  - .2 Store Hazardous Materials and wastes in closed and sealed containers
  - .3 Label containers of Hazardous Materials and wastes in accordance with WHMIS
  - .4 Store Hazardous Materials and wastes in containers compatible with that material or waste
  - .5 Segregate incompatible materials and wastes

- .6 Ensure that different Hazardous Materials or hazardous wastes are not mixed
  - .7 Store Hazardous Materials and wastes in secure storage area with controlled access
  - .8 Maintain clear egress from storage area
  - .9 Store Hazardous Materials and wastes in location that will prevent them from spilling into environment
  - .10 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment
  - .11 Maintain inventory of Hazardous Materials and wastes, including product name, quantity, and date when storage began
  - .12 Report spills or accidents immediately to Consultant and submit a written spill report within 24 hours of incident.
- .2 Transportation: Transport Hazardous Materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations and as follows:
- .1 Comply with federal Export and Import of Hazardous Waste Regulations where it is necessary to export hazardous waste to another country
  - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste
  - .3 Use licensed carrier authorized by provincial authorities to accept subject material
  - .4 Obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material prior to shipping hazardous waste
  - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations
  - .6 Use trained personnel to handle, offer for transport, or transport dangerous goods
  - .7 Provide photocopy of shipping documents and waste manifests to Consultant.
  - .8 Track receipt of completed manifest from consignee after shipping dangerous goods; provide a photocopy of completed manifest to Consultant.
  - .9 Report discharge, emission, or escape of Hazardous Materials immediately to Authority Having Jurisdiction and Consultant; take reasonable measures to control release.
- 2 Products
- 2.1 MATERIALS
- .1 Provide all temporary facilities, equipment, containers and spill remediation kits required by Authority Having Jurisdiction and as necessary to complete the work of this Section.
  - .2 Provide MSDS in proximity to where materials are being stored; communicate this location to personnel who may have contact with hazardous waste materials.
- 3 Execution
- 3.1 DISPOSAL
- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
  - .2 Recycle hazardous wastes where there is approved, cost effective recycling process available.

- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of Hazardous Materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .7 Take necessary precautions to avoid mixing clean and contaminated wastes.
- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
  - .1 Hazardous wastes recycled in manner constituting disposal
  - .2 Hazardous waste burned for energy recovery
  - .3 Lead acid battery recycling
  - .4 Hazardous wastes with economically recoverable precious metals
  - .5 Additional items identified during the course of the work
- .9 Sequence abatement and removal of Hazardous Materials with selective demolition work; complete removal of Hazardous Materials and make areas clean before actual start of demolition activities.

**END OF SECTION**

## **REASSESSMENT OF HAZARDOUS BUILDING MATERIALS SURVEY REPORT**



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**Maple Project No. 17020**

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## **1.0 INTRODUCTION**

Maple Environmental Inc. ("Maple") was retained by Conseil scolaire catholique MonAvenir ("cscMonAvenir") to conduct a reassessment of hazardous materials within Saint Michel located at 29 Meadowvale Road, Toronto, Ontario, (the "Site"). The reassessment of hazardous building materials includes:

- ❖ Asbestos-Containing Building Materials ("ACM")
- ❖ Lead
- ❖ Mercury
- ❖ Mould
- ❖ Polychlorinated Biphenyls ("PCB")
- ❖ Radioactive Sources
- ❖ Silica

A detailed survey for the presence of the listed hazardous building materials was initially performed by Maple in 2014. The initiation of the current reassessment was to confirm the condition of the known hazardous materials, make updates subject to renovation or remedial work that may have taken place since the time of the previous assessment and make recommendations as required. Reassessments are performed on an annual basis.

## **2.0 METHODOLOGY**

The site work was performed by Maple representative Mark Pollock on July 19, 2018. The surveyor accessed each functional space where possible to assess the quantity and condition of hazardous materials identified during the initial hazardous materials survey for the property. The survey included a detailed assessment of all exposed hazardous materials and a representative assessment of concealed hazardous materials (i.e. above ceilings, pipe chases, etc.). It is important to note that concealed spaces were not entered in every room but rather in sufficient quantity to assess the overall representative condition of known hazardous materials.

Ceiling plenums and areas above accessible suspended ceiling systems were observed by removing ceiling tiles in various locations in the building. Drywall or plaster ceiling or wall spaces were accessed via existing access panels only.

## **2.1 Asbestos-Containing Building Materials ("ACM")**

The scope of the reassessment included all friable asbestos products and all major non-friable asbestos materials. The term friable is applied to a material that can be readily reduced to dust or powder by hand or moderate pressure. Asbestos materials that are friable have a much greater potential to release airborne asbestos fibres when disturbed.

Ontario Regulation 278/05 applies to buildings with regards to maintenance, renovations or demolition work where ACM is present and may be disturbed. The regulation requires all buildings where asbestos has been used as part of the building to implement an Asbestos Management Program ("AMP"). The AMP is currently in place for this Site.

Regulation 278/05 requires that the detailed asbestos inventory already performed in all cscMonAvenir schools be updated annually. This report satisfies this requirement.

## **2.2 Lead**

No regulations currently exist in Ontario defining the lower limit of lead-containing material. The Ontario Ministry of Labour (MOL) has issued a guideline for lead abatement, entitled Guideline – Lead on Construction Projects (2004) which is considered enforceable. The Guideline does not specify what constitutes a material as "lead-containing". Instead it outlines procedures based on the concentration of airborne lead encountered during removal, as well as providing procedures and/or specific operations for lead-containing material removal. However, the Environmental Abatement Council of Ontario (EACO) Lead Guideline for Construction, Renovation, Maintenance or Repair indicates that paints containing 0.1% to 0.5% lead be considered "lead-containing" and paints with greater than 0.5% be considered "lead-based". Based on this criterion, low levels of lead should be assumed to be present within all paint finishes.

Based on the date of the building construction, no paint samples were collected during the current reassessment survey or past surveys as the lead concentration was not suspected to be "lead-containing".

## **2.3 Mercury**

The reassessment included a visual identification of switches, electrical controls, heating system thermostats, thermometers, and other components historically known to contain mercury.

## **2.4 Mould**

The reassessment for mould was conducted in accordance with standard industry practice as set out in the Canadian Construction Association ("CCA") "Mould Guidelines for the Canadian Construction Industry" for a visual reassessment. Although there are no regulatory requirements in Ontario for such a reassessment, the CCA Guidelines, and similar guidelines from other agencies have been accepted as the industry standard by most experts, consultants, the Ontario Ministry of Labour, and the CCA.

All guidelines and protocols for mould investigations indicate that investigations should be performed largely on a visual basis with limited collection of bulk and/or air samples. The Ontario Ministry of Labour has consistently enforced the removal of all mould from buildings regardless of mould genus or species, and therefore bulk samples or air samples for confirmation of mould are not typically collected for investigative purposes where mould is visible.

## **2.5 Polychlorinated Biphenyls ("PCB")**

The current survey included a reassessment of transformers and representative light fixture ballasts for determination of suspect PCB content. Where possible, serial numbers and codes from the manufacturer's labels of equipment were recorded and compared to manufacturer's literature for determination of PCB content. Samples of PCB liquids were not collected.

## **2.6 Radioactive Sources**

Radioactive Sources, including: smoke detectors; test equipment; or other known sources, not including sources that generate radiation through input of energy (e.g. microwaves, x-ray machines, laser light sources) were identified. Sampling for radon or radon gas was not performed.

## **2.7 Silica**

Free crystalline silica is associated with all concrete and masonry products, which were identified on a visual basis at the Site.

# **3.0 LIMITATIONS AND OMISSIONS FROM SCOPE**

Due to the nature of building construction, some limitations exist as to the possible thoroughness of any building materials inventory. The field observations, measurements, and analysis are considered sufficient in detail and scope to form a reasonable basis for the findings presented in this report. Maple warrants that the findings and conclusions contained herein have been made in accordance with generally accepted evaluation methods in the industry and applicable regulations at the time of the performance of the inventory.



It is possible that conditions may exist which could not be reasonably identified within the scope of the inventory, or which were not apparent during the Site investigation. Maple believes that the information collected during the inventory period concerning the property is reliable. No other warranties are implied or expressed.

In addition, with respect to asbestos, during a standard reassessment, performed for the purposes of regulatory compliance, it is industry practice to exclude some non-friable materials in the inventory. Examples of such assumptions include; elevator brakes, roofing felts and mastics, high voltage wiring, mechanical packing and gaskets, underground services or piping, fire-doors, window caulking, levelling compound, and/or materials used in operating equipment.

It should be noted there was no access to the 2<sup>nd</sup> Floor Elevator Room at the time of the reassessment.

## **4.0 REASSESSMENT FINDINGS**

### **4.1 Asbestos**

Asbestos-containing materials were not identified within the Site during the initial survey. Further, no asbestos-containing materials were identified during the current reassessment. The possibility of the presence of ACM in the building is unlikely based on the date of construction (Post 1985) although it is possible that non-friable ACM materials may be present that were not included in this report.

### **4.2 Lead**

No paint samples were collected during the current or past surveys. However, paint present within the school is suspected to have a detectable concentration greater than the reporting limit, although at low levels.

It should be noted that lead may be present in wiring connectors, electric cable sheathing, mortar, ceramic tile glazing and solder joints on copper piping.

All paints were observed to be in GOOD condition.

### **4.3 Mercury**

Mercury is present as vapour within fluorescent light tubes and HID lighting.

### **4.4 Mould**

During the current assessment, stained ceiling tiles were identified within the following locations:

- First Floor Corridor (Outside Library): 1 stained ceiling tile

- Gym Office 123: 2 stained ceiling tiles
- Classroom 144: 1 stained ceiling tile
- Room 134: 2 stained ceiling tiles
- Room 208: 2 stained ceiling tiles
- Room 214: 1 stained ceiling tile
- Room 215: 1 stained ceiling tile
- Second Floor Corridor (near east Stair): 1 stained ceiling tile
- Second Floor Girl's Washroom: 1 stained ceiling tile
- Room 217: 1 stained ceiling tile
- Room 218: 1 stained ceiling tile

The probable cause of water staining may be caused by sweating pipes.

Additionally, approximately 10 square feet of minor staining was observed on fibreglass breaching within the Second Floor Mechanical Room.

#### **4.5 Polychlorinated Biphenyls ("PCB")**

Fluorescent light fixtures were visually assessed for the presence suspect PCB content during the initial survey.

For light fixtures containing older style tubes an effort was made to determine the ballast code and compare the code to manufacture's specifications. Due to the age of the building, the style of the light fixtures present, and the fact that no major re-lamping has occurred, PCB is suspected to be present within fluorescent lamp ballasts at the Site.

Without assessment of each ballast in every light fixture it is not possible to obtain an accurate inventory of the quantity and location of PCB containing ballasts in the building.

Electrical transformers were observed at the Site. However the unit was enclosed within metal casing with a pad lock attached and preventing access to the unit. Maple was unable to determine if the transformer contains PCB fluids.

#### **4.6 Radioactive Sources**

Devices suspected to be radon sources (i.e. smoke detectors etc.) were not identified at the subject Site.

Recently, Health Canada published a guideline "Guide for Radon Measurement in Public Buildings". This guideline was adopted by the Government of Canada on June 9, 2007. Methods of measurement for radon within school buildings are specified in this guideline. A maximum average

annual concentration of up to 200 Bq/m<sup>3</sup> is permitted and remedial measures are suggested if radon level exceeds the recommended limit.

#### **4.7 Silica**

Free crystalline silica in the form of common construction sand is a constituent of all concrete and masonry products present at the Site.

Cracking in the masonry block was observed within the First Floor Corridor (outside of Room 144) and within the Second Floor Corridor (near the east stair). Additionally, minor on the drywall cracking was observed within Room 216 and on the ceiling within the Second Floor Corridor.

### **5.0 RECOMMENDATIONS**

1. General recommendations as presented in the original report apply to this Site.
2. Complete radon testing in accordance with procedures outlined in "Guide for Radon Measurements in Public Buildings (Schools, Hospitals, Care Facilities, Detention Centres)" to determine the level of radon at the subject site. It is important to note that this recommendation is based on the Health Canada guideline for due diligence, however this is not a regulatory compliance requirement.
3. Disturbance of paint suspected to have a lead concentration should follow Type I lead abatement procedures, at a minimum, provided that; a) work does not include fume producing activities such as welding, burning, torching, etc., b) is not removed or demolished by scraping, sanding or striking c) airborne lead concentration are kept below 0.05 mg/m<sup>3</sup> and d) general dust suppression and worker protection procedures are utilized including; minimum N95 respirator, protective clothing, and proper worker hygiene. However, it may be prudent that air monitoring be conducted during the disturbance of lead-containing materials to ensure airborne levels of lead do not exceed the acceptable limit.
4. Remove and replace stained ceiling tiles within locations outlined in Section 4.4.
5. Monitor water staining within 2<sup>nd</sup> Floor Mechanical Room. The source of water intrusion should be addressed to prevent further staining and possible mould amplification.

## **6.0 LIMITATION OF USE OF THIS REPORT**

The Client acknowledges this report has been prepared for the exclusive use of Client and agrees that this report may not be used or relied upon by any third parties.

Any use not authorized by cscMonAvenir and Maple Environmental Inc. which any third party makes of this report, or any reliance on, or decision(s) to be made based on it, are the responsibility of such third parties and are without any liability of any nature to cscMonAvenir and Maple Environmental Inc. cscMonAvenir and Maple Environmental Inc. accept no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

**Sincerely,**

**MAPLE ENVIRONMENTAL INC.  
Environment, Health and Safety Consultants**

**Prepared By:**



**Mark Pollock  
Project Technologist**

**Reviewed By:**



**Jason De Sousa  
Project Manager**

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1 General

1.1 SECTION INCLUDES

- .1 Labour, Products, equipment and services necessary for cast-in-place concrete Work in accordance with the Contract Documents.

1.2 REFERENCES

- .1 ACI 308R, Guide to Curing Concrete.
- .2 ACI 309R, Guide for Consolidation of Concrete.
- .3 ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.
- .4 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .5 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
- .6 ASTM C510, Standard Test Method for Staining and Colour Change of Single- or Multicomponent Joint Sealants.
- .7 ASTM C920, Standard Specification for Elastomeric Joint Sealant.
- .8 ASTM C881/C881M, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- .9 ASTM C1059/C1059M, Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- .10 ASTM C1116/C1116M, Standard Specification for Fiber-Reinforced Concrete.
- .11 ASTM D1752, Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .12 ASTM D6690, Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
- .13 ASTM D7508/D7508M, Standard Specification for Polyolefin Chopped Strands for Use in Concrete.
- .14 CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .15 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .16 CSA A3000, Cementitious Materials Compendium. Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Shop Drawings:
  - .1 Submit 3 weeks prior to placement, detailed and dimensioned drawings indicating the locations of sawcut joints for review.

1.4 QUALITY ASSURANCE

- .1 Construction Tolerances:
  - .1 Make concrete in place plumb, level and true. Have maximum variations (non-cumulative) in accordance with CSA A23.1/A23.2, unless noted otherwise.
  - .2 Surface finish tolerances:

- .1 Slab on grade:  $F_F = 25$  and  $F_L = 20$  overall.
- .2 Inspection and Testing:
  - .1 Inspection and testing for the Work of this Contract in accordance with CSA A23.1/A23.2 and to the Contract Documents.
  - .2 Be responsible for inspection and testing for the Work of this Contract.
  - .3 Remove defective materials and completed Work which fails inspection or testing and replace as directed by the Consultant.
- .3 Defective Concrete:
  - .1 Hardened concrete state:
    - .1 Concrete is considered defective when a cylinder test fails to meet the performance requirements for corresponding concrete type.
  - .2 Plastic concrete state:
    - .1 Concrete considered defective when the measured slump, air content, placing temperature, or density of concrete fails to meet the performance requirements.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials on Site in accordance with CSA A23.1/A23.2.
- .2 Concrete, Site-Mixed:
  - .1 Site-mixed concrete is not permitted when:
    - .1 A structure contains more than a total of 50 m<sup>3</sup> of concrete.
    - .2 Specified compressive strength is higher than 25 MPa at 28 Days.
    - .3 Concrete is prestressed.
    - .4 Ready-mix concrete is specified.
  - .2 Transport concrete from mixer to point of delivery as rapidly as practicable. Conform to the requirements of Article 3.3, specified for methods and equipment.

## 2 Products

### 2.1 MATERIALS

- .1 General:
  - .1 Use admixtures for concrete in accordance with CSA A23.1/A23.2.
  - .2 Have the concrete manufacturer certify that materials and admixtures are compatible.
  - .3 Use Products in accordance with the manufacturer's printed instructions unless otherwise acceptable to the Consultant.
  - .4 Fresh concrete to be normal density concrete (2350 kg/m<sup>3</sup> ±100 kg/m<sup>3</sup>), unless otherwise noted.
- .2 Cement and Supplementary Cementing Materials:
  - .1 Conforming to CAN/CSA A3001:
    - .1 For use in general concrete construction, when the special properties of other cement types are not required, use Portland cement Type GU or blended hydraulic cement Type GUB.
- .3 Coarse Aggregate:

- .1 In accordance with CSA A23.1/A23.2.
- .4 Fine Aggregate:
  - .1 In accordance with CSA A23.1/A23.2.
- .5 Water:
  - .1 In accordance with CSA A23.1/A23.2.
- .6 Admixtures:
  - .1 Manufacturers:
    - .1 The Euclid Chemical Company (Euclid Canada), a division RPM, Inc.
    - .2 Grace Construction Products.
    - .3 BASF – Admixture Systems.
    - .4 Sika Canada Inc.
  - .2 Add admixtures to concrete mix in accordance with manufacturer's written instructions.
    - .1 The use of calcium chloride is not permitted.
    - .2 Have the concrete manufacturer certify that admixtures are compatible.
  - .3 Air-entrainment admixtures in accordance with ASTM C260/C260M.
  - .4 Chemical admixtures: In accordance with CSA A23.1/A23.2 and ASTM C494/C494M.
    - .1 Water-reducing admixture: Type A.
    - .2 Retarding admixture: Type B.
    - .3 Accelerating admixture: Type C.
    - .4 Water-reducing and retarding admixtures: Type D.
    - .5 Water-reducing and accelerating admixture: Type E.
    - .6 Water-reducing high range admixture (super plasticizers): Type F.
    - .7 Water-reducing, high range and retarding admixtures (super plasticizers): Type G.
    - .8 Specific performance admixtures: Type S.
- .7 Perimeter Joint Filler:
  - .1 In accordance with ASTM D1752, Type I, flexible foam, firm grade, in thickness indicated on Contract Drawings. Supply the manufacturer's recommended adhesive for securing joint filler to abutting adjacent structures.
  - .2 Manufacturer's Product: Ceramar, Flexible Foam Expansion Joint by W.R. Meadows of Canada Ltd.
- .8 Interior Joint Sealant:
  - .1 Polyurethane joint sealant, in accordance with ASTM C920, Type M, Grade P, minimum Class 25, and non-staining in accordance with ASTM C510, grey colour.
  - .2 Manufacturer's Products:
    - .1 Sonneborn brand, Sonolastic SL 2 by BASF – Building Systems.
    - .2 Eucolastic II by The Euclid Chemical Company (Euclid Canada), a division RPM, Inc.
    - .3 Sikaflex 2c SL by Sika Canada Inc.

- .9 Drilled Anchors:
  - .1 Manufacturer's Products:
    - .1 HVA Adhesive System with HVU Capsules by Hilti Canada Corporation.
    - .2 HIT-HY 200 Safe Set System by Hilti Canada Corporation (fast cure).
    - .3 HIT - RE 500 Epoxy Adhesive Anchoring System by Hilti Canada Corporation (slow cure).
    - .4 FLO-ROK FR5MAX Injection Adhesive Anchor by UCAN Fastening Products.
    - .5 Heavy Load Expansion Anchor (Part # LHL) by UCAN Fastening Products.
    - .6 KWIK BOLT-TZ Expansion Anchor by Hilti Canada Corporation.
    - .7 HSL-3 Expansion Anchor by Hilti Canada Corporation.
    - .8 HDA Undercut Anchor by Hilti Canada Corporation.
- .10 Steel Dowels:
  - .1 In accordance with CSA G30.18, Grade 400.

## 2.2 CONCRETE MIXES

- .1 Design concrete to avoid segregation and excessive bleeding.
- .2 Mix concrete and concrete proportions in accordance with CSA A23.1/A23.2.
- .3 Ensure Mix Design is adjusted suitably to prevent alkali aggregate reaction.
- .4 Concrete temperature limits:
  - .1 Temperature at placing: In accordance with CSA A23.1, Table 14.
  - .2 Maximum curing temperature: 70°C.

## 3 Execution

### 3.1 GENERAL

- .1 Supply, place and cure cast-in-place concrete in accordance with CSA A23.1/A23.2 and this Section.
- .2 Prior to placement of concrete give the Consultant at least 2 Days' notice to permit a review of placement of formwork, reinforcing steel, and associated items, embedded in concrete in accordance with reviewed Shop Drawings and Contract Documents.
- .3 Do not place concrete on surfaces which contain water or debris.
- .4 Ensure that reinforcement and associated items embedded in concrete are not disturbed during placement of concrete.
- .5 Install premoulded joint filler for full depth of concrete at abutting structures where indicated on Contract Drawings.
- .6 Ensure concrete cover over reinforcing steel in accordance with Contract Drawings.
- .7 Place insulation in locations in accordance with Contract Drawings and manufacturer's printed instructions:
  - .1 Ensure that insulation does not move when placing concrete.
- .8 Include required formwork and reinforcing.

### 3.2 INSERTS



- .1 Tolerance for placing embedded items: In accordance with CSA A23.1/A23.2, unless otherwise indicated on Contract Documents.
- .2 Set and build in inserts, anchors, frames, angles, sleeves, and plates, supplied by other trades. Advise trades well in advance of scheduled pours to allow adequate time for supply of items to be built-in.
- .3 Have respective trades verify location of items supplied by them.
- .4 Do not eliminate, cut, or displace reinforcement, to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from the Consultant before placing concrete.
- .5 Check locations and sizes of sleeves and openings in accordance with Contract Drawings.
- .6 Anchor bolts:
  - .1 Before placing concrete, place anchor bolts in locations in accordance with reviewed Shop Drawings under supervision of the trade supplying anchor bolts and templates in accordance with the manufacturer's printed instructions and CSA A23.1/A23.2.
  - .2 Allowable anchor bolt height tolerance within  $\pm 13$  mm maximum.
- .7 As concrete is being placed, ensure that items embedded in concrete are checked from time to time for position, alignment, and elevation.
- .8 Take special care to ensure dense, watertight concrete around items set in concrete.

### **3.3 PLACING OF CONCRETE**

- .1 Place concrete in accordance with CSA A23.1.
- .2 Ensure that placing equipment, if supported by falsework or formwork, does not impart harmful vibration to freshly placed concrete or cause deformation or misalignment of formwork.
- .3 Prevent damage to waterproofing where concrete is poured against waterproofing.
- .4 Slope concrete to levels in accordance with Contract Drawings.
- .5 Do not place concrete at such a rate as to endanger formwork or to prevent proper compaction.
- .6 Place concrete to prevent cold joints and segregation and vibrate sufficiently to ensure thorough compaction, maximum density in accordance with CSA A23.1/A23.2.
- .7 Check Work frequently with accurate instruments for any variation during placing of concrete.

### **3.4 CONCRETE CONSOLIDATION**

- .1 Consolidate concrete in accordance with CSA A23.1.
- .2 Work concrete into complete contact with forms and embedded items. Consolidate concrete adjacent to side forms and along entire length of forms to ensure a smooth surface finish after stripping of formwork.
- .3 Thoroughly vibrate concrete around reinforcement, hardware anchors, and other embedded items, to ensure good bond.
  - .1 Do not use vibrators to move concrete laterally.
  - .2 Have vibrating equipment on hand and ready for use before placing is started.
- .4 Internal vibration can significantly affect entrained air void systems in concrete. Follow the detailed guidance for proper vibration as stated in ACI 309R.
- .5 Method of concrete consolidation to prevent damage to the temperature monitoring and recording systems, if installed.

### **3.5 PROTECTION AND CURING**

- .1 Protect and cure concrete in accordance with CSA A23.1.
- .2 Provide when necessary enough tarpaulin or other suitable materials to completely cover or enclose forms and Work areas during placing and curing.
- .3 Do not remove protection until the concrete has cooled to the temperature differential given in the CSA A23.1, Table 20, in order to avoid cracking of the concrete due to the sudden temperature change near the end of the curing period.
- .4 Removal of forms prior to the minimum curing period does not remove the Contractor's obligation to cure and protect the exposed concrete for the minimum time periods specified for curing and protection.
- .5 Have all materials and equipment needed for protection and curing on hand and ready for use prior to placement of concrete.
- .1 For additional information refer to ACI 308R, Guide to Curing Concrete.

### **3.6 CONSTRUCTION JOINTS**

- .1 Construct construction joints in accordance with CSA A23.1 and as indicated on Contract Drawings. Provide dowels in construction joints unless otherwise detailed.

### **3.7 BONDING CONCRETE TO HARDENED CONCRETE**

- .1 Bond concrete in accordance with CSA A23.1/A23.2.

### **3.8 FINISHING**

- .1 Treat and finish exposed formed surfaces in accordance with CSA A23.1.

### **3.9 LOADING OF STRUCTURE**

- .1 Do not load any portion of structure prior to achieving 70% of specified strength and only with the acceptance of the Contractor.
- .2 Removal of forms prior to the minimum required curing period does not remove the Contractor's obligation to cure and protect the exposed concrete for the minimum required time periods specified. Refer to Article 3.5 of this Section.

### **3.10 SAWCUT JOINTS**

- .1 Time joint sawing to concrete setting. Start sawing as soon as concrete has hardened sufficiently to prevent aggregates from being dislodged by saw.
- .2 Complete sawcutting before drying shrinkage stresses become large enough to produce cracking and in any event not more than 12 hours after concrete is placed.
- .3 Sawcut joints in straight lines.
- .4 For sawcut location, width, depth, and sealant protection in reinforced concrete slab, refer to Contract Drawings.
- .5 Ensure that reinforcing steel is not cut or damaged.
- .6 Locate sawcut joints in accordance with submitted Shop Drawings in Section 1.3.2.
- .7 Give special consideration to areas of restraint to shrinkage such as at columns, re-entrant corners and sudden changes in width.
- .8 Spray water on saw blade at all times during sawing.
- .9 After sawing, clean joints with jet of water and blow-out with compressed air.
- .10 Broom clean residue caused by sawing operation.

### **3.11 REPAIRING CRACKS IN CONCRETE**

- .1 After concrete has set for a minimum of 28 Days, and before a maximum of 125 Days, examine surfaces carefully for cracks.
- .2 Rout cracks larger than 0.3 mm.
- .3 Fill cracks with non-shrink grout.
- .4 Match surface to existing surfaces in quality, texture, colour, and elevation.

### **3.12 PATCHING**

- .1 Carry out patching as specified in CSA A23.1/A23.2.
- .2 Make good temporary openings left in concrete for pipes, conduits, ducts, shoring, and other Work during construction.
- .3 Reinforce with welded wire fabric, as required.
- .4 Mix, handle, and cure patching material according to manufacturer's instructions.
- .5 Immediately prior to patching clean, prepare, and remove free water from the surface.
- .6 Finish flush with the surface of the surrounding concrete and remove excess material.

### **3.13 SEALANT APPLICATION**

- .1 Do not fill joints sooner than 30 Days after concrete pours.
- .2 Comply with the manufacturer's printed instructions and curing and sawcutting requirements.
- .3 Execute joint sealing during cool, dry ambient conditions when slab is in contracted state to minimize future joint separation at sealant filled joints.
- .4 Fill sawn joints in concrete slabs full depth with sawcut joint sealant.
- .5 Comply with sealant manufacturer's primer, application, and temperature requirements. Mask floor to edge of joints and fill joint with sealant.
- .6 After initial set, prime sealant surface and refill joints with sealant as required to produce slightly convex joint surface.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 SUMMARY**

- .1 Work of this Section includes the following:
- .1 Requirements for concrete floor additives such as:
    - .1 Penetrating sealer
    - .2 Hardener additive
  - .2 Testing and measurement for floor flatness and levelness,
  - .3 Trowelling, levelling, and floating of floor surfaces for ready for applied finishes.

**1.3 RELATED REQUIREMENTS**

- .1 Section 05 50 00: Metal Fabrications
- .2 Section 32 16 13: Curbs and Sidewalks

**1.4 DEFINITIONS**

- .1 Floor Classifications: Classification of concrete floor slabs based on their intended use, methods of finishing and finish materials applied to flooring as denoted by the F-rating below, and as follows:
- .1 Single Course Floor: Floors placed in a single course with final finishing applied to properly levelled concrete.
  - .2 Finish or Finishes: Materials applied to finished concrete surface, i.e.: stained or coloured concrete, carpet, resilient flooring or ceramic tile.
  - .3 Finishing: Methods, tools and equipment employed to achieve levelness or surface flatness for shored slabs and slabs-on-grade, and durability indicated and as follows:
    - .1 F3-Finishing: Floors having a straightedge value of  $\pm 1.6$  mm over 3048 mm (1/6" over 10'); similar to CSA A23.1 Class C Slab Finishing.

**1.5 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials (ASTM):
- .1 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compound for Curing Concrete.
  - .2 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Colored Concrete.
- .2 American Concrete Institute (ACI):
- .1 ACI 117-2010, Specifications for Tolerances for Concrete Construction and Materials and Commentary
  - .2 ACI 302.1R-15, Guide for Floor and Slab Construction
- .3 Canadian Standards Association (CSA):
- .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .4 International Concrete Repair Institute (ICRI):

- .1 ICRI 310.2R-2013, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair

## 1.6 ADMINISTRATION REQUIREMENTS

- .1 Coordination: Coordinate a meeting between the Contractor, Subcontractor responsible for concrete placement, and the Consultant to determine Site Quality Control testing section borders and sample measurement line locations, method of measurement, and accuracy requirements of the measuring devices.
- .2 Pre-Construction Meetings: Arrange meeting with Contractor, Subcontractor for work of this Section and other Subcontractors affected by work of this Section to discuss effects and issues governing installation of concrete finishing materials; prepare an outline agenda for meeting in accordance with Section 01 31 19 Project Meetings.

## 1.7 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 Submittal Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Product Data: Submit manufacturers product data for each materials specified including recommended application rates and methods of installation.
- .3 Informational Submittals: Provide the following submittals during the course of the work:
  - .1 Site Quality Control Submittals: Submit results for straightedge measurements to demonstrate compliance with specified tolerances. Record the following information on a drawing indicating floor slab layout, column locations and slab penetrations:
    - .1 Indicate variance from specified straightedge measurements as a + or - value.
    - .2 Failed tests in excess of 50% of the straightedge will require the Subcontractor to flash patch floor to achieve specified tolerance; example of tolerance failure.
    - .3 Slabs-On-Grade: Measurement of 1.6mm (1/16") or greater than  $\pm 6$ mm (1/4") measurement will be considered as a failed test and will require flash patching.

## 1.8 PROJECT CLOSEOUT SUBMISSIONS

- .1 Operation and Maintenance Data: Submit detailed cleaning and maintenance instructions for concrete densifier products, and instruct Owner in proper care and maintenance of specified floor finishes, including a complete list of floor care products that will be required for ongoing maintenance, in accordance with Section 01 33 00.

## 1.9 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Work of this Section shall be executed by a company that has adequate equipment and skilled tradesmen to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified, during a period of at least the immediate past five years.
- .2 Co-operation:
  - .1 Ensure that concrete supplied for slabs contains no admixtures which would be incompatible with floor finishing materials.

## 1.10 SITE CONDITIONS

- .1 Environmental Requirements:
  - .1 Ensure that adequate temporary heating is provided as required for cold weather work.
  - .2 Provide adequate moisture, sun shades and wind barriers to prevent too rapid drying of concrete during hot weather.

- .2 Protection:
  - .1 Ensure that finished concrete floor areas are protected from abrasion from foot or wheeled traffic, and from damage caused by spillage of oil or other harmful materials.

## 2 Products

### 2.1 MATERIALS

- .1 Curing Sheet: 2 mil polyethylene sheet conforming to CGSB 51-GP-51M or laminated waterproof kraft paper.
- .2 Liquid Applied Penetrating Sealer: Clear water based silane micro emulsion penetrating concrete sealer formulated to prevent water and chloride intrusion into concrete surfaces.
  - .1 Basis of Design Materials:
    - .1 Cipadam S-40 by CPD Construction Products
    - .2 Sikagard SN40 LO-VOC by Sika Canada Inc.
    - .3 MasterProtect H440 HZ by BASF.
  - .3 Hardener Aggregate: Pre-mixed, non-metallic aggregate, dry shake hardener.
    - .1 Basis of Design Materials:
      - .1 Floor Hardener Pre-Mix by CPD Construction Products
      - .2 Diamag 7 by Sika Canada Inc.
      - .3 MasterTop 100 by BASF.
  - .4 Underlayment:
    - .1 Concrete Substructure: Cementitious, self levelling, single component, polymer modified underlayment and manufacturer's recommended primer, for application thicknesses to a minimum feather edge to 13 mm (½"); acceptable.
      - .1 Basis of Design Materials:
        - .1 Planipatch by MAPEI Canada Inc.
        - .2 Sika Level-125 CA by Sika Canada Ltd.
        - .3 Floor-Top STG by W.R. Meadows of Canada
  - .5 Patching and Flash Patching Materials: Cementitious based, polymer modified, fine aggregate, single component, rapid curing, early strength floor patching compounds having high adhesion, for application in thicknesses to a minimum of 1/8" to 1".
    - .1 Basis of Design Materials:
      - .1 Mapecem 101 by MAPEI Canada Inc.
      - .2 SikaQuick 1000 by Sika Canada Ltd.
      - .3 Meadow-Crete H by W.R. Meadows of Canada
  - .6 Joint Sealant: Refer to Section 07 92 00 Joint Sealants.

## 3 Execution

### 3.1 EXAMINATION

- .1 Before commencing work, ensure that surfaces are acceptable to receive and maintain concrete finishing, and that specified installation will be achieved.

### 3.2 FINISHING FLOORS AND SLABS

- .1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.

### 3.3 INSTALLATION

- .1 Concrete Finishing:
  - .1 Roll or tamp concrete to force coarse aggregate into concrete mix and then screed.
  - .2 Bring surface to true grade by floating.
  - .3 Steel trowel to a true and even surface.
  - .4 Follow with second steel trowelling to produce a smooth burnished surface.
- .2 Sealed Floors:
  - .1 Seal all exposed concrete floors. Apply sealer as recommended by manufacturer. Install bond breaker of silica sand, polyethylene film strip or foam filler in bottom of joints.
- .3 Hardened Floors:
  - .1 Apply hardener aggregate to floor surfaces indicated on drawings and/or schedules in two shakes, half of the aggregate for each shake.
  - .2 Apply first shake when the concrete is firm enough to support workmen and equipment and when no standing water is present. Mechanically float aggregate into surface.
  - .3 Apply the second shake and mechanically float as specified above for finishing.
  - .4 Apply total amount of aggregate at rate of 60-100 lbs. per 100 sq.ft. of floor area.
  - .5 Cure concrete as specified in CAN/CSA-A23.1/A23.2-94, and as indicated in Paragraph 3.4 - Concrete Finishing Schedule. Ensure that no curing compound is used which is detrimental to bond of bedding for finish flooring or finish flooring materials.
- .4 Floor Underlayment:
  - .1 Leak Prevention: Fill cracks and voids in subfloor where leakage of slurry could occur using suitable quick setting patch material or caulk, as recommended by underlayment manufacturer.
  - .2 Prime substrate according to manufacturers recommendations.
  - .3 Installation shall not begin until building is enclosed.
  - .4 Install sound attenuation mat where required on drawings, complete with isolation strips, prior to pouring floor underlayment.
  - .5 Mix underlayment in accordance with manufacturers written instructions and test mix for slump using 100 mm (4") cylinder.
  - .6 Pour underlayment to recommended thickness and immediately spread and screen to smooth surface.
- .5 Control Joints:
  - .1 As soon as concrete surface is firm enough not to be torn or damaged by cutting, cut 5 mm (3/16") wide control joints into surface of concrete with abrasive blade power saw.
  - .2 Locate control joints on centre lines of columns, and at maximum spacing of 6096 mm (20') in both directions unless noted.
  - .3 Cut joints in slabs on grade 38 mm (1-1/2") deep.
  - .4 Within four (4) weeks of cutting joints, fill them with joint sealant. Completely clean side joint surfaces of dirt, oil, grease, and similar contaminants. Mask floor surfaces at joints

while pouring. Prime side joint surfaces with compatible primer if surfaces are not completely dry.

- .6 Cast-in all items as supplied by other Sections.

### **3.4 PATCHING AND REFINISHING**

- .1 Before completion of project, patch and refinish defective surfaces to match surrounding areas with no discernible variation in appearance.

### **3.5 CONCRETE FINISHING SCHEDULE**

- .1 Exposed Concrete:
  - .1 Steel trowel finish, cured by liquid curing-sealing compound.
- .2 For Resilient Tile Flooring:
  - .1 Steel trowel finish, cured by compatible curing compound, curing sheet or moist curing.
- .3 For Ceramic Tile:
  - .1 Installed with thin set mortar: light steel trowel finish, cured by curing sheet or moist curing.
- .4 For Depressed Slabs:
  - .1 Rough broom finish, cured by curing sheet or moist curing.
- .5 Exterior Concrete Sidewalks and Ramps:
  - .1 Broom finish for traction.

**END OF SECTION**



1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Sections of Division 1 apply to work of this Section.

**1.2 RELATED REQUIREMENTS**

- .1 Section 04 20 00: Unit Masonry

**1.3 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA):  
.1 CSA A179-04 (R2009), Mortar and Grout for Unit Masonry  
.2 CSA S304.1-04 (R2010), Design of Masonry Structures  
.2 American Society for Testing of Materials (ASTM):  
.1 ASTM C270-12, Standard Specification for Mortar for Unit Masonry.

**1.4 QUALITY ASSURANCE**

- .1 Do mortar and grout work in accordance with CSA A179 except where specified otherwise.  
.2 Use same brands of materials and source of aggregate for entire project.  
.3 Irregularity in mortar joints for wall faces exposed or painted in the completed work: Not be noticeable when viewed from a distance of 4500 mm (15'-0").

2 Products

**2.1 MATERIALS**

- .1 Cement: Normal Portland, CAN/CSA-A3001, Type GU.  
.2 Hydrated Lime: ASTM C207; Type S.  
.3 Aggregate: CSA A179, except that the maximum allowable percentage passing 600 um (No. 30) sieve shall be 80% and maximum passing 300 um (No. 50) sieve shall be 50%.  
.4 Integral Water Repellent Admixture: Liquid polymeric admixture added to mortar during mortar mixing in accordance with manufacturer's recommendations, provide Class E Rating when tested in accordance with ASTM E514.  
.1 Basis of Design Product: Dry Block System by GCP Applied Technologies.

**2.2 MORTAR TYPES**

- .1 Mortar and Grout, General: CSA A179.  
.2 Mortar for Exterior Masonry Above Grade.  
.1 Loadbearing: Type S.  
.2 Non-Loadbearing: Type N.  
.3 Parapet Walls, Chimneys, Unprotected Walls: Type S.  
.3 Mortar for Foundation Walls, Manholes, Sewers, Pavements, Walks, Patios and Other Exterior Masonry at or Below Grade: Type S.  
.4 Mortar for Interior Masonry.  
.1 Loadbearing: Type S.  
.2 Non-Loadbearing: Type N.

- .5 Non-Staining Mortar: Use non-staining masonry cement for cementitious portion of specified mortar type.
- .6 Parging Mortar: Type N.

### 2.3 MIXES

- .1 Measure and mix mortar materials based on CSA A179 Proportion Specifications.
- .2 Use Portland cement in mortar for exterior masonry work and masonry cement for interior masonry work.
- .3 Incorporate admixtures into mixes in accordance with manufacturer's instructions.
- .4 Do not mix different types of mortar or grout in the same mixer unless the mixer is thoroughly cleaned first.
- .5 Type N Mortar: At Contractor's option, one of the following:
  - .1 Pre-Mixed Mortar: CSA A179, portland cement/lime/aggregate, Type N, by St. Lawrence Cement Company, Canada Cement, St. Mary Cement or Lake Ontario Cement Ltd. Mix, use and store in accordance with manufacturer's instructions to produce small batches for immediate use only. Discard mixed mortar after 2 hours.
  - .2 Site Silo Mix: CSA A179, portland cement/lime/aggregate, Type N, by Mega-Mix Ltd. or Max-Mix Ltd. or Jiffy Concrete Products. Mix required amount from site silo as required. Take representative samples for testing consistency of strength in accordance with CSA A179. Use mortar within 2 hours after mixing at temperature of 26 deg C (79 deg F), or 2-1/2 hours at temperatures under 10 deg C (50 deg F).
- .6 Pointing Mortar: Prehydrate pointing mortar by mixing ingredients dry, then mix again adding just enough water to produce damp unworkable mix that will retain its form when pressed into ball. Allow to stand for not less than 1 hour nor more than 2 hours then remix with sufficient water to produce mortar of proper consistency for pointing.

## 3 Execution

### 3.1 APPLICATION

- .1 Do masonry mortar and grout work in accordance with CSA A179 except where specified otherwise.
- .2 Grouting: Do not place grout until height of masonry to be grouted has attained enough strength to resist grout pressure.
  - .1 Comply with requirements in CSA 371 for cleanouts and for grout placement, including minimum grout space and maximum pour height for low lift grouting.
- .3 Parging: Apply parging in uniform coating not less than total 10 mm (3/8") thick.

### 3.2 REPOINTING

- .1 Repoint defective joints.
- .2 Cut back joints 13 mm (1/2") taking care not to damage units. Remove dust and loose materials by brushing or by water jet. If water jet is used, allow excess water to drain before repointing.
- .3 Repoint with same mix and colour as original.
- .4 Pack mortar tightly in thin layers, and tool joint to match non defective joints.

**END OF SECTION**

**1 General**

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 SUMMARY**

- .1 This Section includes supply and installation of unit masonry assemblies consisting of the following:
- .1 Veneer Brick
  - .2 Veneer Stone
  - .3 Acoustical Concrete Masonry Units
  - .4 Architectural Concrete Masonry Units (CMUs)
  - .5 Fire Rated Concrete Masonry Units (CMUs)
  - .6 Reinforcing steel
  - .7 Masonry Joint Reinforcement
  - .8 Ties and Anchors
  - .9 Embedded Flashing
  - .10 Miscellaneous Masonry Accessories

**1.3 RELATED REQUIREMENTS**

- .1 Section 05 41 00: Structural Metal Stud Framing
- .2 Section 05 50 00: Metal Fabrications
- .3 Section 07 21 00: Thermal Insulation
- .4 Section 07 27 13: Modified Bituminous Sheet Air Barriers
- .5 Section 07 62 00: Sheet Metal Flashing and Trim
- .6 Section 07 92 00: Joint Sealants
- .7 Section 08 11 00: Metal Doors and Frames

**1.4 REFERENCE STANDARDS**

- .1 Brick Institute Association (BIA)
  - .1 BIA Technical Notes 20, Cleaning Brickwork
  - .2 BIA Technical Notes 23A - Efflorescence, Causes and Prevention
- .2 Canadian Standards Association (CSA):
  - .1 CSA A165 Series-04 (R2009), CSA Standards on Concrete Masonry Units
  - .2 CSA A179-04 (R2009), Mortar and Grout for Unit Masonry
  - .3 CSA A370-04 (R2009), Connectors for Masonry
  - .4 CAN/CSA A371-04 (R2009), Masonry Construction for Buildings
  - .5 CSA S304.1-04 (R2010), Design of Masonry Structures
  - .6 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction

- .3 American Society for Testing of Materials (ASTM):
  - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
  - .2 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
  - .3 ASTM A496/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement
  - .4 ASTM A563-07a, Standard Specification for Carbon and Alloy Steel Nuts
  - .5 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .6 ASTM A1011/A1011M-12, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
  - .7 ASTM C67-11, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
  - .8 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes
  - .9 ASTM C270-12, Standard Specification for Mortar for Unit Masonry.
  - .10 ASTM C494-11, Standard Specification for Chemical Admixtures for Concrete.
  - .11 ASTM E488/E488M-10, Standard Test Methods for Strength of Anchors in Concrete Elements
  - .12 ASTM E514/E514M-11, Standard Test Method for Water Penetration and Leakage Through Masonry
- .4 Underwriters Laboratories of Canada (ULC):
  - .1 ULC List of Equipment and Materials for Fire Rated Construction

## 1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Construction Conference: Arrange a site meeting attended by the contractor's superintendent, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personal before commencement of work for this Section; agenda for meeting will include; but not be limited to, the following:
  - .1 Confirmation of specifications and details for the project
  - .2 Required mortar, grout and concrete testing, batch control and grouting procedures
  - .3 Installation requirements of air/vapour membranes and insulation and coordination with other components of the Work
  - .4 Confirmation of cavity compartmentalization and drainage requirements
  - .5 Confirmation of appearance of exposed block lintels
  - .6 Confirmation of reinforcement at corners and wall intersections
  - .7 Coordination of interior and exterior crack control measures
  - .8 Confirmation of trowelled or tooled joints to concealed and exposed masonry faces
  - .9 Confirmation of methods for keeping mortar out of cavity space
  - .10 Confirmation of methods for controlling efflorescence during construction
  - .11 Confirmation of membranes and membrane flashing materials and details used for construction

- .12 Review of submitted masonry unit samples
- .13 Review of hot and cold weather requirements
- .2 Coordination: Coordinate components of the work of this Section with work performed by other Sections including; but not limited to, the following:
  - .1 Rain Screen Wall Construction:
    - .1 Masonry veneer forms a part of the exterior rain screen and protective facing.
    - .2 Construct assembly to allow for ventilation, drainage and pressure equalization of the voids between the veneer and the insulation with the outside pressures.
    - .3 Construct cavity space divided into separate compartments as a means of controlling these pressure differences within the building envelope.
  - .2 Steel Support Angles and Brackets:
    - .1 Coordinate requirements for structural steel support angles and brackets supplied and installed onto the building structure by Section 05 50 00.
    - .2 Provide requirements for supply of loose steel lintels and shelf angles installed by this section to Section 05 50 00.
  - .3 Sheet Metal Flashings and Trim:
    - .1 Coordinate installation of prefinished sheet metal through flashings with Section 07 62 00.

#### 1.6 WORK INSTALLED BUT SUPPLIED BY OTHERS

- .1 Build into masonry elements inserts, anchors, bolts, sleeves and other items supplied by other Sections and which are required for installation and performance of work of other Sections.
- .2 Install loose steel lintels required for support of masonry elements.
- .3 Install steel door frames and access doors occurring in masonry elements.
- .4 Install reinforcing steel and concrete fill into block lintels.
- .5 Install precast concrete sills.

#### 1.7 QUALITY ASSURANCE

- .1 Meet requirements of CSA A370-04, CSA A371-04 and CSA S304.1-04.
- .2 Ensure that work is executed under the continuous supervision and direction of a competent foreperson.
- .3 Comply with requirements of Section 01 45 00 when constructing fire rated walls and partitions. Solidly fill around beams and joists penetrating fire rated walls/ partitions in accord with requirements of Ontario Building Code.
- .4 Masonry units used in partitions / walls designated to provide a fire separation shall be of thickness and material required to achieve required rating. Hollow masonry units used in fire separation shall have the necessary percentage of solid material to meet required rating. Concrete block used in fire separation shall be suitably identified to permit verification of fire resistance rating.

#### 1.8 SUBMITTALS

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Submit samples of each type masonry accessory required, including but not limited to horizontal reinforcing, ties, weep hole inserts, dampproof coursing, mortar dropping control device.
- .3 Shop Drawings: Submit shop drawings indicating the following:

- .1 Indicate sizes, profiles, coursing, and locations of special shapes for concrete masonry units and cladding.
- .2 Indicate sizes, profiles, and locations of each stone trim unit required.
- .3 Detail corner units, end dam units, and other special applications for fabricated flashings.
- .4 Samples for Verification: Submit samples for verification for each type and colour of the following:
  - .1 Decorative masonry cladding units, in the form of small scale units.
  - .2 Architectural concrete block units, in the form of small scale units.
- .5 Informational Submittals: Provide the following submittals when requested by the Consultant:
  - .1 Submit ULC Assembly Listings and Materials cut sheets for fire rated assemblies as follows:
    - .1 Not later than 30 working days following Award of Contract, submit copies of ULC Assembly and Materials Listing for indicating ULC Number and how assembly meets the rating criteria for assemblies listed on drawings or meets requirements of Supplementary Standard SB-3 of Ontario Building Code.
    - .2 Use the same system and material as would be required for a tested assembly for the project; ULC Listings are tested with the specific materials indicated; substitutions will not be permitted unless evidence of equivalency is confirmed.
    - .3 Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.
- .6 Certificates: Submit statements of material properties indicating compliance with specified requirements for each type and size of the following:
  - .1 Masonry Units:
    - .1 Include material test reports substantiating compliance with requirements.
    - .2 Include ULC Listings for fire resistance rated materials and construction equivalent to assemblies with indicated on drawings indicating fire resistance ratings.
  - .2 Cementitious Materials:
    - .1 Include brand, type, and name of manufacturer for site mixed mortar materials.
    - .2 Include description of type and proportions of ingredients for pre-blended, dry mortar mixes.
    - .3 Include description of type and proportions of ingredients for grout mixes.
  - .3 Accessories:
    - .1 Reinforcing bars
    - .2 Joint reinforcement
    - .3 Anchors, ties, and metal accessories
  - .4 Site Quality Control Submissions: Submit detailed description of methods, materials, and equipment used in accordance with cold or hot weather requirements; and proposed unit masonry cleaning techniques.

## 1.9 SITE MOCK-UPS

- .1 Construct sample panel of an exposed face brick/architectural block and block cavity back-up wall including reinforcement, insulation, air barrier, flashings and weep holes, minimum 1.6 m x 2.5 m in size. Build sample panel in stepped-back fashion to expose each material used (brick,

insulation, air barrier, block) to a minimum height of 400 mm each. Coordinate with Sections 07 21 00 and 07 27 13 for installation of insulation and air barrier.

- .2 Construct sample panel of interior concrete block partition, including wall corner and door opening, approximately 3m long x full height.
- .3 Locate sample panels where directed by Consultant.
- .4 Construct panel to meet project requirements. Select masonry units to represent maximum texture and colour variations.
- .5 Do not begin masonry work until panel is approved by Consultant. Approved panel shall represent minimum standard of quality for project masonry.

#### 1.10 PRODUCT HANDLING & STORAGE

- .1 Deliver and handle masonry units so as to prevent soiling and chipping.
- .2 Store masonry units above and off ground on level platforms which permit air circulation under stacks.
- .3 During storage, protect masonry units against moisture absorption, damage and staining.
- .4 Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

#### 1.11 PROTECTION

- .1 When work is not in progress, cover tops of completed masonry elements exposed to weather with non-staining weatherproof covers. Covers shall be at least 600 mm wider than masonry elements and shall be well secured against displacement.
- .2 Protect finished work at corners, sills, projections and other areas likely to be damaged, with suitable coverings until completion of building.
- .3 Adequately brace masonry walls and partitions to resist effects of wind and other lateral forces.

#### 1.12 SITE CONDITIONS

- .1 Protection of Masonry: Protect masonry and other work from marking and other damage and as follows:
  - .1 Cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work during construction until permanent flashings and membranes are completed.
  - .2 Cover partially completed masonry when construction is not in progress to prevent wetting of inside wythes of construction and contribution to efflorescence.
  - .3 Extend cover a minimum of 24" down both sides and hold cover securely in place.
  - .4 Secure cover a minimum of 24" down face next to un-constructed wythe and hold cover in place where one (1) wythe of multi-wythe masonry walls is completed in advance of other wythes.
  - .5 Provide adequate bracing for masonry during construction and until permanent lateral supports are in place.
  - .6 Do not apply uniform floor or roof loads for a minimum of 12 hours and concentrated loads for a minimum of 3 days after building masonry walls or columns.
- .2 Cold Weather Protection:
  - .1 Keep masonry materials completely free from ice and frost. Use approved smokeless heaters. Do not use scorched sand. Do not use salts, admixtures or antifreezes.
  - .2 Conform to the following construction requirements:

AIR TEMPERATURE	HEATING OF MATERIALS	PROTECTION
Above 5 deg C	Normal masonry procedures.	Cover walls and materials
Below 5 deg C	Heat mixing water. Maintain mortar temperatures between 5 deg C and 50 deg C until placed.	Cover walls and materials to prevent wetting and freezing.
Below 0 deg C	In addition to above heat sand. Thaw frozen sand and frozen wet masonry units before use.	With wind velocities over 35 km/h provide windbreaks during the workday and cover walls and materials at the end of each workday to prevent wetting and freezing. Maintain masonry above 0 deg C by using auxiliary heat or insulated blankets for 16 hours after laying masonry units.
Below -6 deg C	In addition to above heat dry masonry units to -6 deg C.	Provide enclosure and supply sufficient heat to maintain masonry enclosure above 0 deg C for 24 hours after laying masonry units.

.3 Hot Weather Requirements

- .1 Comply with hot weather construction requirements contained in reviewed submittals.
- .2 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
- .3 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.

**2** Products

**2.1 MANUFACTURERS**

- .1 Subject to compliance with requirements listed in this Section, manufacturers listed as offering products may be incorporated into the Work; alternates may be considered by the Consultant when submitted a minimum of five (5) days before closing of Bids.
- .2 Manufacturer all exposed masonry by one manufacturer to provide uniform in colour, shade and texture.

**2.2 MATERIALS**

- .1 Face Brick:
  - .1 Burned Clay Brick: Manufactured in accordance with CAN/CSA A82-06 (R2011), and as follows:
    - .1 Grade: Exterior Grade (EG)
    - .2 Type: X
    - .3 Size: Metric modular.



- .4 Colour and Texture: To match existing school brick, as approved by the Consultant in writing, prior to ordering brick for the project. Remove brick supplied to site which has not been approved by the Consultant, at no additional cost to the Owner.
- .5 Allow for two (2) colours.
- .6 Approved Manufacturers:
  - .1 Brampton Brick
  - .2 Forterra Brick
  - .3 IXL Masonry Supplies
- .2 Special Shapes:
  - .1 Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
  - .2 Provide special shapes for applications where stretcher units cannot accommodate special conditions, including at corners, movement joints, bond beams, sashes, and lintels.
  - .3 Provide special shapes for applications requiring brick of size, form, colour, and texture on exposed surfaces that cannot be produced by sawing.
  - .4 Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- .2 Face Stone:
  - .1 Manufactured in accordance with CAN/CSA A82-06 (R2011), and as follows:
    - .1 Grade: Exterior Grade (EG)
    - .2 Size: Metric modular.
    - .3 Colour and Texture: as approved by the Consultant in writing, prior to ordering brick for the project. Remove brick supplied to site which has not been approved by the Consultant, at no additional cost to the Owner.
    - .4 Allow for two (2) colours.
    - .5 Approved Manufacturers:
      - .1 Brampton Brick
      - .2 Forterra Brick
      - .3 IXL Masonry Supplies
  - .2 Special Shapes:
    - .1 Provide units without cores or frogs and with exposed surfaces finished for ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces.
    - .2 Provide special shapes for applications where stretcher units cannot accommodate special conditions, including at corners, movement joints, bond beams, sashes, and lintels.
    - .3 Provide special shapes for applications requiring of size, form, colour, and texture on exposed surfaces that cannot be produced by sawing.
    - .4 Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.

- .3 Concrete Unit Masonry:
  - .1 Architectural Concrete Masonry Units: Manufactured in accordance with CAN/CSA CSA A165 Series-04 (R2009), and as follows:
    - .1 Classification: H/15/A/M
    - .2 Size: 90mm x 190mm x 390mm.
    - .3 Type CM1:
      - .1 Configuration: Full Block
      - .2 Decorative Face Treatment: Split Face
      - .3 Colour: As selected by the Consultant from the manufacturers standard product line.
      - .4 Basis of Design Manufacturers:
        - .1 Richvale York Block Inc.
        - .2 Brampton Brick
  - .2 Special shapes:
    - .1 Provide bull nosed units for exposed corners.
    - .2 Provide purpose made shapes for lintels and bond beams.
    - .3 Provide additional special shapes required for project.
    - .4 Manufacture special shapes at same time and with the same batch as architectural concrete block to be used.
  - .3 Standard concrete blocks shall be autoclave or bubble cure process, high pressure steam cured, modular, conforming to CSA A165 Series-04 (R2009), with lineal shrinkage and moisture movement not to exceed 0.035% and shall be as follows:
    - .1 Classification: S/15/A/M, 75% solid for all locations where structural members bear on concrete block.
    - .2 H/15/A/M, for all other block work.
    - .3 Size: Modular metric to sizes indicated on Drawings.
    - .4 Special shapes:
      - .5 Provide square units for exposed corners.
      - .6 Provide purpose made shapes for lintels and bond beams.
      - .7 Provide additional special shapes required for project.
      - .8 Manufacture special shapes at same time and with the same batch as standard concrete block to be used.
  - .4 Acoustical Concrete Masonry Units: CAN/CSA A165.1, modular size, purpose made with slots to provide the acoustical characteristics specified.
    - .1 Classification: H/15/D/M.
    - .2 Sound Insulation: Fill masonry units with manufacturer's standard non-combustible mineral fibre inserts.
    - .3 Colour: As selected by the Consultant from the manufacturer's standard product line.
    - .4 Acceptable Products: Acoustade by Richvale York Block, or approved alternate, as accepted by the Consultant.

- .5 Noise Reduction Coefficients (NRC): Minimum NRC of 0.75; 290mm wide units with 20mm wide slots and two cavities with noncombustible fibrous filler elements when surface painted before testing.
- .5 Fire Resistant Concrete Masonry Units: Manufactured in accordance with CAN/CSA A165 Series-04 (R2009) as modified below:
  - .1 Classification:
  - .2 2 Hour Fire Rating: H/15/C/O
  - .3 1 Hour Fire Rating: H/15/A/O
  - .4 Concrete Composition – 2 Hour Fire Rating: Type L<sub>2</sub>20S Concrete.
  - .5 Size: Modular to sizes indicated on Drawings.
  - .6 Where concrete block walls are required as fire separations or barriers, they shall conform to the National Building Code. With respect to equivalent thickness and type of concrete. Consult with Consultant for locations and special conditions.
- .6 Exposed block shall all be made by one manufacturer and shall be uniform in colour, shade and texture.
- .4 Mortar Materials
  - .1 Mortar materials shall conform to CSA A179, as indicated in Section 04 05 13 Masonry Mortar and Grout.
- .5 Metal Reinforcement, Ties and Anchors:
  - .1 Masonry Joint Reinforcement: In accordance with to CSA A371-04(R2009) and ASTM A496/A496M-07, with corrosion protection in accordance with CSA S304.1-04(R2010) and CSA A370-04 (R2009), and as follows:
    - .1 Interior Walls: Hot dip galvanized, carbon steel.
    - .2 Exterior Walls: Stainless steel.
    - .3 Lengths: A minimum of 10' with prefabricated corner and tee units.
  - .2 Connectors: In accordance with to CSA A370-04 (R2009) and CSA S304.1-04(R2010) with hot dip galvanized finish.
  - .3 Single Wythe Masonry Joint Reinforcement: Either ladder or truss type with single pair of side rods.
  - .4 Ties and anchors specified in this section shall be designed in accordance with CSA A370-04 (R2009) for non-conventional masonry connectors as follows:
    - .1 Deflection: Maximum 1/16" including free play, when acted upon by a lateral load of 0.45 kN, in all possible positions of adjustment.
    - .2 Positive restraint at position of maximum adjustment.
    - .3 Free play of multi-component ties maximum 1/32" when assembled in all possible configurations.
    - .4 Anchors shall allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall.
  - .5 Masonry Unit Veneer - Concrete Masonry Unit Substrate Tie Systems:
    - .1 Bent anchor plate, minimum 1.6 mm thick stainless steel, Type 304 per ASTM 167, sized to suit block back-up, insulation and cavity widths.
    - .2 Minimum 4.76 mm stainless steel wire tie,

- .3 Anchor plate and tie to meet the requirements for non-conventional connectors specified in CSA A370-14, Connectors for Masonry.
- .4 Acceptable products:
  - .1 'BL-507' by Blok-Lok Limited or
  - .2 'Slotted Block Tie (Type II)' by Fero Corporation.
- .6 Masonry Unit Veneer - Cast-In-Place Concrete Substrate Tie System:
  - .1 Bent anchor plate, minimum 1.6 mm thick stainless steel, Type 304 per ASTM 167, sized to suit insulation and cavity widths.
  - .2 Minimum 4.76 mm stainless steel wire tie,
  - .3 Provide manufacturer's recommended fastener to suit conditions.
  - .4 Anchor plate, tie and fastener to meet the requirements for non-conventional connectors specified in CSA A370-14, Connectors for Masonry.
  - .5 Acceptable products:
    - .1 'BL-407' by Blok-Lok Limited or
    - .2 'Slotted Rap-Tie' by Fero Corporation.
- .7 Lateral Partition Supports (Top of Wall Anchors):
  - .1 Angle Support: Fabricated from 1/8" core metal thickness angled steel plate having 3" long legs fastened to deck structure to allow vertical movement of masonry assembly; hot dip galvanized; coordinate with Section 07 84 00 for firestopping insulation and smoke seals.
  - .2 Plate Support: Fabricated from 1/8" core metal thickness stainless steel plate with 3/8" diameter metal 6" long welded to plate having closed end plastic tube fitted over rod that allows rod to move in and out of tube.
  - .3 Anchor Bolts: Where required provide Headed or L-shaped steel bolts in accordance with ASTM A307-10, Grade A; with ASTM A563-07a hex nuts and, where indicated, flat washers; hot-dip galvanized in accordance with ASTM A153/A153M-09, Class C.
  - .4 Post Installed Anchors: Provide chemical anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete when tested in accordance with ASTM E488/E488M-10 conducted by a qualified independent testing agency.
- .8 Galvanizing for Masonry Reinforcement, Ties and Anchors:
  - .1 Hot Dip Hardware and Bolts: In accordance with ASTM A153/A153M-09, Class B-2 regardless of location.
  - .2 Hot Dip Sheet Steel: In accordance with ASTM A653/A653M-11, Coating Designation Z600, regardless of location.
  - .3 Structural Shapes and Pipes: In accordance with ASTM A123/A123-09, Grade 85, regardless of location.
- .6 Embedded Flashing Material:
  - .1 Self-adhering rubberized asphalt flashing; non-extruding composite flashing membrane compatible with air and vapour membrane; consisting of pliable, adhesive rubberized asphalt compound, bonded to a high density, cross laminated polyethylene film to produce an overall thickness of a minimum of 1/32" and specifically manufactured for use as a through wall flashing and damp course membrane.

- .2 Acceptable Materials:
  - .1 Blueskin TWF by Henry Company
  - .2 Perm-A-Barrier 4000 Wall Flashing by Grace Construction Products
  - .3 Sopraseal Stick 1100HT by Soprema
- .3 Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- .4 Metal Flashing: Provide metal flashing materials in accordance with Section 07 62 00, and as follows:
  - .1 Fabricate through wall flashing with snap lock receiver on exterior face to receive counter flashing.
  - .2 Fabricate through wall flashing with drip edge by extending flashing 13 mm (1/2") out from wall, with outer edge bent down 30 deg and hemmed.
  - .3 Fabricate through wall flashing with sealant stop by bending metal back on itself 19 mm (3/4") at exterior face of wall and down into joint 10 mm (3/8") to form a stop for retaining sealant backer rod.
  - .4 Fabricate metal drip edges and sealant stops for ribbed metal flashing from plain metal flashing of same metal as ribbed flashing and extending a minimum of 75 mm (3") into wall with hemmed inner edge to receive ribbed flashing and form a hooked seam; form hem on upper surface of metal so that completed seam will shed water.
  - .5 Fabricate metal drip edges for flexible flashings from stainless steel; extend a minimum of 75 mm (3") into wall and 13 mm (1/2") out from wall, with outer edge bent down 30 deg and hemmed.
- .7 Mortar dropping control device (cavity drainage mat):
  - .1 High density polyethylene or nylon mesh in trapezoidal configuration designed to facilitate effective drainage of moisture to weep holes; thickness to suit air space.
  - .2 Basis of Design Material: The Mortar Net by JV Building Supply, or approved equal.
- .8 Premoulded joint filler:
  - .1 Exterior control joints: Emseal 25V expanding foam sealant.
  - .2 Interior walls, non-fire rated locations: mineral fibre insulation by Roxul or Fibrex.
- .9 Control joints: Titewall BL-A by Blok-Lok Ltd.
- .10 Weep Holes:
  - .1 PVC 'T' shaped brick vents by Goodco Limited, or cadium plated airplane type 'Weep Holes-343' by Blok-Lok Limited, set 32" O.C. for architectural block in the following locations:
    - .1 Bottom course of manufactured stone masonry units throughout;
    - .2 Top courses of manufactured stone masonry units throughout;
    - .3 Manufactured stone masonry units resting on lintels and intermediate angles.

## 2.3 MASONRY COATINGS

- .1 Proprietary Masonry Cleaner: Masonry manufacturer's recommended cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discolouring or damaging masonry surfaces.
  - .1 Clear coating.

**3** Execution

**3.1 ERECTION - GENERAL**

- .1 Lay masonry work in uniform manner. No one portion of any section of work shall rise more than 750 mm above general level. Do not lay more than 1500 mm in height of any wall in any working day.
- .2 Unless otherwise noted, all walls and partitions shall extend to the underside of the structural deck.
- .3 Cut exposed masonry units with power driven table model masonry saw only. Ragged or chipped edges will not be permitted.
- .4 Consult with other Sections to avoid cutting and patching. Co-operate in setting and aligning built-in items. Build in conduit and piping so that they are not exposed. Do not break masonry bond to accommodate concealed built-in items.
- .5 Grout solid with mortar all spaces around built-in items.
- .6 Build in metal nailing plugs, grounds, inserts, anchor bolts, bearing plates, loose and miscellaneous items of steel and iron, isolated beams, lintels and shelf angles, sleeves, blocking and items furnished by other Sections.
- .7 Do not shift or tap masonry units after mortar has taken its initial set.
- .8 At masonry openings less than 450 mm wide, unless otherwise detailed, use mild steel plates, minimum 6 mm thick, of width 25 mm less than supported masonry thickness and with minimum 100 mm end bearing each side.
- .9 Construct structurally reinforced masonry elements in accordance with requirements indicated on structural drawings.

**3.2 CHASES, OPENINGS AND HOLES**

- .1 Chases and openings shall be built in during erection of masonry work, and purpose-made chased units shall be built into proper position.
- .2 Openings in masonry work exceeding 450 mm shall be provided with lintels in accord with lintel schedule.
- .3 Chasing of completed walls or formation of holes shall only be carried out with Consultant's prior approval, and then only with a tool designed to cleanly cut masonry units.
- .4 Chases shall be plumb and shall be minimum of one unit length from jambs of openings.
- .5 No horizontal or diagonal chases will be permitted.

**3.3 MASONRY BEARING**

- .1 Masonry bearing shall extend full thickness of wall.
- .2 Unless otherwise indicated, provide at least 200 mm of bearing for lintels and beams.
- .3 Bearings of block masonry walls: use minimum 2 courses of solid or grouted block units except where concrete bearing pads are required.
- .4 Bearings in brick masonry walls: use solid face brick where exposed to view.
- .5 Build masonry neatly around beam, and lintel bearings.

**3.4 CONSTRUCTION JOINTS**

- .1 Where fresh masonry joins partially or totally set masonry, clean exposed surfaces of set masonry and remove loose mortar and foreign material prior to laying fresh masonry.
- .2 If necessary to stop off a horizontal run of masonry, rack back one-half masonry unit length in each course. Toothing will not be permitted unless approved by the Consultant.

### 3.5 BLOCKWORK

- .1 Blockwork shall be laid up in running bond except where shown otherwise. Unless otherwise indicated, blocks shall be of thickness required to produce total wythe thickness.
- .2 Do not wet blocks before laying.
- .3 Units shall be laid with webs aligning one over the other in full bed of mortar over entire laying surface including webs.
- .4 Exposed faces shall be full units laid out to minimize cutting with not less than 100 mm any at vertical edge or corner.
- .5 Top course of block walls shall be laid with solid blocks at door and window sills, at wall changes to brick and where shown.
- .6 Use solid block for at least two courses under all point bearing loads.
- .7 Provide bullnose block at all exposed block corners, except where directed by Consultant.
- .8 Provide minimum 400 mm solid or grouted block for jambs of openings and at ends of walls.
- .9 Cut with power saw exposed units to accommodate flush mounted electrical outlets, grilles and other components. Leave maximum 5 mm clearance. Cover plates and flanges must cover cut edges.
- .10 Blockwork scheduled to be left exposed or painted shall be laid and pointed with utmost care. Distribute units of varying colour and texture evenly to achieve homogeneous blend. Replace at no extra cost to Contract, block units which in the opinion of the Consultant are too contrasting in appearance for satisfactory blending.
- .11 Take special care to prevent mortar or other substances from staining exposed block faces. Replace stained blocks as directed by the Consultant at no extra cost to Contract.

### 3.6 BLOCK LINTELS

- .1 Build block lintels; install reinforcement and concrete fill. Unless otherwise detailed make lintels 200 mm high.
- .2 Lintels shall have minimum 200 mm bearing, with care taken in layout of wall to ensure that lintel jointing coincides with regular bond of wall.
- .3 Provide building paper in joint at bearings and at vehicle joint at ends of block lintels to break bond.

### 3.7 BRICKWORK

- .1 Lay face brick in running bond except where shown otherwise. Provide header, soldier, rowlock and special band courses, where indicated. Provide solid soldier course units at outside corners; 45° cut units will not be accepted.
- .2 Lay exposed face brick in full horizontal modules only, except where Consultant has approved use of cut units. Make small adjustments in width of vertical mortar joints to maximize use of full modules. Cut units, where permitted by Consultant, shall be located as directed by Consultant.
- .3 Completed brickwork shall appear uniform and well blended, free of contrasting areas. Replace at no cost to Contract, brickwork which does not meet this requirement.
- .4 Brick with an absorption rate of over 1 g/min./1000 mm<sup>2</sup> when tested in accordance with ASTM C67 shall be dampened before laying.
- .5 Tops of walls which have been left exposed for any period of time shall be dampened before work is commenced again, if required.
- .6 Brickwork at different levels shall be stepped in regular proportions between levels.
- .7 Brickwork shall be laid up with the shove joint method in full bed of mortar with vertical and horizontal joints filled flush. Slushing mortar into joints after brick is laid, is not permitted.

- .8 All joints in brickwork, including bed and collar joints, shall be filled flush as each course is laid. Pull down and rebuild walls/partitions which do not meet this requirement as directed by Consultant and at no extra cost to Contract.
- .9 Variations in size of brick shall be evenly distributed in wall so that mortar joints are uniform throughout.
- .10 At first brick course over steel lintels place brick directly on membrane flashing without mortar.
- .11 At external corners other than 90° provide special custom shape corner units.

### 3.8 CAVITY WALLS

- .1 Erect interior wythe masonry and co-ordinate with Sections 07 21 00 and 07 27 13 for installation of insulation and air barrier.
- .2 Ensure that air barrier and insulation are complete and have been inspected and accepted by Consultant prior to installation of exterior wythe masonry.
- .3 After the first course of exterior masonry units is laid install one continuous row of mortar dropping control device at bottom of cavities and veneer air space; place device on top of membrane flashing, with "zig-zag" side up. Where cavity/air space is larger than 25 mm use multi-layer mortar dropping control device of thickness designed to fill space completely.
- .4 Keep the cavity clean and free from mortar droppings or projections. Bevel the "cavity" edge of the mortar bed immediately after "stringing" the mortar.
- .5 Reinforce back up masonry with continuous metal reinforcement at maximum 400 mm o.c. vertically. Provide additional reinforcing at openings as specified hereinafter. Provide first row of reinforcing at first joint above support. Place reinforcement in alternate courses to cavity wall connectors, except where connectors are integral with reinforcement.
- .6 Provide cavity wall connectors at maximum 400 mm o.c. horizontally and vertically, unless other spacing, supported by manufacturer's engineering analysis is accepted by jurisdictional authorities. Locate first row of connectors/ties at 200 mm above foundations and loose lintels and at maximum 400 mm above shelf angles; install connectors/ties above through wall metal flashings. Locate last row of connectors/ties maximum 200 mm below openings and below top of parapets. Locate connectors/ties maximum 300 mm from inside and outside corners and at maximum 200 mm each side of expansion and control joints.

### 3.9 JOINT WORK

- .1 Make joints uniform and 10 mm thick unless otherwise shown.
- .2 All joints including joints in walls above ceilings and areas behind wall mounted and built-in fixtures, shall be tooled when thumbprint hard with a 25 mm o.d. plastic tool to produce a concave joint.
- .3 Joints in unparged masonry below grade shall be pointed tight with a trowel.
- .4 Joints directly behind resilient base, rigid insulation, ceramic tile and gypsum board shall be struck flush.

### 3.10 ANCHORING, BONDING & REINFORCEMENT

- .1 Anchor or bond walls and partitions at points where they intersect.
- .2 Except where stack bond is required bond each wythe or masonry walls and partitions at corners by alternately bonding 50% of units of each wall and partition at corner intersection.
- .3 Bond non-loadbearing walls and partitions to loadbearing walls with ties spaced at 400 mm o.c. vertically. Provide one tie for each 100 mm thickness, or part thereof, of wall or partition.
- .4 Anchor masonry walls and partitions to concrete and steel elements with anchors spaced at 400 mm vertically.



- .5 Unless otherwise indicated reinforce all walls and partitions with continuous horizontal metal reinforcement, installed at 400 mm o.c. vertically.
- .6 At wall openings place continuous reinforcement in first and second mortar joints above and below openings. Additional reinforcement at openings shall extend 610 mm beyond both sides of openings.
- .7 Install prefabricated corner assemblies at corners.
- .8 Lap continuous reinforcement 150 mm at splices. Cut reinforcement at control joints.
- .9 Provide lateral support angles at top of non-loadbearing masonry walls/partitions. Anchor angles to structural deck or beam at 10x partition/wall thickness each side of partition. Locate lateral support angles at maximum 0.6 m from partition ends or corners.

### 3.11 CONTROL JOINTS AND EXPANSION JOINTS

- .1 Provide control joints in masonry walls supported by foundation walls at approximately 7.5 m o.c. and in masonry walls supported on framed slabs at approximately 4 m o.c., and where shown. Confirm actual locations of control joints with Consultant before starting work.
- .2 Provide control joints at intersection of bearing and non-bearing walls.
- .3 At cavity walls, offset control joints at outer and inner wythe as shown.
- .4 Construct control joints as shown. Unless otherwise shown make control joints 10 mm wide. Interrupt masonry reinforcement at control joints.
- .5 Control joints must be constructed during erection of masonry, and may not be sawcut later.
- .6 Construct expansion joints in accordance with details shown. Provide metal flashing built into masonry wall.

### 3.12 MEMBRANE FLASHINGS / DAMPPROOF COURSE

- .1 Install dampproof course on top of foundation walls above grade.
- .2 Install membrane flashing at bottom of cavity walls; where shown, and at the following locations:
  - .1 Door heads
  - .2 Window heads
  - .3 Immediately above horizontal interruptions within exterior walls.
  - .4 Below precast concrete components.
- .3 Lap membrane flashing 100 mm at joints; seal lap with adhesive.
- .4 In all cases extend membrane flashing 13 mm beyond outside face of wall or outside edge of steel lintel. Trim as required to Consultant's later instructions.
- .5 Unless otherwise indicated carry membrane flashing up behind exterior wythe masonry units min. 200 mm and turn into concrete block back-up. Mechanically secure top edge at concrete back-up.

### 3.13 WEEP & VENT HOLES

- .1 Form weep holes by inserting weep/vent hole inserts into exterior wythe mortar joint immediately above all membrane flashings, and at other locations where shown. Space weep holes at 800 mm o.c. horizontally.
- .2 Form vent holes by inserting weep/vent hole insert into exterior wythe mortar joint near top of each cavity compartment and at other locations, where indicated. Space vent holes at 800 mm o.c. horizontally.
- .3 Keep face of weep/vent hole inserts back from face of brick minimum 6 mm. Keep weep holes free of mortar.

### 3.14 STEEL DOOR FRAMES

- .1 Install steel frames in masonry walls. Build in frames rigid, true and plumb. Fill voids between frames and masonry with mortar grout. Fill fixed door centre mullions with grout.
- .2 Brace frames solidly in position while being built in. Provide temporary horizontal wood spreader at mid-height of frames to ensure maintenance of required frame width until masonry work is completed. For frames over 1200 mm width provide temporary vertical support at centre of head.
- .3 Comply with installation requirements specified under Section 08 11 00.

### 3.15 GROUTED MASONRY

- .1 Provide grouted masonry at loadbearing walls in accordance with requirements shown on structural drawings.
- .2 Meet requirements of CSA S304.1-04 and CSA A371-04, except where indicated otherwise.

### 3.16 MISCELLANEOUS

- .1 Where non-loadbearing, non-fire rated partitions extend to underside of structural deck, terminate partitions as detailed. Where not detailed allow for structural deflection and fill space with premoulded joint filler. Refer to Section 07 84 00 for firestopping requirements at fire rated partitions. Recess joint filler to permit installation of caulking by Section 07 92 00.
- .2 Provide continuous 0.1 mm thick polyethylene or glass fibre reinforced kraft paper - asphalt laminate bond breaker at base of partitions and walls which bear on concrete slabs.
- .3 Provide paper backed galvanized steel lath as required for support of grout and mortar fill within masonry elements.
- .4 Build in date stone and document box in location indicated (after Project completion at a date determined by Owner).

### 3.17 PARGING

- .1 Provide parging at locations shown. Parging mix: 1 part Portland cement and 3 parts sand by volume, mixed with sufficient water to produce workable mix.
- .2 Bond coat mix: 24 kg Portland cement and 4L parging bonding agent and 4L water.
- .3 Prepare substrate and apply bond coat in accordance with bonding agent manufacturer's recommendations. Apply parging while bond coat is still moist and tacky. Apply parging minimum 6 mm thick, trowelled to smooth surface.

### 3.18 PATCHING AND CLEANING

- .1 At completion of work, holes and other defects in masonry joints shall be repaired, and masonry surfaces shall be thoroughly cleaned.
- .2 Holes in masonry joints shall be filled with mortar and suitably tooled. Cut out and repoint defective joints. Use coloured mortar to match existing.
- .3 Dry brush masonry surfaces at end of each day's work and after all final pointing.
- .4 Remove mortar smears and droppings from concrete block masonry surfaces after such smears and droppings have dried. When mortar joints are dry and hard, clean block masonry surfaces by rubbing down with abrasive blocks and stiff fibre brushes.
- .5 Remove mortar particles from clay masonry surfaces with wood paddles. Remove stains from clay masonry surfaces by wet cleaning in accordance with manufacturer's recommendations.
- .6 Upon completion of work, clean blockwork by brushing and washing. In extreme cases a 5% solution of muriatic acid may be used preceded and followed by a copious bath of clean water. Clean blockwork to be painted to suit requirements of Section 09 91 00.

END OF SECTION

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 06 10 00: Rough Carpentry
- .2 Section 07 21 00: Thermal insulation
- .3 Section 07 27 13: Modified Bituminous Sheet Air Barriers
- .4 Section 09 21 16: Gypsum Board Assemblies

**1.3 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Have work of this section designed by a professional engineer licensed to design structures and registered in the place of Work.
  - .2 Design cold formed metal framing system to resist pressure and suction of wind loads, snow loads, snow load build-up and temperature range, expected in the geographical area for this project, under the local Building Code, climatic information for 30 year probability without any detrimental effects on appearance and performance.
  - .3 Design shall be based on Limit States Design principles using factored loads and resistances.
  - .4 Deflection (inward or outward) shall not be greater than  $L/720$  of the span between points of support.
  - .5 Resistance strength and resistance factors shall be determined in accordance with applicable building code requirements and CAN/CSA-S136.
  - .6 Construct work of this section to provide for expansion and contraction of components as will be caused by ambient temperature range without causing buckling, failure of joint seals, undue stress on fasteners or other effects detrimental to appearance or performance.
  - .7 Section properties shall be computed on the basis of the nominal core thickness.
  - .8 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress affects due to torsion between lines bridging. Sheathing shall not be used to help restrain member rotation and translation perpendicular to the minor axis for wind bearing studs.
  - .9 Design cold formed metal framing system to support loads and superimposed loads transferred from cladding and include for design of support and attachment components between other assemblies and stud system. Responsibility for design of exterior wall loads transferred from other envelope components is part of work of this section.

**1.4 SUBMITTALS**

- .1 Provide submittals in accordance with the requirements the General Conditions and Section 01 33 00.
- .2 Submit certified copy of mill reports covering chemical and mechanical properties, and coating designation of steel used in this work.
- .3 Shop Drawings:
  - .1 Prepare and submit shop and erection drawings which conform to the requirements of the CAN/CSA-S16, and as specified herein.

- .2 Cold formed metal framing system must have shop drawings prepared by qualified draftsmen, checked by and bearing the seal of an professional engineer registered to design structures and practice in the place of Work.
- .3 Show the size, spacing and location of connections, attachments, reinforcing and anchorage. Include necessary plans, elevations and details. Indicate size and type of fastening. For weld connections use welding symbols in compliance with AWS and indicate clearly net weld lengths.
- .4 Submit typical details of connections, and any special connections for approval before preparation of shop drawings.
- .5 Review of shop drawings by the Consultant and Structural Engineer will not absolve the Contractor from his responsibility of providing materials and equipment to complete and finish work of this section in accordance with the architectural and structural drawings. Departures or differences from the referenced drawings shall be approved in writing by the Consultant.

## 1.5 QUALITY ASSURANCE

- .1 Design criteria:
  - .1 Design shall be based on Limit States Design principles using factored loads and resistances.
  - .2 Specified requirements shall be considered to be a minimum. It shall be the Contractor's responsibility to ensure that framing assemblies meet or exceed requirements of jurisdictional authorities. Notify Consultant in writing in case of discrepancy between Contract Documents and requirements of jurisdictional authorities.
  - .3 Loads and load factors shall meet requirements of OBC. Resistances and resistance factors shall be determined in accordance with OBC and CSA-S136.
  - .4 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging.
  - .5 Maximum deflection of wall studs under design load:
    - .1 Locations with masonry veneer:  $L/720$
    - .2 Location with other wall finishes:  $L/360$ .
  - .6 Design sliding track connections to accommodate expected deflection of building structural frame, without transferring axial loads onto metal stud system.
- .2 Do welding to CSA W59. Welders shall be certified by the Canadian Welding Bureau to CSA W47.1 for appropriate class of work.
- .3 Meet applicable requirements of "Lightweight Steel Framing Manual" by CSSBI (CSSBI 50M).

## 1.6 INSPECTION AND TESTING

- .1 An independent inspection and testing company appointed and paid for by the Owner may carry out inspection and testing of the structural steel stud systems in accordance with Section 01 45 00.
- .2 Provide free access for inspectors to all places where work is being done.
- .3 Inspectors are to ensure that materials conform to the requirements of this section.
- .4 Any inspection and/or testing required because of an error by the Contractor, or due to departure from the Contract Documents shall be paid for by the Contractor.
- .5 Inspection and testing of structural metal stud systems shall include, but shall not be limited to the following:
  - .1 Checking that mill test reports are properly correlated to materials.

- .2 Sampling fabrication and erection procedures for general conformity to the requirements of the specification.
- .3 Checking that the welding conforms to the requirements of CSA W47.1, CSA W59 (R2008) and/or ANSI/AWS D1.3, whichever is applicable.
- .4 Checking fabricated members against specified member shapes.
- .5 Visual inspection of all welded connections including sample checking of joint preparation and fit-up.
- .6 Sample checking of screwed and bolted joints.
- .7 Sample checking that tolerances are not exceeded during fit-up and/or erection.
- .8 Additional inspection and testing of welded connections as required by CSA W59.
- .9 General inspection of field cutting and alterations required by other trades.
- .10 Submission of reports to the Consultant covering the work inspected with details of deficiencies discovered.
- .6 The inspection and testing provided in this Section does not relieve the Contractor of his responsibility for the performance of the Contract. The Contractor shall implement his own supervisory and quality control procedures.
- .7 Materials and/or workmanship not conforming to the requirements of the Contract Documents may be rejected at any time during the progress of the work, and shall be replaced and/or repaired without cost to the Owner.

## 1.7 PRODUCT HANDLING

- .1 Protect framing members from physical damage.
- .2 Store framing members on flat plane, off ground in dry location.
- .3 Identify steel members, showing specification type, grade and mechanical properties. The steel thickness, exclusive of coating, shall be marked on each member by embossing, stamping with indelible ink or by colour coding.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Cold formed metal framing as indicated on drawings and as specified herein shall be by one of the following:
  - .1 Bailey Metal Products Limited, or;
  - .2 Canadian Steel Manufacturing, Division of British Steel Canada Inc., or;
  - .3 Lightsteel Inc., Boucherville, Quebec or;
  - .4 Roll Formed Specialty or;
  - .5 Approved equal.

### 2.2 MATERIALS

- .1 Steel framing:
  - .1 Roll formed steel channel sections to ASTM A446 or CSA S136, hot dip galvanized (wipe coat) to ASTM A653, minimum coating designation Z180.
  - .2 Studs: unless otherwise indicated on Drawings, or unless otherwise required to satisfy design criteria: 150 mm depth, 1.2 mm thick.
  - .3 Runners: approximately 30 mm high, width to suit stud depth, minimum 1.2 mm thick. Deep runners for slip connection shall be approximately 50 mm high.

- .4 Bridging: minimum 38 mm x 12 mm x 1.9 mm.
- .5 Metal Plates, Bridging, Gussets and Clips: Formed from galvanized sheet steel, of gauges, shapes and sizes required to meet design requirements determined for conditions encountered, and of same finish as framing members.
- .6 Meet requirements of tables 1 and 2 of CSSB1 50 M for unreinforced cutouts and fabrication tolerances.
- .2 Fasteners:
  - .1 Finish: zinc, cadmium or nickel plated, minimum coating thickness 0.008 mm.
  - .2 Runners to concrete: drilled friction or expansion type anchors.
  - .3 Runners to structural steel: bolted.
  - .4 Steel studs to runners and bridging to studs: minimum #10 x 12.5 mm pan or water head, self-tapping sheet metal screws, plated.
- .3 Touch up coating: zinc rich paint to CAN/CGSB-1.181.

### **2.3 FABRICATION**

- .1 Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.
- .2 Take measurements at the building for work which is to fit or be connected to steel, concrete framing or masonry, before commencing fabrication.
- .3 Structural metal studs shall have one unreinforced service cut-out centred in the web of the studs and with the centreline of the cut-out a minimum of 455mm (1'-6") from the bottom of the studs. In addition to the above, provide cut-outs for internal bridging as required. All unreinforced cut-outs shall conform to dimension limitations of Table 1, in the CSSBI M50-1987 Manual.
- .4 Provide prepunched cut-outs in inner top track for anchor clearances so that deflection clearances are not reduced.
- .5 Fabrication tolerances for cold formed steel framing members shall to Table 2 of the CSSBI M50-1987 Manual.
- .6 Cutting of cold formed steel framing members shall be by "power saw" or "shear" methods. Cutting by "torch" method shall not be permitted.
- .7 Steel thickness, exclusive of coating shall be marked on all cold formed steel framing members by embossing, or by stamping with indelible ink, or by colour coding method.
- .8 Gauges and sizes of metal shall be adequate for various conditions.

## **3 Execution**

### **3.1 EXAMINATION**

- .1 Verify at site that the work to receive the work of this section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.
- .2 Verify that building framing components are ready to receive work.
- .3 Beginning of installation means acceptance of existing conditions.

### **3.2 INSTALLATION**

- .1 Provide lightweight steel framing at exterior walls, where indicated.
- .2 Align runners accurately, in accordance with wall layout and in a manner to ensure plumb stud installation.

- .3 Anchor runners to supporting construction, top and bottom, at 400 mm o.c.
- .4 At wall corners extend one runner to end of corner and butt other runner to it. Do not mitre runners.
- .5 Position studs vertically, spaced at 400 mm o.c. and screw fasten to runners with screw, one at each flange, top and bottom. Place studs maximum 50 mm from abutting construction.
- .6 Provide slip connection where top of wall framing meets building structural elements. Use double runner arrangement, one runner nestled inside the other but not fastened to each other. Allow for up to 12.5 mm vertical movement. Position stud screw fasteners at lower runner to permit required movement.
- .7 Install horizontal bridging inside and outside of studs at maximum 1200 mm o.c. Notch bridging at studs and screw fasten at each stud.
- .8 Unless otherwise detailed, provide double studs at each side of openings and triple studs at wall corners. Continue regular stud spacing above and below openings.
- .9 Provide horizontal sill and head members at openings. Cut ends of horizontal members and bend web and flanges to permit fastening onto adjacent studs.
- .10 Connections shall be bolted, screwed or welded to meet or exceed design requirements. Wire tying is not acceptable.
- .11 Screws shall be of the minimum size indicated. Penetration through joined materials shall be minimum three exposed threads. Screws covered by sheathing materials shall have low profile heads.
- .12 Cut steel framing members with saw or shear. Torch cutting of loadbearing members is not permitted.
- .13 Do not field cut holes into framing members without Consultant's approval. Provide reinforcement, based on design calculations, where holes through framing members are required.
- .14 Provide temporary bracing as required until work is permanently anchored in place.
- .15 Touch up welds and other areas where zinc coating is damaged with zinc rich paint.
- .16 Unless otherwise indicated, erect work of this Section within the following tolerances:
  - .1 Vertical alignment: 1:1000
  - .2 Horizontal alignment: 1:100
  - .3 Stud spacing:  $\pm 3$  mm

### 3.3 FIELD QUALITY CONTROL

- .1 At no extra cost to Contract, provide periodic field review during construction and submit reports to Consultant.
- .2 Field review shall be carried out by professional engineer responsible for design of system provided under this Section, or his authorized representative.

### END OF SECTION



1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 04 20 00: Unit Masonry  
.2 Section 05 41 00: Structural Metal Stud Framing  
.3 Section 06 10 00: Rough Carpentry  
.4 Section 08 51 13: Aluminum Windows  
.5 Section 09 21 16: Gypsum Board Assemblies  
.6 Section 09 91 00: Painting  
.7 Section 10 21 13.19: Solid Phenolic Toilet Compartments

**1.3 WORK SUPPLIED BUT NOT INSTALLED**

- .1 Supply following items for installation under other Sections of work: anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support of metal fabrications.  
.2 Supply other Sections with instructions, and if required, templates, necessary for accurate setting of inserts and components.

**1.4 QUALITY ASSURANCE**

- .1 All Codes and Standards referred to in this Specification shall be current editions including all latest revisions and addenda.  
.2 Conform to requirements of CSA-S16, Design of Steel Structures and CAN/CSA-S136, Cold Formed Steel Structural Members.  
.3 Architectural metals work shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, staining and other imperfections.  
.4 Work of this Section to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.  
.5 Work of this Section shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work of this Section.  
.6 Qualifications of Welders: certified under CSA W47.1 for appropriate class of work.  
.7 Upon completion of installation of ladders, stairs, platforms, pit covers, balustrades and railings submit certification by professional engineer responsible for design of these components, verifying that they have been installed in accordance with reviewed shop drawings.  
.8 Sizes of structural members, such as stair stringers shall be taken to be a minimum size and shall not be decreased without Consultant's approval.

**1.5 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00, bearing stamp or seal and signature of the Professional Engineer responsible for the design of the work of this Section.  
.2 Shop Drawings:

- .1 Make thorough examination of drawings and details, determine the intent, extent, and materials, and be fully cognizant of requirements when preparing shop drawings.
- .2 Submit shop drawings showing and describing in detail all work of this Section including large scale detail of members and materials, of connection and interfacing with work of other Sections, jointing details, and of anchorage devices, dimension, gauges, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.
- .3 Digital files of design drawings shall not be used in the preparation of shop drawings.

## 1.6 STORAGE, DELIVERY, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off the ground, under cover storage locations. Do not load any area beyond the design limits.
- .2 Adequately protect and crate all components against damage, dirt, disfigurement and weather during delivery and storage. Damaged materials shall not be used and shall be replaced by approved material.
- .3 Cover and protect the work of other Sections in the area of work from damage. Make good all damage to the satisfaction of the Consultant.
- .4 Protect the installed work of this Section and on completion the work shall be examined and damage shall be remedied to the complete satisfaction of the Consultant.

## 2 Products

### 2.1 MATERIALS

- .1 Structural Steel Sections and Steel Plate: New stock (not weathered or rusted); to conform to CAN/CSA-G40.21, Grade 300W (44W) and Grade 350W (50W) for wide flange shapes.
- .2 Hollow Structural Sections (HSS): New stock; to conform to CAN/CSA-G40.21, Grade 350W (50W), Class C, stress relieved.
- .3 Sheet Steel (Structural Quality): Conforms to ASTM A1011/A1011M.
- .4 Sheet Steel (Commercial Quality): Conforms to ASTM A653/A653M, stretcher levelled or temper rolled.
- .5 Square steel tube: CAN/CSA-G40.21-04, Grade 350W.
- .6 Steel Pipe: Hot-dip galvanized, zinc coated, welded and seamless type steel pipe conforming to ASTM A53/A53M.
- .7 Galvanized Sheet Steel (Commercial Quality): Galvanized coating G90 (Z275) in accordance with ASTM A653/A653M, minimized spangle, stretch levelled or temper rolled. Specially treat by phosphate conversion process conforming to CGSB 31-GP-105Ma ready to receive prime paint finish.
- .8 Stainless Steel Sheet, Strip, Plate, and Flat Bars: In accordance with ASTM A666, Type 304.
- .9 Stainless Steel Bars and Shapes: In accordance with ASTM A276, Type 304.
- .10 Welding materials: CSA W59.
- .11 Shop primer: CAN/CGSB-1.40-97.
- .12 Zinc rich shop paint:
  - .1 Shop coat: Inorganic reinforced zinc rich paint: Devoe Catha-Coat 302.
  - .2 Field touch up: CAN/CGSB 1.181-02.
- .13 Non-Shrink Grout: Premixed, high strength, maximum bearing, impact resistant, non-shrink non-metallic aggregate grout having minimum 76 Mpa 28 day compressive strength and conforms to

ASTM C939 and ASTM C1107/C1107M, 'Embeco Premixed Grout' by Master Builders Technologies Ltd., or 'Tartan Grout Iron' by Webster & Sons Ltd., or 'Sika Grout 212 HP' by Sika Canada Inc.

- .14 Bolts, Nuts, Washers: Conforms to ASTM A325.
- .15 Metal Filler: Polyester based type. 'M45' by Dura Chemical Ltd., Hamilton, Ontario
- .16 Painting:
  - .1 Shop Applied Structural Steel Primer: Steel Spec Universal Primer (B50RV6227 Red), by Sherwin Williams Company of Canada Ltd., or approved equal. Apply a minimum of 2 mils dft./coat. Grey coloured primer is acceptable.
  - .2 Zinc Rich Paint For Touch-up of Galvanized Metals: Ready mixed, zinc-rich primer conforming to CAN/CGSB-1.181, Sealtight Galvafrid Zinc-Rich Coating by W.R. Meadows of Canada Limited or Zinc Clad No. 5 Organic Zinc Rich Primer by Sherwin Williams Company of Canada Ltd., or approved equal.
  - .3 Touch-up Primer (On Site): Procryl Universal Acrylic Primer by Sherwin Williams Company of Canada Ltd, or approved equal. Touch-up primer shall be no less than 3 mil dft.
  - .4 Refer to Section 09 91 00, and coordinate with the above.
- .17 Bituminous Paint: WR Meadows or approved equal.
- .18 Building Paper: Conforms to CAN/CGSB-51.32.
- .19 Butyl Tape: Extruded, high grade, macro-polyisobutylene tape of size, width and shore hardness to suit conditions.

## 2.2 FABRICATION - GENERAL

- .1 Fabricate components in the shop in largest size practicable to minimize field jointing.
- .2 Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine file and fit joints, corners, copes and mitres.
- .3 Reinforce fabricated components to safely withstand expected loads.
- .4 Make joints in built-up sections with hairline joints in least conspicuous locations and manner.
- .5 Make allowance for thermal expansion and contraction when fabricating exterior work.
- .6 Joints shall be welded unless otherwise indicated and unless details of construction do not permit welding. Exposed welds shall be continuous and shall be ground smooth.
- .7 Close exposed open ends of tubular members with welded on steel plugs.
- .8 Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes, as required to facilitate installation of such other work.
- .9 Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation by: drilling, countersinking and tapping holes, forming shapes and cutting to required sizes.
- .10 Grind off mill stampings and fill recessed markings on steel components left exposed to view.

## 2.3 FINISHES

- .1 Thoroughly clean steel of loose scale, rust, oil, dirt and other foreign matter. Suitably prepare steel surfaces by power tool cleaning to receive specified finishes.
- .2 Grind smooth sharp projections.
- .3 Remove oil and grease by solvent cleaning.
- .4 Apply coatings in the shop and before assembly. Where size permits, galvanize components after assembly.
- .5 Shop apply coat of primer to interior components after fabrication except where stainless steel, galvanized or zinc rich paint finish is required.
- .6 Exterior components except where required to be hot dip galvanized: blast clean metals to "Near White Grade" (SSPC-SP-10) and spray apply a coat of zinc rich paint maximum 3 mils thick.
- .7 Hot dip galvanize (unpassivated) components where so indicated after fabrication in accordance with requirements of CAN/CSA-G164-M92, minimum coating weight 600 g/m<sup>2</sup>.
- .8 Apply coat of bituminous enamel to contact surfaces of metal components in contact with cementitious materials and dissimilar metals.

## 3 Execution

### 3.1 INSTALLATION

- .1 Install components plumb, square, straight and true to line. Drill, cut and fit as necessary to attach this work to adjoining work.
- .2 Provide temporary supports and bracing required to position components until they are permanently anchored in place.
- .3 Securely anchor components in place; unless otherwise indicated, anchor components as follows:
  - .1 To concrete and solid masonry with expansion type anchor bolts.
  - .2 To hollow construction with toggle bolts.
  - .3 To thin metal with screws or bolts.
  - .4 To thick metal with bolts or by welding.
  - .5 To wood with bolts or lag screws.
  - .6 Fill space between railing members and sleeves with non-shrink grout.
- .4 Install trench drain in accordance with manufacturer's instructions. Coordinate with Mechanical specifications for drain connection.
- .5 Provide all components required for anchoring. Make anchoring in concealed manner wherever possible. Make exposed fastenings, where approved by Consultant, neatly and of same material, colour, texture and finish as base metal on which they occur. Keep exposed fastenings evenly spaced.
- .6 Dissimilar metals and metals in contact with cementitious elements shall have contact surfaces coated with bituminous paint or be isolated by other means as approved by Consultant.
- .7 After installation, clean and refinish injured finishes, welds, bolt heads and nuts. Refinish with zinc rich paint or primer to match original finish.
- .8 Upon completion of work, or when directed by Consultant, remove protective coverings from stainless steel components.

### 3.2 SCHEDULE

- .1 General: Supply and install all miscellaneous metal work indicated on drawings and not included in the work of other Sections in addition to items listed below. Where items are required to be built into masonry, concrete or other work, supply such items to respective Sections with all anchors and accessories for building in.
- .2 Itemized List: Supply and install metal work listed below unless specifically designated to be supplied only. Each item shall be as shown on drawings and as detailed on reviewed shop drawings.
- .3 Miscellaneous Steel Framing, Channels, Angles, Plates and Brackets: As required and indicated on drawings.
- .4 Masonry Lateral Supports:
  - .1 Install deflection space and lateral support for non-load-bearing masonry walls and partitions in accordance with specified requirements of CAN3-S304-M.
- .5 Exterior Steel Pipe Handrail and Guard Railing:
  - .1 Handrails: 38mm (1-1/2") dia. galvanized steel tube railing, with 3/4" galvanized steel pickets at 4" c/c, as detailed on Drawings.
    - .1 Finishing: Steel - After shop fabrication, thoroughly de-scale steelwork, remove roughness and irregularities by grinding, clean with wire brush, remove oil and grease from surface of steel and give one coat of primer. Give steelwork one coat of primer in shop working well into crevices and interstices. Leave ready for finish painting by Section 09 91 00. Hot-dip galvanized exterior steel railings and handrails.
  - .2 Provide handrails and guardrails of the minimum diameter, standard weight pipe required to resist design loads, and as follows:
    - .1 Return ends of metal handrails toward guardrail after 305mm (12") of straight run, with radius corners, leaving 200mm (8") space between returned end and handrail.
    - .2 Extend handrail horizontally not less than 305mm (12") beyond top and bottom of stairway or ramp in accordance with Building Code.
    - .3 Cap the ends of tube rails with 3mm (1/8") steel plate. Weld all around.
- .6 Bench Framing:
  - .1 50mm x 50mm x 5 mm thick painted metal bench support at 1200 mm O.C. max.
  - .2 Wood Slat Bench Top as indicated 06 20 00 Finish Carpentry
- .7 Unless otherwise shown provide:
  - .1 Interior components: prime coated steel
  - .2 Exterior components: zinc rich paint coated steel.
  - .3 Other metal fabrications required.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED WORK**

- .1 Section 06 20 00: Finish Carpentry  
.2 Section 06 41 00: Architectural Wood Casework

**1.3 QUALITY ASSURANCE**

- .1 Lumber shall bear the grading stamp of an agency certified by The Canadian Lumber Standards Administration Board.  
.2 All lumber shall be sound, straight, dressed all sides and kiln dried, and moisture content at any time during shipment and storage shall not exceed 19%.

**1.4 WORK SUPPLIED BUT NOT INSTALLED**

- .1 Supply to other Sections anchors, bolts, rough hardware and other items required to be built into work of other Sections to receive, accommodate, secure work of this Section.  
.2 Provide other Sections with instructions to ensure accurate setting of built-in items.

**1.5 PRODUCT HANDLING**

- .1 Store materials on site to prevent deterioration, loss or impairment of their structural and other essential properties. Prevent excessive moisture gain of materials.

2 Products

**2.1 MATERIALS**

- .1 Framing Lumber:  
.1 Lumber for structural components shall be of species and grade specified, well seasoned, processed and stamped at same mill with appropriate grade markings. Conform to requirements of Standard Grading Rules for Canadian Lumber of National Lumber Grades Authority the (NLGA) with latest supplements, approved by the Canadian Lumber Standards Administrative Board.  
.1 Treatable Species: No. 2 and better - S4S, Dry, 19%.  
.2 Lumber:  
.1 Except as indicated or stated otherwise, lumber to be softwood, S4S, moisture content 19% or less, in accordance with the following standards:  
.1 CAN/CSA O141-05 (R2009) - "Softwood Lumber".  
.2 NLGA - "Standard Grading Rules for Canadian Lumber" (latest supplement).  
.2 Blocking, Copings, Nailers, Curbs: NLGA 122c "Standard" S-P-F.  
.3 Plywood:  
.1 All locations except backboards: Douglas Fir to CSA 0121-M1978 Unsanded Exterior Sheathing Grade.  
.2 Backboards: Douglas Fir to CSA 0121-M1978, Sanded grade, solid two sides, fire retardant pressure treated.  
.3 19mm thick and/or thickness as indicated on drawings

- .4 Plywood Roof Sheathing:
  - .1 Minimum 13mm thick, exterior grade Douglas fir plywood, veneer core, tongue and groove edges, Select Sheathing - Tight Face, unsanded with non-slip surface one side, 'B' faces and conforming to CSA 0121-08.
- .5 Fasteners and Connecting Hardware:
  - .1 Nails: to CSA B111-1974, hot dip galvanized steel for exterior work including components located in exterior walls and roofs; bright finish steel in all other locations. Unless otherwise indicated use common spiral flathead nails.
  - .2 Bolts, nuts, washers: ASTM A307, hot dip galvanized steel.
  - .3 Connectors, anchors, brackets, spikes: hot dip galvanized structural quality steel.
  - .4 Screws: to CSA B35.4-1972 zinc, cadmium or chrome plated.

## 2.2 WOOD TREATMENT

- .1 Surface cut, bore and trim components to sizes required as much as possible prior to pressure treatment.
- .2 Pressure Preservative Treated Lumber:
  - .1 Lumber graded and stamped in accordance with applicable grading rules and standards of associations or agencies approved to grade lumber by Canadian Lumber Standards Accreditation Board in accordance with CAN/CSA O80 Series -08.
    - .1 Species: Pine or Spruce-Pine
    - .2 Grade: No.2 or better structural posts and lumber, pieces may be grade stamped or shipment certified by letter of compliance.
    - .3 Grading authority: NLGA, paragraph 131CC
    - .4 Material having twisted grain or structural defects affecting integrity of lumber will not be acceptable for this project.
    - .5 Use only material with radius edges, minimum 6 mm.
    - .6 Kiln dry lumber materials to 8% moisture content or less.
  - .2 Pressure Preservative Treated Plywood: Treated in accordance with CAN/CSA O80 Series -08 using water-borne preservative to obtain minimum net retention of 4 kg/m<sup>3</sup> of wood. Plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8% or less.
- .3 Fire Retardant Pressure Treated Components:
  - .1 Treat by pressure impregnation with fire-retardant chemicals in accordance with CAN/CSA O80 Series -08 to provide classification for flame spread of not more than 25, smoke developed of not more than 75 in accordance with CAN4 S102.
  - .2 All fire retardant wood must comply with the requirements in AWPAC Standard C20 for lumber and C27 for plywood.
    - .1 AWPAC C20: Structural Lumber, Fire-Retardant Pressure Treatment, lumber materials shall only be of species listed. After treatment, lumber 50 mm or less in thickness shall be kiln dried to moisture content of 8% or less.
    - .2 AWPAC C27: Plywood, Fire-Retardant Pressure Treatment, plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8% or less.
    - .3 All species to comply with CAN4 S102 for surface-burning characteristics and shall bear identification showing classification and type of fire retardant.

- .3 Each piece or bundle of fire-retardant treated material or panel to bear ULC inspection label or stamp attesting to FRS rating indicating flame spread, smoke developed, and fuel contributed classification meeting AWPA standard C20 and C27 for Type A Use.
- .4 Fire retardant chemicals used to treat lumber must comply with FR-1 of AWPA Standard P17 and shall be free of halogens, sulphates and ammonium phosphate.
- .5 Acceptable materials: Plywood and lumber materials treated by licensed applicators with fire retardant materials from the following:
  - .1 Hickson Corporation – Dricon FRTW
  - .2 Hoover Treated Wood Products Inc. – Pyro-Guard
  - .3 Chemical Specialties Inc. – D-Blaze

### 3 Execution

#### 3.1 GENERAL

- .1 Erect work plumb, level, square and to required lines. Ensure that materials are rigidly and securely attached to each other and to adjacent building elements and will not be loosened by work of other Sections.
- .2 Where other materials and components are to be applied directly over wood members recess heads of fastening devices below wood surfaces.
- .3 Where work remains exposed to view, fasteners shall be uniformly and evenly spaced and neatly installed.

#### 3.2 NAILERS, BLOCKING, COPINGS, GROUNDS, CURBS

- .1 Provide wood nailers, blocking, copings, strapping, bucks, grounds and other rough carpentry components to sizes and in locations required for satisfactory support of fabricated items and other work. Provide wood blocking at steel stud framed gypsum board partitions for support of wall mounted components.
- .2 Unless otherwise indicated, provide minimum 38 mm thick materials. Grounds may be 21 mm thick material unless otherwise indicated.
- .3 Provide built-up wood curbs for rooftop mounted equipment. Unless otherwise detailed, provide 90 mm thick curbs extending minimum 300 mm from top of roof membrane to top of curb.
- .4 Provide minimum 12 mm thick plywood back-up for fastening of curtain tracks and blinds at head of windows, where curtains or blinds are required.

#### 3.3 ANCHORS AND FASTENERS

- .1 Provide rough hardware including nails, screws, bolts, washers, brackets, hangers, and fastening devices of all types.
- .2 Unless otherwise indicated, attach wood members at maximum 600 mm o.c. as follows:
  - .1 To concrete and solid masonry with expansion or friction type anchor bolts.
  - .2 To hollow masonry with toggle bolts.
  - .3 To heavy gauge metal with bolts.
  - .4 To light gauge metal with screws or bolts.
  - .5 To wood with nails, screws or bolts as required to ensure stability.
- .3 Bucks and plates shall be anchored to masonry walls with 13 mm galvanized steel bolts or with approved type screw anchors.



- .4 Fasten wood copings to supporting masonry elements with 13 mm galvanized steel bolts minimum 450 mm long spaced maximum 600 mm o.c. Where width of coping plate exceeds 100 mm, stagger bolts off centre.

### **3.4 PLYWOOD PANELS**

- .1 Provide plywood panels required for electrical/telephone mounting of equipment and in other locations as indicated on drawings.

### **3.5 ROOF SHEATHING NOT USED**

### **3.6 BACKBOARDS**

- .1 Where required by Electrical specifications and by telephone system supplier, provide minimum 19 mm thick plywood backboards mounted on strapping if required.
- .2 Size backboards to adequately accommodate equipment to be mounted. Secure boards with countersunk fasteners to supporting walls in manner which will carry equipment load without damaging wall.

### **3.7 PRESSURE PRESERVATIVE TREATED WOOD INSTALLATION**

- .1 Comply with AWWA M4.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation. Allow first coating to fully soak into grain before applying second coating in accordance with manufacturer's instructions.
- .3 Remove with fine sandpaper, chemical deposits on treated wood to receive applied finish.
- .4 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of preservative treated materials.
- .5 Use water-borne preservative treated wood for:
  - .1 Wood in contact with masonry or concrete,
  - .2 Wood within 450 mm of grade,
  - .3 Wood decking and fence boards,
  - .4 Wood in contact with flashings,
  - .5 Wood in contact with waterproofing membranes, confirm compatibility with membrane manufacturer prior to application.
- .6 Use oil-borne preservative treated wood for:
  - .1 Wood in contact with the ground,
  - .2 Wood in contact with freshwater,
  - .3 Landscaping timbers,
  - .4 Retaining walls,
  - .5 Piers or docks,
  - .6 Pilings,
  - .7 Bases of utility poles,
  - .8 Bases of fence posts.

### **3.8 PRESSURE FIRE RETARDANT TREATED WOOD INSTALLATION**

- .1 Field Cuts:
  - .1 Do not rip, mill or conduct extensive surfacing of fire retardant treated lumber, label will be voided.

- .2 Only end cuts, drilling holes and joining cuts are permitted.
- .3 All cuts on plywood will be considered end cuts.
- .4 Fire-retardant lumber and plywood can be given a light sanding for cosmetic cleaning after treatment.
- .5 Pre-cut to the greatest extent possible before treating.
- .2 Fire retardant treated plywood used in structural applications shall be graded or span-rated material.
- .3 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of fire resistant treated materials.
- .4 Where humidity conditions are such that moisture may condense between hardware and treated wood, hardware shall be back-primed with a corrosive-inhibitive paint.
- .5 Back-prime at contact points and fasteners to prevent electrolysis when fire retardant framing members are used in metal buildings.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED WORK**

- .1 Section 05 50 00: Metal Fabrications  
.2 Section 06 10 00: Rough Carpentry  
.3 Section 06 41 00: Architectural Wood Casework  
.4 Section 09 91 00: Painting

**1.3 QUALITY ASSURANCE**

- .1 Reference Standards: unless otherwise specified, carry out finish carpentry work in accordance with requirements of "Quality Standards for Architectural Woodwork" (latest issue) of Architectural Woodwork Manufacturer's Association of Canada (AWMAC).

**1.4 SUBMITTALS**

- .1 Submit two samples of each type of solid wood and plywood used in exposed work scheduled to receive transparent finish.

**1.5 PRODUCT DELIVERY, HANDLING & STORAGE**

- .1 Protect against damage, including damage by excessive changes in moisture content, during delivery and storage. Maintain minimum storage temperature of 16°C, and relative humidity 25% to 55%.  
.2 Do not deliver finish carpentry components to site before all wet trades are completed, the building is closed in and humidity conditions on site are acceptable. Do not deliver during rain or damp weather.  
.3 Store materials on site in such a way as to prevent deterioration or loss or impairment of essential properties. Prevent moisture gain of kiln dried materials.

**1.6 PROTECTION**

- .1 Provide coverings as necessary to protect finish carpentry components from damage of any kind during storage and after installation.

2 Products

**2.1 MATERIALS**

- .1 Solid Wood:  
.1 Unless otherwise indicated, provide AWMAC Premium Grade.  
.2 All wood materials shall be new, straight and clean, free of sap, knots, pitch, and other defects, except as permitted by applicable grading rules.  
.3 All wood shall be kiln dried to a maximum moisture content of 12% for exterior work and 6% to 8% for interior work.  
.4 Hardwood: Species as indicated; where no species is indicated, provide Birch.  
.5 Softwood: to CAN/CSA 0141-05, dressed all sides used in concealed locations only except where shown otherwise. Unless otherwise indicated use No. 1 White Pine at interior locations.

- .2 Panel Materials:
  - .1 Hardwood plywood: to CSA 0115-M1982, Type II Veneer: AWMAC Architectural Grade Maple or Select White Birch; use veneer core or multi-core plywood.
  - .2 Softwood plywood: to CSA 0151-04 Sanded Grade, Solid Two Sides. Use in concealed locations only; use veneer core or multi-core plywood only.
- .3 Fasteners and Adhesives:
  - .1 Nails and staples: CSA B111-1974, galvanized.
  - .2 Screws: zinc, cadmium or chrome plated steel.
  - .3 Adhesive: waterproof type as approved by Consultant.

## 2.2 FABRICATION

- .1 General Requirements:
  - .1 Exposed joints and edges:
    - .1 Uniformly space exposed joints unless otherwise indicated.
    - .2 Edge grain shall not be visible; mitre external corners, house internal corners. Secure corners with corrugated metal fasteners. Glue mitred corners.
    - .3 All exposed edges of plywood shall have solid wood edging, pressure glued.
  - .2 Mechanical fasteners:
    - .1 Inconspicuously locate mechanical fasteners. Wherever possible conceal fastenings.
    - .2 Countersink nail heads.
    - .3 Unless otherwise indicated, countersink screw and bolt heads and fill holes with matching wood plugs.
  - .3 Cutting and fitting: make cutouts in work of this Section as required to accommodate work of other Sections.
- .2 Standing & Running Trim:
  - .1 Fabricate trim and base of softwood where paint finish is designated and of hardwood where transparent finish is required.
  - .2 Length: standing trim shall be in one piece. Running trim shall be in longest practicable lengths.
  - .3 Thickness: unless otherwise indicated, minimum 13 mm.
- .3 Rails, Slats, Caps, Base:
  - .1 Fabricate components to profiles shown and in longest practicable lengths.
  - .2 Slightly round exposed edges, sand smooth all surfaces.
  - .3 Unless otherwise indicated fabricate members of hard- wood. Use the same species of wood throughout, except where specifically indicated otherwise.

## 3 Execution

### 3.1 INSTALLATION

- .1 Install finish carpentry components plumb, true and level and securely fasten in place. Accurately scribe and closely fit components to irregularities of adjacent surfaces.
- .2 Accurately fit joints in true plane, locate joints over bearing or supporting surfaces.

- .3 Provide mechanical fastening devices such as nails, screws and bolts required for fastening wood components. Unless permitted provide concealed fastening of components.
- .4 Where permitted, nail with small headed finishing nails. Countersink nail heads with nail setter.
- .5 Where components are fastened with screws or bolts, countersink screw and bolt heads and provide wood plugs matching surrounding wood.
- .6 Install caps, rails, base, casings and trim in longest practicable lengths; accumulation of short pieces not permitted. No edge grain shall be visible; mitre corners. Slope cut intermediate joints.
- .7 Provide interior wood trim where indicated and where required to complete work.
- .8 Select components within any area to produce well blended, uniform appearance. Avoid use of components with starkly contrasting colours. Replace components which in Consultant's opinion are not of satisfactory appearance.

### 3.2 FINISHING

- .1 Sand finished wood surfaces thoroughly as required to produce uniformly smooth surface, always sanding in direction of grain run. Coarse grained sandpaper marks, hammer marks, or other similar imperfections in finished work are not acceptable.

### 3.3 SCHEDULE

- .1 Unless specifically indicated otherwise, all finish carpentry components shall receive transparent stain and varnish finish by Section 09 91 00.
- .2 Provide the following:
  - .1 Bench and Shelf Slats:
    - .1 Species: Maple
    - .2 Bench Slats: 38mm x 89mm, fastened to steel channel from below.
    - .3 Finish: to be selected by consultant.
  - .2 Other finish carpentry components required.

**END OF SECTION**

1 General

1.1 GENERAL REQUIREMENTS

- .1 Comply with requirements of Division 1.

1.2 RELATED WORK

- .1 Section 05 50 00: Metal Fabrications  
.2 Section 06 10 00: Rough Carpentry  
.3 Section 06 20 00: Finish Carpentry  
.4 Section 07 21 00: Thermal Insulation

1.3 DEFINITION

- .1 "Exposed" when referred to in this Section shall mean all parts that can be viewed and shall include interiors of cupboards, cabinets and counters, backs of doors, shelving, gables, drawers.

1.4 QUALITY ASSURANCE

- .1 Reference Standards: unless otherwise specified, carry out finish carpentry work in accordance with requirements of "Quality Standards" (latest issue) of Architectural Woodwork Manufacturers' Association of Canada (AWMAC), Custom Grade.

1.5 SUBMITTALS

- .1 Submit detailed shop drawings for cabinetwork showing proposed assembly, connections, anchorage, materials, dimensions, thickness and finishes.  
.2 Shop drawings shall be originated and produced by fabricator and may not be copied or reproduced from Consultant's drawings. Each item shall be shown in plan, section and elevation, detailed in appropriate scale, clearly displaying all required information. Single line diagrams are not acceptable.  
.3 Submit duplicate samples of each type of solid wood and plywood used in exposed work prior to fabrication of cabinetwork.

1.6 PRODUCT DELIVERY, HANDLING & STORAGE

- .1 Protect cabinetwork against damage, including damage by excessive changes in moisture content. Maintain minimum storage temperature of 16°C, and relative humidity 25% to 55%.  
.2 Cover plastic laminate faces at shop with heavy kraft paper.  
.3 Do not deliver finish carpentry components to site before all wet trades are completed, the building is closed in and humidity conditions on site are acceptable. Do not deliver during rain or damp weather.  
.4 From time of fabrication until installation, store handle and transport materials so as to prevent deterioration or loss or impairment of essential properties. Prevent moisture gain of kiln dried materials.

1.7 PROTECTION

- .1 Provide coverings as necessary to protect finish carpentry components from damage of any kind during storage and after installation.

1.8 WARRANTY

- .1 At no cost to Owner remedy any defects in work of this Section due to defects in materials and workmanship, including but not necessarily limited to delamination, warping, and other defects detrimental to appearance and/or performance for a period of 2 years from date of Substantial Performance.

2 Products

2.1 MATERIALS

- .1 Solid Wood:
  - .1 Unless otherwise indicated, provide AWMAC Premium Grade.
  - .2 All wood materials shall be new, straight and clean, free of sap, knots, pitch, and other defects, except as permitted by applicable grading rules.
  - .3 All wood shall be kiln dried to a maximum moisture content of 6% to 8%.
  - .4 Hardwood: White Birch Premium Grade.
  - .5 Softwood: to CAN/CSA-0141-05, dressed all sides used in concealed locations only except where shown otherwise. Concealed framing: No. 1 Grade White Pine.
- .2 Plywood Panel Materials:
  - .1 Hardwood plywood: to CSA 0115-1982, Type II, veneer: AWMAC Architectural Grade Select White Birch; use veneer core or multi-core plywood only.
  - .2 Softwood plywood: to CSA 0151-04 Sanded Grade, solid two sides. Use in concealed locations only; use veneer core or multi-core plywood only.
- .3 Plastic Laminated Components:
  - .1 Plastic laminate facing sheet: ANSI/NEMA LD3-2005 Grades HGS, VGS, HGP; colours, gloss and texture will be selected by Consultant from full range of products by Formica, Arborite, Nevamar, Wilsonart, Pionite.
  - .2 Plastic laminate backing and liner sheets: High pressure, paper based, melamine surfaced, laminated plastic backing sheets, conforming to CAN3-A172, backing grade (BK), minimum 0.5mm (0.020") thick, colour as selected later by Consultant and by manufacturer of plastic laminate face sheets.
  - .3 Core: veneer core plywood.
  - .4 Laminating adhesive: urea formaldehyde type meeting requirements of CAN3-0112 Series M1977.
  - .5 Core sealer: clear water resistant synthetic resin sealer.
- .4 Fasteners & Adhesive:
  - .1 Nails and staples: CSA B111-1974, galvanized.
  - .2 Screws: zinc, cadmium or chrome plated steel.
  - .3 Adhesive: CAN3-0112 Series - M1977, waterproof type.
- .5 Solid Core Doors: to CSA 0132.2-M1977, flush doors, 35 mm thick, face veneer and edge banding matching adjacent cabinetwork.
- .6 Cabinet Hardware: products listed below are a standard of acceptance. Products by other manufacturers, of equal quality and similar appearance may also be provided subject to review and approval by Consultant.
  - .1 Hinges for 19 mm door Blum 91-650, 170° with self-closing spring.
  - .2 Hinges for 38 mm thick doors: Hager 1279 76 x 76.
  - .3 Door and drawer pull: GSH 302 x 100 mm, CTC 7.5 mm o.d. brushed stainless steel.
  - .4 Drawer slides: KV 1429 full extension for 45 kg load.
  - .5 Automatic door bolt for double doors: Hafele 245.58.754.
  - .6 Pilaster and clips: KV 255, 256.

- .7 Coat hooks: Royal Arch # 209Z (Zinc Plated)
- .8 Change Table Step Caster: 2" Rigid, non-swivel top plate caster equal to TPR.
- .9 Closet Rods: Extension type zinc coated steel closet rods with zinc coated forged steel end brackets and 2 centre supports, 1524mm to 2438mm (60" to 96") extension type, complete with mounting screws, 'KV2 ZC' by Knappe & Vogt Canada.
- .10 Hardware finish: Unless otherwise indicated chrome or nickel plated.

## 2.2 FABRICATION

- .1 General Requirements:
  - .1 Exposed surfaces:
    - .1 Provide wood members free from bruises, blemishes, mineral marks, knots, shakes and other defects, except as specifically permitted by grade rules.
    - .2 Select exposed surfaces in any one area for balanced overall appearance free of stark contrasts.
    - .3 Sand smooth all exposed surfaces to provide even and uniform finish free of defects detrimental to appearance.
  - .2 Exposed joints and edges:
    - .1 Uniformly space exposed joints unless otherwise indicated.
    - .2 No edge grain shall be visible; mitre external corners, house internal corners. Secure corners with corrugated metal fasteners. Glue mitred corners.
    - .3 All exposed edges of plywood and particle board shall have solid wood edging, pressure glued.
  - .3 Mechanical fasteners:
    - .1 Inconspicuously locate mechanical fasteners. Wherever possible conceal fastenings.
    - .2 Countersink nail heads.
    - .3 Where exposed to view, countersink screw and bolt heads and fill holes with matching wood plugs.
  - .4 Cutting and fitting: make cutouts in work of this Section as required to accommodate work of other Sections.
- .2 Standing & Running Trim:
  - .1 Fabricate trim of hardwood.
  - .2 Length: standing trim shall be in one piece. Running trim shall be in longest practicable lengths.
  - .3 Thickness: unless otherwise indicated, minimum 6 mm.
- .3 Plastic Laminate Components:
  - .1 Unless otherwise specified herein meet requirements of AWMAC "Quality Standards".
  - .2 Assembly: bond plastic laminate to core with adhesive using pressure. Bond plastic laminate to both faces of core using same adhesive and same pressure.
  - .3 Core: unless otherwise indicated: 19 mm thick veneer core plywood.



- .4 Balanced construction: plastic laminate covered components shall be of balanced construction, with plastic laminate on both faces of core. Seal core edges not covered with plastic laminate.
- .5 Use largest practicable plastic laminate sheet size.
- .6 Provide joints symmetrically; provide joints at corners and at changes in superficial areas; provide concealed draw bolt anchors at joints. All butt joints shall have a blind spline.
- .7 Construct countertops with preformed front edge and square corner splashback. Chamfer edges uniformly at approximately 20°C; do not mitre.
- .8 At L-shaped corners mitre plastic laminate to outside corner. Accurately fit members together to provide tight and flush butt joint.
- .9 Apply self-edged minimum 1.1 mm thick plastic laminate to exposed ends of countertops.
- .10 Construct splashbacks minimum 100 mm high or higher where indicated. Return splashback at ends except where indicated otherwise.
- .11 Openings and cutouts:
  - .1 Radius internal corners at least 3 mm and chamfer edges.
  - .2 Where core edge is to remain exposed, cover with plastic laminate edging.
  - .3 Where core edge is to be concealed, seal with sealer.
- .4 Cabinetwork:
  - .1 As far as practicable, assemble work in shop and deliver to site ready for installation. Leave ample allowance for fitting and scribing in place.
  - .2 Except where otherwise detailed use "flush overlaid" construction. Where shown or required use "exposed case" construction. Tenon, dado, dowel or rabbet interior construction with all parts well glued along full length/height. Use glue blocks where necessary. Shoulder mitre all exposed corners. Open ends or skeleton frames against walls are not permitted.
  - .3 Construct all cabinetwork, counters, cupboards, including tops, bottoms, backs and shelves from hardwood faced veneer core plywood or solid hardwood. Use same species of hardwood throughout, unless a specific species is called up, shown or specified for a particular unit or area. Select hardwood plywood for each cabinetwork unit so as to produce well blended uniform appearance. Avoid use of starkly contrasting veneer colours within any one unit. Replace components which in Consultant's opinion are not of satisfactory appearance.
  - .4 Design and fabricate work to accommodate expansion and contraction of components. All connectors and fasteners shall be concealed unless permitted by Consultant to be exposed. Fabricate work to produce tight joints. Locate prominent joints where directed. Prevent opening up of joints and glue lines in finished work.
  - .5 Unless otherwise indicated provide the following thicknesses:
    - .1 Doors: 19 mm
    - .2 Drawer fronts: 19 mm
    - .3 Gables: 19 mm
    - .4 Cabinet backs (floor supported): 12 mm
    - .5 Cabinet backs (wall hung): 19 mm
    - .6 Shelves: 19 mm
    - .7 Drawer bodies: 12 mm

- .6 Rout gables for pilaster strips where adjustable shelving is required.
- .7 Limit shelf span to 900 mm.
- .8 Construct doors and drawer fronts of 19 mm hardwood faced plywood. Where height of door exceeds 1200 mm provide 35 mm thick solid core doors, unless otherwise shown.
- .9 Provide running members in maximum length obtainable. Provide thickness of members in maximum dressed size of standard lumber. Where width or thickness indicated is not available, use glue laminations to obtain sizes required.
- .10 Install cabinet hardware in accordance with hardware manufacturer's directions. Unless otherwise indicated, provide each drawer and door with pull, each drawer with extension hardware and each door with minimum two hinges, (2 hinges for door height up to 900 mm, 3 hinges for door height up to 1350 mm and 4 hinges for door height up to 1800 mm); provide additional hinges where recommended by hinge manufacturer based on door size and weight. Provide locks at all doors and drawers unless otherwise shown.
- .11 Unless otherwise indicated, factory finish all cabinetwork with a stain and polymerizing two component catalytic conversion varnish system; colour and sheen to be selected by Consultant. All surfaces shall be carefully prepared and sanded before and between coats to provide final finish which shall be smooth, even and uniform free of machine marks, hammer marks, depressions and imperfections.
- .12 Apply moisture repellent sealer to concealed backs of cabinetwork.

3 Execution

3.1 INSTALLATION

- .1 Install cabinetwork components plumb, true and level and securely fasten in place. Accurately scribe and closely fit components to irregularities of adjacent surfaces.
- .2 Accurately fit joints in true plane, locate joints over bearing or supporting surfaces.
- .3 Provide mechanical fastening devices such as nails, screws and bolts required for fastening wood components. Unless permitted provide concealed fastening of components.
- .4 Where permitted, nail with small headed finishing nails. Countersink nail heads with nail setter.
- .5 Install plastic laminate components using concealed fastening devices.
- .6 Where components are fastened with screws or bolts, countersink screw and bolt heads and provide wood plugs matching surrounding wood.
- .7 Where cabinetwork abuts other building elements provide wood trim matching cabinetwork except where otherwise detailed.
- .8 Where access is required to valves and other mechanical and electrical components, located behind cabinetwork, provide removable plywood access panels of size required and secure with four brass screws.
- .9 Install display case cork and liner in accordance with manufacturer's recommendations. Bond to substrates with adhesive free of bubbles and tears, with joints neat and tight and with exposed surfaces free of adhesive and stains.
- .10 Check operation of all movable parts and, if necessary, adjust to ensure proper and smooth function.
- .11 Upon completion of installation, inspect work of this Section and touch up, where required, minor or damaged surface finish to restore it to original condition. Replace damaged components which, in the opinion of the Consultant, cannot be satisfactorily repaired.

**END OF SECTION**

**1** General column

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 07 27 13: Modified Bituminous Sheet Air Barriers  
.2 Section 07 51 00: Built-Up Bituminous Roofing  
.3 Section 07 84 00: Firestopping  
.4 Section 09 21 16 Gypsum Board Assemblies

**1.3 QUALITY ASSURANCE**

- .1 Applicator of sprayed insulation shall be trained and approved by insulation manufacturer.

**1.4 PRODUCT STORAGE AND HANDLING**

- .1 Deliver insulation to site in sealed wrappings bearing manufacturer's name, product name and RSI or KSI value.  
.2 Store materials in a dry area protected from the elements.

**1.5 PROTECTION**

- .1 Temporarily protect installed insulation from damage and action of the elements until it is permanently concealed or protected.  
.2 Protect polystyrene insulation from sunlight.

**2** Products

**2.1 INSULATION**

- .1 Type 1: Extruded, expanded polystyrene with shiplapped edges: CAN/ULC-S701-05:  
.1 Basis of Design Material: Styrofoam SM by Dow.  
.2 Type 2: Mineral Wool Cavity Wall Insulation Board (Semi-ridged Insulation) : Fibrous mineral wool insulation, unfaced, in accordance with CAN/ULC S702, Type 1, thermal resistance not less than RSI 0.76/25 mm; rated non-combustible in accordance with CAN/ULC S114 and having a flame spread rating of 5 or less in accordance with CAN/ULC S102; density 72 kg/m<sup>3</sup>; square edges, board size 406 mm x 1220 mm x thickness indicated on the Drawings:  
.1 Density: To ASTM C303:  
.1 Outer layer: 100 kg/m<sup>3</sup>  
.2 Inner layer: 60 kg/m<sup>3</sup>  
.2 Water vapour permeance: 1555 ng/Pa.s.m<sup>2</sup>.  
.3 Moisture sorption: 1 % maximum to ASTM C1104/C1104M.  
.4 Fungi resistance: Zero mould growth to ASTM C1338.  
.5 Product:  
.1 CavityRock manufactured by Rockwool,  
.2 Rainbarrier 45 manufactured by Thermafiber.

**2.2 ADHESIVES AND FASTENERS**

- .1 Adhesive for polystyrene insulation: Adhesive for securement of insulation to waterproofing / dampproofing membrane shall be compatible with such membranes.
  - .1 Basis of Design Material: 230-21 Insulation Adhesive by Henry Company
- .2 Impaling clips: zinc coated Stic-Klip with perforated base and cadmium plated speed washer by Eckel Industries of Canada Ltd., or Insul-Anchors "Spindle" by Continental Studwelding Ltd.; adhesive and mechanical fasteners as recommended by clip manufacturer.
- .3 Cavity insulation securement: As indicated in Section 04 20 00.
- .4 Mechanical securement system:
  - .1 Metal securement members: 41 x 13 x 0.5 mm galvanized channels: Insulok by Reach Plastics; or 48 x 13 x 0.5 mm galvanized tee: Retainer Tee by Bailey.
  - .2 Concrete/masonry anchors: Tapcon anchors of length to provide minimum 25 mm embedment of anchor.
  - .3 Fasteners to metal framing: Self-drilling, self-tapping plated screws.

### **2.3 CAVITY COMPARTMENT SEALS, FIRESTOPS**

- .1 Sheet metal: minimum 0.9 mm thick sheet steel formed to profiles required, hot dip galvanized ASTM A653, zinc coating designation Z275.

## **3 Execution**

### **3.1 PREPARATION**

- .1 Substrates to receive rigid board insulation, shall be sound, dry and free of dirt, oil, grease and other foreign substances.
- .2 Clean substrates as required. Remove concrete surface ridges and deposits.

### **3.2 INSULATION INSTALLATION - GENERAL**

- .1 Provide under this Section all thermal insulation required except where it is specified to be part of other Sections.
- .2 Provide continuous uniform thermal insulation over insulated areas.
- .3 Where insulation is interrupted by construction elements, neatly fit insulation around such elements and pack spaces around elements with same insulation.
- .4 Moderately butt insulation boards against each other so that there are no gaps.
- .5 Stagger joints at multiple layer installations.

### **3.3 INSULATION TYPE 1**

- .1 Provide Type 1 rigid board perimeter insulation at inside or outside of foundation walls as indicated, to minimum 600 mm below finished grade or lower where shown. Unless otherwise indicated provide 50 mm thick insulation bonded to substrate with spot adhesive application.
- .2 Where indicated provide Type 1 rigid board insulation below slabs on grade. Place insulation board on prepared, level subgrade, with joints tightly butted. Unless noted, use 50 mm thick insulation.

### **3.4 INSULATION TYPE 2**

- .1 Completely fill spaces with insulation, leaving no gaps or voids. Do not pack insulation tighter than manufactured density of materials.

### **3.5 MECHANICAL SECUREMENT**

- .1 Space securement members at maximum 600 mm o.c. Provide additional members at openings, penetrations, corners, changes of directions and terminations to ensure firm securement and adequate support for gypsum board in all locations.
- .2 Fasten members to supporting elements maximum 150 mm from end of furring members and at maximum 600 mm at walls and at maximum 400 mm o.c. at horizontal applications.

### 3.6 SCHEDULE

- .1 Unless otherwise indicated provide the following:
  - .1 Type 1 insulation: building foundations, in contact with soil (perimeter insulation); below slabs on grade;
  - .2 Type 2 insulation: Semi-rigid cavity wall insulation.

**END OF SECTION**

1 General

**1.1 DESCRIPTION**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 SUMMARY**

- .1 This section includes requirements for supply and installation of under-slab vapour retarder required for the following:

- .1 Below-grade Areas.

**1.3 RELATED REQUIREMENTS**

- .1 Section 31 50 00: Excavation Support and Protection

**1.4 SUBMITTALS**

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

- .2 Action Submittals:

- .1 Samples: Submit samples of materials to Consultant for review and acceptance as follows:

- .1 305 mm x 305 mm (12" x 12") sample for review and acceptance.

- .2 Data Sheets: Manufacturer's descriptive literature and recommended method of installation.

- .3 Certificates: Manufacturer's certificates attesting that products meet specification requirements.

- .3 Informational Submittals:

- .1 Product Data: Submit manufacturer's product literature for each product listed including manufacturer's recommended installation procedures and any modifications required to suit installation conditions.

**1.5 QUALITY ASSURANCE**

- .1 Contractor executing work of this Section shall employ installers having a minimum of five (5) years continuous Canadian experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

- .2 The below-grade vapour retarder shall be inspected by the Consultant prior to concrete work.

**1.6 STORAGE, DELIVERY, HANDLING AND PROTECTION**

- .1 Deliver materials on manufacturer's original skids, or in original unopened protective packing.

- .2 Protect materials during transportation, storage and installation to avoid physical damage.

2 Products

**2.1 MATERIALS**

- .1 Plastic Sheet Vapour Retarder: Polyethylene sheet in accordance with ASTM E1745-11, including manufacturer's recommended seam tape, pipe boots and vapour proofing mastic forming a complete system, and as follows:

- .1 Vapour Permeance: 0.3 Perm maximum

- .2 Water Vapour Transmission Rate: 17 ng/(s·m<sup>2</sup>·Pa) maximum

- .3 Tensile Strength: Class A

- .4 Thickness: Not less than 15 mil in accordance with ACI 302R recommendations.
- .5 Acceptable Materials:
  - .1 Perminator 15 mil by W.R. Meadows, Perminator 15 mil.
  - .2 Stego Wrap Vapour Barrier by Stego Industries.

### 3 EXECUTION

#### 3.1 INSPECTION

- .1 Check graded subgrade for conformity with elevations and cross-sections before placing material.
- .2 Check for unstable areas and areas requiring additional compaction.
- .3 Notify Consultant of unsatisfactory surfaces and conditions.
- .4 Do not begin installation of material until deficiencies have been corrected.

#### 3.2 INSTALLATION

- .1 Coordinate placement with other drainage materials and install in accordance with manufacturer's written instructions.
- .2 Before placing concrete for slabs on grade, water compacted base; do not use polyethylene. Place interior slabs on premoulded vapour retarder membrane, installed in accordance with manufacturer's written instructions.
- .3 Overlap sheet membrane seams 150mm (6") and tape using manufacturer's recommended 100mm (4") seam tape. Tape membrane edge to foundation wall to prevent membrane from moving and ensuring a continuous below-grade vapour retarder.

#### 3.3 PROTECTION

- .1 Take extreme care during trenching operations, installation of materials and backfilling not to damage or displace materials or other utilities.

**END OF SECTION**

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of self-adhered air and vapour membranes that prevent exfiltration and infiltration between interior and exterior of building through wall and roof transition construction.

1.2 RELATED REQUIREMENTS

- .1 Section 04 20 00: Unit Masonry
- .2 Section 07 21 00: Thermal Insulation
- .3 Section 07 51 00: Built-Up Bituminous Roofing
- .4 Section 09 21 16 Gypsum Board Assemblies

1.3 REFERENCE STANDARDS

- .1 American Society for Testing of Materials (ASTM):
  - .1 ASTM E96/E96M-10, Standard Test Methods for Water Vapour Transmission of Materials
  - .2 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Conference:
  - .1 Convene a pre-installation conference two (2) weeks prior to commencing work of this section. Require attendance of parties directly affecting work of this section, including, but not limited to, the Owner's representative, Consultant, General Contractor, air and vapour barrier membrane contractor, air and vapour barrier membrane manufacturer's representative and substrate installer.
  - .2 Contact Consultant two (2) weeks prior to pre-installation conference to confirm schedule.
  - .3 Review preparation and installation procedures and co-ordinating and scheduling required with related work.
  - .4 Record discussions of conference and decisions and agreements (or disagreements) reached, and furnish copy of record to each party attending. Review foreseeable methods and procedures related to the vapour permeable air barrier membrane, including the following:
    - .1 Tour, inspect and discuss condition of substrate, penetrations and preparatory work performed by other trades.
    - .2 Review surface preparation, minimum curing period and installation procedures.
    - .3 Review special details and flashings.
    - .4 Review required submittals, both completed and yet to be completed.
    - .5 Review and finalize construction schedule related to work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
    - .6 Review required inspections, testing, protection and repair procedures.
    - .7 Review weather and forecasted weather conditions, and procedures for coping with unfavourable conditions.
- .2 Coordination: Coordinate interface of membranes specified in this Section with adjacent systems to ensure continuity of system and that junctions between various components are effectively



sealed; verify with manufacturers and installers for installation procedures of materials incorporated into air and vapour membrane elements including membranes, transitions, coatings and sealants and continuity with roofing membrane.

## 1.5 SUBMITTALS

- .1 Provide submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Action Submittals:
  - .1 Product Data: Submit manufacturer's product literature, and installation instructions required for complete and proper installation of air and vapour retarder elements including membranes, primers, fasteners, proprietary application equipment, etc.
  - .2 Samples: Submit representative sample of air and vapour membrane minimum 305mm x 305mm (12" x 12") with factory applied identification clearly visible.
- .3 Safety Data Sheets:
  - .1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on site for reference by workers.

## 1.6 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
  - .1 Manufacturer: Obtain air and vapour membrane materials through one source from a single manufacturer or using materials from a secondary source that are acceptable to the manufacturer.
  - .2 Installer: Use an installation company that is acceptable to the manufacturer, using workers who are trained and approved by the membrane manufacturer having experience with projects of similar complexity and area.

## 1.7 ENVIRONMENTAL CONDITIONS

- .1 Air and vapour barrier is not to be applied to surfaces that are either wet, oily, frosted, dirty or contaminated in any way.
- .2 Ambient Conditions: Apply air and vapour membrane to substrate surfaces that are within manufacturer's installation temperature threshold range accounting for wind cooling and apparent temperature when actual temperature is approaching manufacturer's minimum temperature threshold.
- .3 Air and vapour barrier is not to be applied over lightweight cast-in-place concrete containing high moisture or certain curing compounds. Cast-in-place concrete should be cured for a minimum of two weeks prior to application of air barrier membrane.

## 1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries with construction schedule and arrange for proper storage areas.
- .2 All materials are to be stored in a clean, dry and protected area in their original containers sealed and undamaged. Manufacturer's labels are to be easily visible and undamaged.
- .3 Care and precaution are to be exercised by the applicator so as not to damage the work of other trades. Applicator is responsible to take all necessary precautions to protect work of other trades during application.
- .4 In addition to the above, store modified bituminous sheet type air and vapour barrier membrane as follows:
  - .1 Store rolls of membrane on end, in vertical position without leaning with selvage end up.
  - .2 Store materials away from direct heat or open flame.

- .3 For installation in cold weather, store rolls of membrane in heated storage trailer for minimum of 24 hours with the temperature kept at 21 deg C and remove for application with as little exposure as possible to low ambient temperatures.
- .5 Provide portable fire extinguishers within easy access of torching applications.

## 1.9 WARRANTY

- .1 Manufacturer's Warranty: Submit manufacturer's warranty stating that air and vapour membranes and accessories are free of defects and are manufactured to meet manufacturer's published physical properties and material specifications as of the date of product delivery.
- .2 Installer's Warranty: Submit installers warranty stating that air and vapour membranes and accessories are installed in accordance with manufacturer's recommendations and that membrane, transitions and through-wall flashing membranes, primers, mastics, adhesives and sealants are sourced from one manufacturer.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Basis-of-Design products are named in this Section; form the basis-of-design materials for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests a minimum of five (5) days in advance of Bid Closing.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - .1 Henry Company
  - .2 Soprema Inc.
  - .3 Tremco

### 2.2 MATERIALS

- .1 Self adhering SBS modified bitumen reinforced membrane; having low temperature formulation appropriate for installation requirements; tested in accordance with ASTM E96 and ASTM E2178, and having the following nominal properties:
  - .1 Low Temperature Flexibility: Less than -10°C
  - .2 Basis of Design Products:
    - .1 Blueskin SA by Henry Company
    - .2 Sopraseal Stick 1100-T by Soprema Inc.
    - .3 ExoAir 110LT by Tremco
- .2 Primer: Solvent based, synthetic rubber adhesive type, quick setting, solvent based, roller consistency type primer.
  - .1 Basis of Design Product: Blueskin Primer by Henry Company.
- .3 Air Barrier Sealant: High solids, rubber asphalt caulking and sealing compound.
  - .1 Basis of Design Product: 570-05 Polybitume Sealing Compound by Henry Company.
- .4 Through Wall Flashing Membrane: 40 mils (1mm) thick x width to suit, strips of self-adhering, SBS rubberized asphalt laminated to a cross-laminated, high density polyethylene film with a siliconized release liner.
  - .1 Basis of Design Product: Blueskin TWF by Henry Company

- .5 Packing Insulation: Loose, glass fibre or mineral fibre insulation, 1.0 lbs./cu.ft. density, and conforming to CAN/CGSB-51.11.

### 3 Execution

#### 3.1 EXAMINATION

- .1 Ensure that surfaces to receive air barrier membrane are dry, firm, suitable for bond, and free from dust, dirt, loose material, projections, ice, frost, slick, grease, oil or other matter detrimental to bond of sheet type air barrier membrane.
- .2 Report surfaces left unacceptable by other trades in writing to the Consultant before commencing installation.
- .3 Co-ordinate work of this section with the work of other sections.
- .4 Commencement of work of this section implies acceptance of surfaces and conditions.

#### 3.2 PREPARATION

- .1 Prepare surfaces in accordance with manufacturer's written requirements for type of substrate; free from voids, spalled areas, loose aggregates or sharp points; clean surfaces to remove contaminants that could affect bond such as grease or wax, dust, dirt and debris.
- .2 Apply primer to substrates when required by manufacturer at rate recommended by manufacturer; cover primed substrates on same day, reapply primer when work cannot be completed on the same day.

#### 3.3 INSTALLATION

- .1 Install air and vapour barrier membranes in accordance with manufacturer's written requirements, using appropriate equipment and skilled workers and as follows:
  - .1 Transition Membranes: Connect air and vapour membranes to adjacent assemblies having pre-installed transition membranes; install transition membranes where required to maintain continuity of building envelope.
  - .2 Through Wall and Flexible Flashings: Install flexible membranes where required to maintain flow direction to divert water away from face of building envelope.
- .2 Separate air and vapour barrier membranes from incompatible materials, and provide manufacturer's recommended transition materials required to maintain continuity of building envelope.
- .3 Cut and tightly seal air and vapour barrier membrane around penetrations and protrusions to provide a continuous air barrier.
- .4 Lap joints in air and vapour barrier membrane minimum of 75mm (3").
- .5 Where masonry anchors and supports pass through air and vapour barrier membrane, ensure continuity of air and vapour barrier membrane by applying air barrier mastic all around/over masonry anchors.
- .6 Prior to masonry being installed by section 04 20 00, inspect air and vapour barrier membrane for punctures, misaligned seams and fishmouths. Apply additional layer of air and vapour barrier membrane over damaged/affected areas, extending membrane minimum of 152 mm (6") beyond damage in all directions.

#### 3.4 SITE QUALITY CONTROL

- .1 Allow access for review and inspection and testing of installed air and vapour barrier membrane, and repair of deficiencies before placement of insulation materials.
- .2 Manufacturer's Site Services: Arrange for air and vapour barrier membrane manufacturer's technical personnel to review building envelope during installation.

- .3 Owner reserves the right to engage a testing firm to perform air and vapour barrier membrane testing to confirm performance of installed membranes and insulation systems in accordance with Section 01 45 23; testing will be performed when the building mechanical systems are balanced and operating; when building is occupied and climatic conditions are suitable for infrared thermographic scan of the building.
- .4 Cooperate with testing agency; repair or replace air and vapour barrier membrane as directed by testing agency, at no additional cost to the Owner.

### **3.5 CLEANING AND PROTECTION**

- .1 Protection: Protect membrane as recommended by manufacturer from effects of long term exposure where membrane is open to the environment for prolonged time periods using opaque plastic sheets or tarpaulins; protect membrane from penetrations and damage by successive components of the Work; assign payment for repairs to responsible parties; make repairs in accordance with manufacturer's written instructions using original installers.
- .2 Cleaning: Remove masking materials, debris, excess materials and equipment from site at completion of the work; conduct ongoing daily cleaning as directed by the Contractor; clean stains, drips or spills of coatings, sealants, mastic or primers visible on finished surfaces.

### **END OF SECTION**

### **3.6**

1 General

**1.1 SUMMARY**

- .1 Provision of pre-finished metal soffit and fascial for canopy.

**1.2 RELATED REQUIREMENTS**

- .1 Section 04 20 00: Masonry
- .2 Section 05 12 00: Structural Steel
- .3 Section 06 10 00: Rough Carpentry
- .4 Section 07 62 00: Sheet Metal Flashing and Trim
- .5 Section 07 92 00: Sealants
- .6 Read carefully all other Sections and review drawings to determine how the work of this Section is effected by the other Sections.

**1.3 REFERENCE STANDARDS**

- .1 American Architectural Manufacturers Association (AAMA):
  - .1 AAMA 605.2, Voluntary Specification for High Performance Coatings on Architectural Panels and Extrusions.
- .2 American Society for Testing and Materials (ASTM):
  - .1 ASTM A653/A653M-11, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process, Physical (Structural) Quality.
  - .2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- .3 Canadian Sheet Steel Building Institute (CSSBI):
  - .1 CSSBI 20M-08, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications.
  - .2 CSSBI S8-08, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
- .4 Canadian Standards Association (CSA):
  - .1 CSA CAN/CSA S16-09, Design of Steel Structures
  - .2 CSA S136-07, North American Specification for the Design of Cold Formed Steel Structural Members
- .5 Canadian General Standards Board (CGSB):
  - .1 CGSB 1.108-M89, Bituminous Solvent Type Paint
- .6 The Society for Protective Coatings (SSPC)
  - .1 SSPC Guide 14 , Guide for the Repair of Imperfections in Galvanized, Organic, or Inorganic Zinc-Coated Steel Using Organic Zinc-Rich Coatings

**1.4 SUBMITTALS**

- .1 Provide submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Submit manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

- .3 Shop Drawings:
  - .1 Submit fully dimensioned shop drawings to Consultant showing construction, assembly, elevations, sections and interfacing with work of other Sections.
  - .2 No work of this Section shall be fabricated until shop drawings and all other related submittals, documentation, certifications and samples as required by this Section, have been reviewed by the Consultant.
  - .3 Details shall indicate metal thicknesses, areas to be sealed and sealant materials, gaskets, type of joints, flashings, trim, finishes, fasteners and welds, all anchorage assemblies and components and erection details.
  - .4 Shop drawings shall bear the seal of an engineer registered to practice in the place of Work, employed by the preformed metal siding manufacturer, and shall include complete design calculations for the system and documentation in regard to the reactions of the metal siding due to thermal expansion and contraction, positive and negative wind pressure and assurance that the thermal movement and wind forces have sufficient attachments, supports, bracing and anchorage.
- .4 Samples:
  - .1 Submit to the Consultant for approval, samples of materials and components to be used in the system, prior to fabrication of work together with name of manufacturer and technical literature. Submit 305 mm x 305 mm (12" x 12") samples of metal, peel and stick membrane and Z-girts. Submit two (2) full size panels of metal siding.
- .5 Safety Data Sheets:
  - .1 Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on Site for reference by workers.

## 1.5 QUALITY ASSURANCE

- .1 Qualifications:
  - .1 Manufacturer and tradesmen executing the work of this Section shall have had a minimum five (5) years continuous Canadian experience in successful manufacture and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
  - .2 Erection of preformed metal siding systems shall be by workers especially trained and experienced in this type of work. Have a qualified representative at the job site to direct the work of this Section at all times.
  - .3 Retain a professional engineer, registered in the province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Document requirements including, but not limited to, the following:
    - .1 Seal and signature to shop drawings and design submittals requiring structural engineering.
    - .2 Field review of installed components.
  - .4 Conform to the requirements of the local Building Code, local by-laws and Authorities having jurisdiction.

## 1.6 PRE-INSTALLATION CONFERENCE

- .1 Convene one (1) week before commencing Work of this Section to discuss expectations for fit and finish of wall system, quality of workmanship for installation of air/vapour retarders and insulation and relationship of wall system to adjacent components.
- .2 Meeting shall be attended by the installer, manufacturer's representative, Contractor and the Consultant.

- .3 Manufacturer's representative shall also provide frequent inspection visits during the course of work of this Section to assure quality and competence of membrane installation and panel alignment

#### 1.7 DESIGN REQUIREMENTS

- .1 Maximum deflection not to exceed  $L/180$  under system's own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:50 years.
- .2 Design sheet cladding to span continuously over at least four structural supports (three spans) and design fastening to structural supports to sustain factored loads in accordance with CAN/CSA S136-07.
- .3 Calculate live load deflections in accordance with CSSBI 20M-08, as modified by the requirements of this Section.
- .4 Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from  $-40^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$ , and wind loads noted above.
- .5 Design the systems so that there is no air or water infiltration under the positive and negative forces imposed by wind and gravity loads. Provide means of draining space between insulation and exterior skin, in accord with NRC Rain Screen Principles.
- .6 Final review and acceptance of work completed by this Section shall be carried out by the manufacturer's representative, the Consultant, Contractor and the Subcontractor.

#### 1.8 STORAGE, DELIVERY, HANDLING AND PROTECTION

- .1 Co-ordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage locations. Do not load any area beyond the design limits.
- .2 Adequately protect and crate all components against damage, dirt, disfigurement and weather.
- .3 Assembled units and/or their component parts shall be transported, handled and stored in a manner to preclude damage. Accessory materials required for erection at the Site shall be delivered to the Site in manufacturer's labelled containers. Remove all units or components which are cracked, bent, chipped, scratched or otherwise unsuitable for installation and replace with new.
- .4 Provide safe and adequate equipment on the Site to execute the work of this Section, hoisting, scaffolding, staging, safety protection equipment, tools, plant and other equipment required for the completion of the work of this Section.
- .5 Delivered damaged materials or materials which do not comply with this Section shall be rejected by Consultant, removed from the Site and replaced with acceptable materials at Contractor's expense.
- .6 Adequately protect the structure and work of all other trades during delivery, storage, handling and erection of the work of this Section.
- .7 Preformed metal siding components being hoisted to the working level shall be adequately banded and carefully slung employing steel wire rope.
- .8 Bundles shall be tag lined during the ascent of the hoisting operation. Precaution shall be taken to avoid damage to metal siding components and to prevent marring of exposed surfaces.
- .9 Preformed metal siding components, after being positioned, shall be adequately secured in place as quickly as possible and prior to leaving the job site at the end of the working day.
- .10 Loose bundles of preformed metal siding components shall be adequately secured at the completion of each working day.
- .11 Scaffolds, platforms, ladders, and the like, required by the erector for installation of metal siding components shall be properly secured to prevent accidental movement or collapse.

## 1.9 PROJECT CONDITIONS

- .1 Make thorough examination of drawings and details. Determine the intent, extent, materials, and conditions of interfacing with work of other Sections and be fully cognizant of requirements.
- .2 Inspect substrate surfaces on which the work of this Section is erected for any irregularities detrimental to the application and performance of the work of this Section. Confirm conditions satisfactory before proceeding.
- .3 Co-ordinate and verify, by measurement at the job site, all dimensions affecting work of this Section. Notify Consultant, in writing, of all dimensions and/or conditions at variance with those on the reviewed shop drawings, Contract Documents and/or detrimental to the proper and timely installation of materials. Direction regarding correction measures shall be obtained from Consultant prior to fabrication of the item affected. Insure the compatibility of adjacent items in relationship to the work of this Section.
- .4 Do not perform work of this Section during period of rain, fog, sleet or snow, or upon surfaces covered with dust, water, dew, ice, frost or snow.
- .5 Report to Consultant in writing, defects of work prepared by other trades and unsatisfactory Site conditions. Commencement of application implies acceptance of surfaces and conditions.

## 1.10 COORDINATION

- .1 Coordinate work of this section with the requirements of Section 07 62 00, for specific requirements for supply of prefinished sheet metal flashing materials to other sections of the work as follows:
  - .1 Supply prefinished sheet metal flashings required for the project, regardless of sheet metal thickness and colour.
  - .2 Provide prefinished sheet metal flashings to installing trades, tension levelled and guillotine sheared to length ready for brake forming, fabrication and installation by installing trades.
  - .3 Coordinate with installing trades during bid period and provide unit prices for materials based on specified thickness and colour of flashing materials required under their respective scopes of work; installing trades will be responsible for carrying cost for flashing materials in their scope of work in their Bid Price.
  - .4 Requirements of this portion of the scope of work do not apply to extruded aluminum or other pre-manufactured flashing materials normally supplied by installing trades (i.e.: extruded aluminum curtain wall flashing and sills, preformed roof penetrations, non-prefinished sheet metal products).
  - .5 Subcontractor responsible for supply of metal wall and soffit cladding will only be responsible for fabrication and installation of flashings relating to their scope of work.

## 1.11 WARRANTY

- .1 Warrant the work of this Section against defects in materials and workmanship in accordance with General Conditions, but for a period of five (5) years. Agree to promptly make good defects which become evident during warranty period without cost to the Owner.
- .2 Without restricting the generality of the Warranty, defects shall include deformation, buckling, leakage, weather tightness, failure of anchors and fastenings, failure of paint coating and sealants.
- .3 Promptly make good defects and/or failures in the Work upon written notification by the Owner. Remedy shall include labour, materials, equipment and services required to make good defective work, and to replace components and finishes and the Owner's property damaged or disturbed in the course of remedying defects.



## 2.1 APPROVED SYSTEMS AND MANUFACTURERS

- .1 Vicwest
- .2 Agway metal

## 2.2 MATERIALS

- .1 Sheet steel conforming to ASTM A653/A653M-11, structural quality, Grade 'A' with a minimized spangle zinc coating of Z275 conforming to ASTM A653/A653M-11 shall be used for girts, sub-girts, Z-bars, brackets, battens, retention clips, cleats, fascias, preformed metal siding panels, closures and flashings.
- .2 Girts, sub-girts, Z bars, clips brackets shall be of the required base steel nominal thickness to meet design requirements. Thermal clips shall be slotted to minimize thru-metal conductivity.
- .3 Preformed metal siding shall be of required base steel nominal thickness to meet design requirements.
- .4 Fascias, and soffits minimum base steel nominal thickness of 24 gauge and thicker to suit application to prevent oil-canning unless otherwise noted.
  - .1 Facia and trim: In accordance with manufacture reconditions for soffit and section 07 62 00.
  - .2 Soffit: Bellara Metal Cladding by Vicwest.
- .5 Membrane Flashing underlayment: Coordinate with section 07 62 00 - Sheet Metal Flashing and Trim.
- .6 Fasteners: concealed.

## 2.3 FABRICATION

- .1 Maximum allowable panel tolerances to be as follows:
  - .1 Panel bow: 0.2% of panel dimensions up to 5 mm (0.1875") maximum.
  - .2 Width or length:  $\nabla$  1 mm up to 1219 (0.032" up to 48"),  $\nabla$  2 mm (0.064") from 1219 mm to 3658 mm (48" to 144").
  - .3 Squareness: # 5 mm (0.1875") difference between diagonal measurements.
  - .4 Camber: # 1 mm (0.032").
- .2 Form all panels to specified dimensions with tolerances to accommodate expansion and contraction between panels and support system when subjected to surface temperatures between -34EC to 82EC. Radii of curved panels to be accurately formed in manufacturer's plant. Reinforce back of panels as required with concealed reinforcing.
- .3 Weld and grind smooth all panels corners prior to finishing. Weld aluminum by electric arc process in accordance with CSA W59.2-M1991 (R2008).
- .4 Factory fabricate accessory and trim components, ready for installation.
- .5 Provide "hairline" joints where panels abut adjacent panels as indicated on drawings.
- .6 Fit joints and intersecting members accurately in true planes, square, plumb, straight with tight joints and intersections.
- .7 Fabricate, drill and tap members to accommodate attachments, anchorage and work of other Sections where located and directed by them.
- .8 Provide weep holes as required, at low end of panels to facilitate drainage of condensation and runoff water, in case joint seals fail in panels.

## 2.4 FINISHES

- .1 Preformed metal shall be prefinished coil coated material in accordance with Technical Bulletin "Prefinished and Post Painted Galvanized Sheet Steel for Exterior Building Products" of the Canadian Sheet Steel Building Institute (CSSBI), prefinished to CSSBI 10,000 Series or WeatherX finish requirements. Colours shall be as indicated on drawings and where not indicated, as selected later by Consultant from manufacturer's full available colours range, including manufacturer's extended colours range. Allow for two (2) different colours to be selected.
- .2 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

**3.1 INSPECTION AND PREPARATION**

- .1 Surfaces to receive panel system shall be even, smooth, sound, clean, dry and free from defects.
- .2 Take field measurements from actual structure and verify prior to commencement of fabrication.
- .3 Allow for dimensional tolerances and deviations from true planes permissible in the structural frame. Excessive deviations shall be reported to the Consultant in writing for correction. Commencement of work of this Section implies acceptance of all surfaces and conditions.

**3.2 INSTALLATION**

- .1 Panel system shall be installed by panel fabricator's authorized erectors in accordance with instructions of panel fabricator and in accordance with shop drawings approved by the Consultant to locations indicated on drawings.
- .2 Isolate contact surfaces to prevent electrolysis due to metal to metal contact or contact between metal and concrete or masonry. Use bituminous paint, butyl tape or other means approved by Consultant.
- .3 Fabricator/erector shall be responsible for installation.
- .4 Co-ordinate with work of other Sections for anchorage/suspension system.
- .5 Be responsible for site measurements.
- .6 Clean and prime panel joints as recommended by sealant manufacturer.
- .7 Install joint back-up material and sealant to panel joints as recommended by sealant manufacturer.

**3.3 CLEANING**

- .1 Remove debris and surplus materials resulting from work of this Section, from the Site upon completion of work of this Section.
- .2 Clean dirt, soil and misplaced sealants from preformed aluminum panel system with recommended cleaners and solvents.
- .3 Immediately prior to final cleaning and before handing over building to the Owner, make good all damage and disfigurement. Remove all protective films/coatings, stains and foreign matter, and leave in uniform colour and in first-class condition, to Consultant's satisfaction.

**END OF SECTION**

1 General

1.1 SUMMARY

- .1 Fully adhered conventional roofing system with 2 ply assembly of pre-manufactured SBS modified bituminous roofing membrane over membrane underlayment, insulation, vapour retarder adhered to gypsum board sheathing on steel deck as indicated on drawings.
- .2 Section Includes:
  - .1 Preparation of Deck Surface
  - .2 Deck Sheathing Board
  - .3 Vapour Retarder
  - .4 Roof Insulation
  - .5 Insulation Overlay Board
  - .6 Base Sheet and Base Sheet Flashing
  - .7 Cap Sheet and Cap Sheet Flashing
  - .8 Accessory Items
  - .9 Sheet Metal Flashings related to roofing, including parapet and cap flashings.

1.2 RELATED REQUIREMENTS

- .1 Section 05 50 00: Miscellaneous Metals
- .2 Section 06 10 00: Rough Carpentry
- .3 Section 07 21 13: Board Insulation
- .4 Section 07 62 00: Prefinished Metal Flashing and Trim
- .5 Section 07 72 33: Roof Hatches and Accessories
- .6 Section 07 92 00: Sealants

1.3 REFERENCE STANDARDS

- .1 Canadian Roofing Contractors' Association (CRCA):
  - .1 Roofing Specification Manual
- .2 American Society for Testing and Materials (ASTM):
  - .1 ASTM D4263-83 (2012), Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
  - .2 ASTM E84 –15, Standard Test Method for Surface Burning Characteristics of Building Materials
- .3 Canadian General Standards Board (CGSB):
  - .1 CGSB 37-GP-56M, Membrane, Modified, Bituminous, Prefabricated and Reinforced for Roofing
  - .2 CGSB 37-GP-64M, Mat Reinforcing, Fibrous Glass, for Membrane Waterproofing Systems and Built-up Roofing
  - .3 CAN/CGSB-37.5-M89, Cutback Asphalt Plastic Cement
  - .4 CAN/CGSB-37.28-M89, Reinforced, Mineral Colloid Type, Emulsified Asphalt for Roof Coatings and Waterproofing

- .5 CGSB 37-GP-9Ma, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing or Waterproofing
- .4 Canadian Standards Association (CSA):
  - .1 CSA A123.4-04(R2013), Asphalt for Constructing Built-up Roof Coverings and Waterproofing Systems
  - .2 CSA B111-1974 (R2003), Wires, Nails, Spikes and Staples
- .5 Underwriters Laboratories Canada (ULC):
  - .1 CAN/ULC S107-10, Methods of Fire Tests of Roof Coverings
  - .2 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering
  - .3 CAN/ULC S702-14, Standard for Mineral Fibre Thermal Insulation for Buildings
  - .4 CAN/ULC S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

#### 1.4 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Product Data: Submit copies of membrane manufacturers current technical data sheets describing the physical properties and recommended installation procedures.
  - .2 Shop Drawings:
    - .1 Submit sloped insulation manufacturer's proposed roofing diagrams and layouts for review by the Consultant.
    - .2 Submit membrane manufacturer's standard details that will be used for this project, indicate changes that must be made to make the details project specific for review by the Consultant.
- .3 Informational Submittals: Certificates: Provide roofing system materials that are compatible with building air and vapour retarders specified under Section 07 27 13.

#### 1.5 SYSTEM PERFORMANCE

- .1 Roofing System: Prevent water migration from entering building through the roof membrane.
- .2 Supply roofing materials from a single manufacturer, from roof deck to roof membrane, to ensure all system components are compatible and warranties can be achieved.

#### 1.6 QUALITY ASSURANCE

- .1 Obtain roofing membrane materials through one source from a single manufacturer and install using workers who are trained and approved by the roofing membrane manufacturer; maintain a full time experienced journeyman roofer, and at least one apprentice per crew on the Work at all times.
- .2 Roofing and sheet metal work will be performed in conformance with the roofing manufacturer's written recommendations using materials that meet the requirements of CAN/ULC S107 to obtain a Class A fire resistance rating; submit proof that roofing materials meet required performance when requested by the Consultant.
- .3 Conform to Roofing Specifications as published by Canadian Roofing Contractors Association (CRCA) as a reference.
- .4 Perform the work of this Section by a company which is a member in good standing of the Ontario Industrial Roofing Contractors' Association (OIRCA) and which has a minimum of five (5) years of proven satisfactory experience in the Work of this Section.

- .1 Follow Ontario Industrial Roofing Contractors' Association "Good Practice and Minimum Standards Code No. GP-67-1" latest revision when higher application standards are not specified.
- .5 Execute work of this section using an applicator approved by the roofing membrane manufacturer.

#### **1.7 FIRE PROTECTION**

- .1 Protect roof junctions at parapets, roof curbs and upstands with a fire-resistant tape or barrier to prevent combustible materials within assemblies from ignition arising from the use of torches. Install prior to installation of base sheets.
- .2 Use a heat detector gun to spot any smouldering or concealed fire at the end of each work day. Establish a minimum one (1) hour fire watch after torch application.
- .3 Do not apply torch directly to dry or unprotected wood surfaces.
- .4 Maintain a clean site and have one approved ABC fire extinguisher within 6 meters of each roofing torch. Respect all safety measures described in manufacturer's technical data sheets. Do not place torches near combustible or flammable products.

#### **1.8 STORAGE, DELIVERY, HANDLING AND PROTECTION**

- .1 Deliver materials to the job site; handle and store in original packages and containers with manufacturer's seals and labels intact. The manufacturer's name, brand, mass, specification number and lot number must be shown on the labels.
- .2 Store materials in weatherproof shelters having floors that will protect the materials from moisture. Store materials on end. Avoid prolonged exposure of light or heat sensitive materials to sunlight.
- .3 Do not store materials on roof in concentrations that exceed design live load.
- .4 Place plywood runways over the Work to enable the movement of materials and other traffic during construction of roofing.
- .5 Protect surrounding surfaces against damage from roofing work. Where hoisting is necessary, hang tarpaulins to protect walls during delivery of materials from ground to roof.
- .6 In the event of materials damage by the elements, improper handling or other causes, such materials will be rejected and will be replaced at no extra cost to the Owner. Remove rejected materials promptly from the site.
- .7 During roofing work, exposed surfaces of finished walls must be protected with tarp to prevent damage. Contractor shall assume full responsibility for damage.

#### **1.9 PREINSTALLATION MEETING**

- .1 Arrange a pre-construction meeting in accordance with Section 01 31 19.
- .2 Include the roofing manufacturer's representative, roofing contractor's representative, the roofing inspector, the Contractor, the Consultant and Owner.
- .3 The purpose of this meeting is to review installation conditions particular to this project and review materials specified in this section.
- .4 The roofing inspector will complete the minutes and prepare a report for this meeting.

#### **1.10 SITE CONDITIONS**

- .1 Minimum ambient application temperature shall not be less than -20 deg C. Notify Consultant and roofing inspector where installation is required below stated minimum temperature and submit manufacturer's standard cold weather installation practices prior to proceeding with work of this section.

#### **1.11 WARRANTY**

- .1 Manufacturer's Warranty: Provide a fifteen (15) year manufacturer's non-prorated labour, material and workmanship warranty to include coverage for failure to meet specified requirements including removal and replacement of defective membrane.
  - .1 Membrane warranty shall not to be limited by other components that are only available or manufactured by the membrane manufacturer.
  - .2 Letters modifying standard warranty not permitted.
- .2 Date warranties to commence at date of Substantial Performance.
- .3 Workmanship Warranty:
  - .1 Submit a two (2) year written warranty of the workmanship of this Section against all failures except as the result of structural failure of substrate. The contractor shall repair any leaks in roofing membrane, flashing membrane and related sheet metal work resulting from faulty workmanship for a period of two (2) years. Ensure warranty is submitted on OIRCA's "standard form of warranty".
  - .4 Submit for Owner's acceptance, manufacturer's warranty document indicated above, executed by an authorized company official.

## 2 Products

### 2.1 MATERIALS - GENERAL

- .1 Source Limitations:
  - .1 Products of specified roofing system shall be products of one manufacturer, or approved by roofing system manufacturer as part of a system as compatible with their system and listed in and covered by the Manufacturer's Warranty.

### 2.2 MANUFACTURERS - MEMBRANE MATERIALS

- .1 Basis of Design: Soprema Inc.,
- .2 Acceptable Manufacturer's: Equivalent systems from the following manufacturers will be considered provided they comply with performance requirements of this Section and the products specified:
  - .1 Firestone Building Products Canada.
  - .2 IKO Industries Ltd.
  - .3 Tremco Commercial Sealants & Waterproofing.
  - .4 Siplast.
- .3 Substitutions: Not permitted.

### 2.3 MEMBRANE MATERIALS

- .1 Roof Membrane: CAN/CGSB-37-GP-56M, ASTM D 6162 and ASTM D 6164 asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) prefabricated sheet.
  - .1 Prefabricated Roof Base Sheet: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, with heavy duty composite glass and polyester reinforcement; smooth surfaced with the following characteristics:
    - .1 Conforming to: CGSB 37-GP-56M Type 2, Class C, Grade 1.
    - .2 Thickness: 2.2 mm.
    - .3 Application: Fully adhered.
    - .4 Top surface suitable for torch-on application of cap sheet.
    - .5 Underside for hot mop asphalt application.

- .6 Product: 'Elastophene 180 PS' manufactured by Soprema.
- .2 Prefabricated Base Sheet Flashing: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, reinforced with woven fibre glass 180 g/m<sup>2</sup>; smooth surfaced with the following characteristics:
  - .1 Conforming to: CGSB 37-GP-56M Type 2, Class C, Grade 2.
  - .2 Thickness: 3.0 mm.
  - .3 Application: Fully adhered.
  - .4 Top surface suitable for torching cap sheet.
  - .5 Underside self-adhesive with silicone release sheet.
  - .6 Product: 'Sopraflash Flam Stick' manufactured by Soprema.
- .3 Cap Sheet Membrane and Flashing Type 1: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, heavy duty composite glass and polyester reinforcement; upper surface finished with a factory applied white finish providing an SRI +/- 85 with the following characteristics:
  - .1 Conforming to: CGSB 37-GP-56M Type 1, Class A, Grade 2.
  - .2 Thickness: 3.5 mm.
  - .3 Application: Fully adhered.
  - .4 Top surface factory applied highly reflective white film granules.
  - .5 Underside suitable for torch-on.
  - .6 Product: 'Soprastar FLAM HD GR' manufactured by Soprema.
- .4 Cap Sheet Membrane and Flashings Type 2: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, polyester reinforcement; upper surface finished with a factory applied grey finish with the following characteristics:
  - .1 Conforming to: CGSB 37-GP-56M Type 1, Class A, Grade 1.
  - .2 Thickness: 4 mm.
  - .3 Application: Fully adhered.
  - .4 Top surface factory applied highly reflective white film granules.
  - .5 Underside suitable for torch-on.
  - .6 Product: 'Sopralene Flam 250 GR' manufactured by Soprema.

## 2.4 BITUMEN MATERIALS

- .1 Asphalt Primer: 'Elastocol Stick' by Soprema for self-adhered applications; 'Elastocol 500' by Soprema for heat welded applications.
- .2 SEBS Asphalt: ASTM D6152; A blend of SEBS and select asphalt for adhering membranes and overlay board.
- .3 Asphalt Bitumen: CSA A123.4M Roof Asphalt Type 3.
- .4 Plastic Cement: ASTM D2822 Type I or II, cutback asphalt type as recommended by roofing system manufacturer for application.

## 2.5 VAPOUR RETARDER

- .1 Prefabricated Vapour Retarder Membrane (noted as membrane in roof system): Self-adhesive air/vapour barrier membranes composed of bitumen modified with thermoplastic polymers and high-density polyethylene film with the following characteristics:
  - .1 Water Vapour Permeance: +/- 1.7 ng/Pa.s.m<sup>2</sup> (0.03 perm)

- .2 Thickness: 0.8 mm.
- .3 Product: 'Sopravap'r' by Soprema, or an approved equivalent product by an acceptable manufacturer of this Section and compatible with the acceptable manufacturer's system.
- .2 Prefabricated Vapour Retarder Transition Strip and Flashing Self Adhesive: Asphalt and polymer modifiers of styrene-butadiene-styrene (SBS) type, polyester and glass reinforcement; smooth surfaced, as approved by system's manufacturer.

## 2.6 INSULATION

- .1 Acceptable Manufacturers- Polyisocyanurate Insulation:
  - .1 Atlas Roofing Corporation; Product: 'AC Foam III'.
  - .2 Firestone Building Products Canada; Product: 'RESISTA ISO'.
  - .3 IKO Industries Ltd; Product: 'IKOTerm III'
  - .4 Soprema Inc.; Product: 'SOPRA-ISO'.
- .2 Flat Insulation: Faced polyisocyanurate insulation boards, CAN/ULC-S704, Type 3, Class 3, HCFC and CFC-free, rigid board, inorganic coated-glass facers, and square edges.
  - .1 Board Density: 32 kg/cu m.
  - .2 Board Size: 1220 x 1220 mm and 1220 x 2440 mm.
  - .3 Board Thickness: Thicknesses to achieve thermal resistance value indicated in two lifts.
  - .4 Thermal Resistance: Min LTTR value of RSI value of 1.8 per 50 mm.
- .3 Tapered Insulation: Faced Polyisocyanurate insulation boards, CAN/ULC-S704, Type 3, Class 3, HCFC and CFC-free, rigid board, inorganic coated-glass facers, and square edges.
  - .1 Board Density: 32 kg/cu m.
  - .2 Board Size: 1220 x 1220 mm.
  - .3 Board Thickness: As required for fabrication of slopes with a minimum thickness of 13 mm.
  - .4 Fabricate to slopes indicated with a minimum 2 percent slope to drain. Provide custom saddles, crickets, tapered edge strips and other insulation shapes with increased local slopes to prevent trapping of water behind parapets returns or curbs.
  - .5 In the absence of slopes on the drawings design a custom configured sloping insulation to provide minimum 2 percent slope to drains with custom sloped accessories as indicated **Error! Reference source not found..**
- .4 Drain Sump:
  - .1 One-piece, pre-manufactured, polyisocyanurate, 1220mm x 1220mm (4' x 4') Gemini Drain Set, with minimum 13mm (1/2") per foot of slope Install at all drains.

## 2.7 GYPSUM ROOF SHEATHING

- .1 Gypsum roof sheathing; ASTM C1396; 16 mm thick unless otherwise indicated; primed finish with non-woven glass mats embedded in a water resistant treated gypsum core; minimum compression strength 500 psi.
  - .1 Product:
    - .1 'DensDeck Prime Roof Board' manufactured by Georgia-Pacific Gypsum LLC,
    - .2 'Securock Gypsum Fiber Roof Board' by CGC Inc.
    - .3 'CertainTeed Glasroc Roof Board' by CertainTeed

## 2.8 COVER BOARD AND OVERLAY BOARD



- .1 Cover board for roof slope less than 6%: 25 mm asphalt coated wood fibreboard conforming to CSA A247-M, Type 1, apply in two layers of 13 mm with joints offset, fully adhered to primary insulation.
- .2 Torchable Glass Fibre Board: Semi-rigid board composed of a mineral fortified asphaltic core formed between two asphalt-saturated inorganic felts, 1220 x 1520 x 6 mm thick.
  - .1 Product: 'Sopraboard' by Soprema, or approved equivalent by an acceptable manufacturer of this Section and compatible with the acceptable manufacturer's system.

## 2.9 ADHESIVES

- .1 Insulation Adhesive: One or two component, low-rise, chemically cured urethane foam adhesive for the attachment of selected rigid roof insulation to one another and to adhere to vapour barrier membranes; contains no solvents and is compatible with the roofing Manufacturers system.
  - .1 Product: 'Duotack' by Soprema, or approved equivalent by an acceptable manufacturer of this Section and compatible with the acceptable manufacturer's system.

## 2.10 CARPENTRY

- .1 Wood roof materials shall be as specified in Section 06 10 00. Do not use pressure treated materials where SBS membrane materials are to be adhered to wood fabrications.

## 2.11 FLASHINGS

- .1 Sheet Metal Flashing: as specified in Section 07 62 00.
- .2 Flexible Flashings: Same material as membrane.
- .3 Counter Flashings: Metal, specified in Division 07 Section Metal Flashings and Trim.
- .4 Cold-Applied Liquid Flashing Membrane: Single component polyurethane bitumen resin waterproof liquid specially formulated for compatibility and use with roofing membrane and base flashings.
  - .1 Product: 'Alsan Flashing by Soprema or approved equivalent by an acceptable manufacturer of this Section and compatible with the acceptable manufacturer's system.
- .5 Prefabricated Curb System: Prefabricated interlocking curb/pocket system sized for penetration and cold-applied single component polyurethane sealant waterproof liquid specially formulated for compatibility and use with roofing membrane and base flashings.
  - .1 Approved Products:
    - .1 'Sopramastic Block' by Soprema, or
    - .2 'Chemcurb' by Chemlink Advanced Architectural Products, or
    - .3 'Fillguard M' by Firestone Building Products Company.
- .6 Prefabricated Roof Penetration Flashings:
  - .1 Vent Stack Flashings: CSA B272 - Mill finish, spun aluminum, 480 mm high; urethane insulated, diameter sizes as shown and as required, min 1.5 mm thick sleeve with removable cap (screw fastened) and EPDM Base Seal and bituminous painted deck flange, types to suit high snow load conditions.
    - .1 General Properties: One piece spun flashing, watertight without the use of sealant or mastic and maintenance free.
    - .2 Product: 'SJ -37, STACK JACK' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.
  - .2 Service Jacks Flashings: Spun aluminum, types to suit high snow load conditions, with integral premoulded urethane insulation, deck flange, cap flashing with neoprene grommets holes for piping or conduits. Mechanical / Electrical Flashings by Thaler Roofing Products, or approved equivalent by Altra Metal Specialties Inc.

- .3 Split Flashing: CSA B272 - Type 304 stainless steel, 305 mm high x square and round types of size(s) as shown and as required, min 0.45 mm thick sleeve with gauge of cap to suit; with EPDM pressure grommet seal around cap and continuous EPDM seals at split junctures of sleeve and deck flange; bituminous painted deck flange; matching split cap with overlapped and stainless steel bolted closure design:
  - .1 General Properties: Watertight without the use of sealant or mastic, maintenance free and re-useable.
  - .2 Product: 'SP -1, Round Split Flashing' by Thaler Metal Industries Ltd or approved equivalent by Altra Metal Specialties Inc.
- .4 Split Cap Flashings: CSA B272 - Type 304 stainless steel, square and round types, size(s) as shown and as required, min 0.45 mm thick split cap with overlapped and stainless steel bolted closure design with EPDM pressure grommet seal around cap.
  - .1 Product: 'Thaler SPJ -1, Split Flashing' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.
- .5 Rigid Conduit Flashings: CSA B272 - Mill finish aluminum, 457 mm high flashing sleeve with integral deck flange, with premoulded urethane insulation, EPDM triple pressure grommet seal and base seal, bituminous painted deck flange, diameter to suit rigid conduit.
  - .1 Product: 'MEF-AE1' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.
- .6 Flexible Conduit Flashings: CSA B272 - Mill finish aluminum, 508 mm high flashing sleeve with integral deck flange, EPDM triple pressure end cap seal and base seal, bituminous painted deck flange, diameter to suit flexible conduit.
  - .1 Product: 'MEF-2A2' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.
- .7 Hot Pipe Flashings: CSA B272 – Type 304 stainless steel, 457 mm high flashing sleeve with perforations at top of flashing, 51 mm mineral wool insulation and integral deck flange, removable stainless steel collar with a friction seal, bituminous painted deck flange, diameter to suit hot pipes.
  - .1 Product: 'MEF-3A' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.
- .8 Gas Pipe Flashings: CSA B272 – mill finish aluminum, 457 mm high flashing sleeve with perforations collar and integral deck flange, removable cap with EPDM triple pressure seal, bituminous painted deck flange, diameter to suit gas pipe.
  - .1 Product: 'MEF-9 Modcon Gas Pipe Flashing' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.
- .9 'B' Vent Flashings: CSA B272 – mill finish aluminum, 305 mm high flashing sleeve and integral deck flange, removable collar with EPDM triple pressure seal, bituminous painted deck flange, diameter to suit 'b' vent diameter.
  - .1 Product: 'MEF-4A' by Thaler Metal Industries Ltd., or approved equivalent by Altra Metal Specialties Inc.

## 2.12 ACCESSORIES

- .1 Pavers:
  - .1 610 x 610mm size, 45 mm thick, precast concrete paver units; diamond pattern; colour: Natural. Approved manufacture:
    - .1 Brooklin Diamond Texture by Armtec.
    - .2 Roof Ballast Paver by Hanover Architectural Products.

- .3 Approved equivalent.
- .2 Paver support pad: Closed cell extruded expanded polystyrene board, with square edges. 25 mm thick. Width to match pavers width specified. Approved Product:
  - .1 Styrofoam brand "Highload 40" by Dow.
- .2 Sheathing Joint Tape: Paper, heat-resistant type.
- .3 Insulation Joint Tape: Asphalt treated glass fibre reinforced; 150 mm wide; self adhering.
- .4 Flame-Stop Tape: Self-adhesive membrane composed of SBS modified bitumen and a glass mat reinforcement, designed to prevent flames from penetrating into voids, cavities and openings before installing heat-welded membranes; type recommended by membrane Manufacturer.
- .5 Fasteners: Factory-coated steel, appropriate for purpose intended, to FM Fire/Wind Classification requirements and approved by system manufacturer; length required for thickness of material with metal plate washers to FM 4470.
- .6 Roofing Nails: Galvanized, hot dipped type, size as required to suit application.
- .7 Jointing Material for Overlay Board: Tape or sealant as recommended by membrane manufacturer.
- .8 Sealants: As recommended by membrane manufacturer.
- .9 Cant Strips: Fabricated from High density mineral wool, asphalt impregnated facer for torch application; 100 mm x 100 mm fabricated to 45 degree angle (with min.140 mm sloped face) dimension.
  - .1 Basis of design: 'CantRSS' by modular RTS or equivalent by listed manufacturer
  - .2 Cant Strip-Insulation Adhesive: Recommended by membrane manufacturer.
- .10 Termination Bars: Aluminum, surface mounted, prepunched, maximum possible length per location, with attachment flanges.
- .11 Roofing Granules: Ceramic-coated roofing granules matching specified cap sheet, provided by roofing system manufacturer.
- .12 Miscellaneous Accessories: Provide all miscellaneous accessories recommended by roofing system manufacturer.

### 3 Execution

#### 3.1 GENERAL

- .1 Perform roofing installation in accordance with membrane manufacturer's written instructions and to CRCA Roofing Specifications Manual requirements.
- .2 Coordinate installation of roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
  - .1 At end of each day's work, provide water cut-offs to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed. Minimize or eliminate staggered joints to accommodate water cut-offs.
  - .2 Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system. Use membrane flashings consistent with permanent detailing sealed to base layer and vapour retarder with minimum 100 mm laps.
  - .3 Remove and discard temporary seals before beginning work on adjoining roofing.

- .3 Provide water cut-offs to prevent dispersion of moisture at insulation level throughout roof assembly, in the event of future roof leak. Locate cut-offs at 9 m intervals each way.
- .4 Install cap sheets within 48 hrs of installation of base sheets.
- .5 No visible fasteners permitted on underside of exposed decks

### 3.2 EXAMINATION

- .1 Verify that surfaces and site conditions are ready to receive work.
- .2 Verify deck is supported and secured.
- .3 Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains.
- .4 Verify deck surfaces are dry and free of snow or ice.
- .5 Confirm dry deck by moisture meter with 12 percent moisture maximum.
- .6 Verify roof openings, curbs, pipes, conduit, sleeves, ducts, and vents through roof are solidly set, and correctly located.

### 3.3 PREPARATION

- .1 Prepare surfaces in accordance with CRCA Standards and manufacturer's written installation instructions.

### 3.4 GYPSUM ROOF SHEATHING

- .1 Apply with adhesive or mechanical fasteners in conformance with manufacturer's written recommendations to obtain wind uplift rating specified.

### 3.5 INSTALLATION OF VAPOUR RETARDER – SELF-ADHERED

- .1 Install insulation to manufacturer written instructions.
- .2 Ensure vapour retarder is clean and dry.
- .3 Bottom Insulation: Install bottom layer of insulation in minimum 2 layers. Apply adhesive to substrate in accordance with adhesive and insulation manufacturer's written instructions. Embed first layer of insulation into adhesive over vapour retarder in accordance with manufacturer's recommendations.
  - .1 For second layer of bottom insulation, apply adhesive to the top surface of first layer of insulation. Embed the second layer of insulation into adhesive, with joints staggered minimum 300 mm from joints of first layer.
- .4 Tapered Insulation: Place constant thickness first layer and tapered thickness insulation second layer to indicated slope pattern in accordance with manufacturer's written instructions.
  - .1 Embed insulation into adhesive as per manufacturer's instructions.
- .5 Minimum Total Insulation Thickness: As required to achieve insulation R or RSI value as indicated. Do not use tapered insulation in the calculation of thickness required.
- .6 Lay boards with edges in moderate contact without forcing. Cut insulation to fit neatly to perimeter blocking and around penetrations through roof.
- .7 Lay tapered boards for a distance of 450 mm back from roof drains for positive drainage.
- .8 Apply no more insulation than can be covered with membrane in same day.

### 3.6 OVERLAY BOARD

- .1 Install overlay boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints a minimum of 150 mm in each direction from joints of insulation below. Loosely butt cover boards together. Tape or seal joints if required by roofing system manufacturer.

- .2 Apply hot mopping of SEBS asphalt to underside, and immediately bond board to substrate at a rate of 1.5 kg/m<sup>2</sup>. Attain full contact.
- .3 Immediately cover overlay boards with subsequent materials; do not leave exposed.

### 3.7 INSTALLATION OF MEMBRANE

- .1 Apply membrane and primer to manufacturer written instructions.
- .2 Hot mop -fully adhere base sheet with SBS modified asphalt at a rate of 1.25 kg/m<sup>2</sup>.
- .3 Apply membrane; lap and seal edges and ends permanently waterproof.
- .4 Apply membrane smooth, free from air pockets, wrinkles, or tears. Ensure full bond of membrane to substrate. Use rollers
- .5 Extend membrane minimum of 200 mm onto vertical surfaces. Secure base sheets to vertical surfaces of parapets with binder bars.
- .6 Extend membrane over vapour and air barrier of wall construction and seal.
- .7 Mop and seal membrane around roof protrusions and penetrations.
- .8 Torch cap sheet to manufacturer written instructions. On exposed membranes lap cap sheets at seams to limit bitumen bleed-out. Alternatively, apply loose granules of same colour as cap sheet to bitumen bleed-out while material is hot; ensure full coverage and embedment. Visible bleed-out not permitted.

### 3.8 FLASHING AND ACCESSORIES

- .1 Apply flexible sheet base flashings to seal membrane to vertical elements.
- .2 Secure to nailing strips at 100 mm on centre.
- .3 Fabricate roofing control and expansion joints to isolate roof into areas as indicated.
- .4 Install prefabricated roof penetration flashings and expansion joint flashings in accordance with manufacturer's instructions.
- .5 Coordinate installation of roof drains, curbs, and related flashings.
- .6 Seal flashings and flanges of items penetrating or protruding through the membrane.
- .7 At locations where standard flashing materials cannot be used apply liquid membrane flashing in accordance with manufacturer's details.

### 3.9 SITE QUALITY CONTROL

- .1 Owner will hire an independent inspection agency for this project to provide inspection services and verify conformance of roofing to specified requirements. Owner to appoint and pay for roof inspections.
- .2 Notify Inspection Company, roofing membrane manufacturer and Consultant 72 hours in advance of commencing roofing. Inspection Company will:
  - .1 Carry out full and complete inspections while the work is in progress, at completion of roofing installation and just prior to the date of Substantial Performance
  - .2 Inspect and review materials and workmanship including storage, handling and protection. Advise the Consultant and the Owner of inspections.
  - .3 Include procedures followed; ambient temperatures, humidity, wind velocity during application.
  - .4 Submit a daily report while work is in progress to the Owner, Consultant, Roofing subcontractor and Contractor. This report is to be countersigned by the Roofing Subcontractor's Superintendent acknowledging content.
- .3 Inspection of all roofing to be provided by Owner appointed inspection agency.

### **3.10 MANUFACTURERS SITE SERVICES**

- .1 Attend Pre-installation Meetings:
  - .1 Review preparation and installation procedures and coordinating and scheduling required with related work.
- .2 Require site attendance of roofing system manufacturer's technical personnel during installation of the Work to provide field surveillance of the installation of their Products:
  - .1 Schedule of Site Visits: Provide a minimum of three visits beginning with initial start-up of installation, at 25% completion and at 50% completion for each roof assembly.
  - .2 Inspect and review materials and workmanship including storage, handling and protection. Advise Consultant and Owner 48 hours in advance of inspections.
  - .3 Monitor and report installation procedures and unacceptable conditions.
  - .4 Manufacturer's representative to provide a written Site Report for each Site visit.
- .3 Correct identified defects or irregularities.
- .4 Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of roofing membrane and flashing.
  - .1 Notify Consultant and Owner 48 hours in advance of date and time of final inspection.
  - .2 Manufacturer's representative to provide a written Site Report for Final Inspection.

### **3.11 CLEANING**

- .1 The work site must be routinely cleared of rubbish and other materials that may hinder roof installation, performance or present a fire hazard.
- .2 At completion of work remove waste materials and items that could cause a roof puncture.
- .3 Clean adjacent surfaces of asphalt, bitumen and other roofing materials deleterious to appearance or function.

### **3.12 PROTECTION**

- .1 Protect installed work and materials.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 04 20 00: Unit Masonry
- .2 Section 06 10 00: Rough Carpentry
- .3 Section 07 51 00: Built-Up Bituminous Roofing
- .4 Section 07 92 00: Joint Sealants

**1.3 DESIGN & PERFORMANCE REQUIREMENTS**

- .1 Perform work in accordance with the most stringent details and requirements of the following unless more stringent requirements are specified or indicated:
  - .1 Architectural Sheet Metal Manual of SMACNA (Sheet Metal and Air Conditioning Contractors' National Association).
  - .2 CRCA (Canadian Roofing Contractors' Association) Roofing Specifications Manual.
- .2 Appearance: neatly and evenly lay out and install components. Exposed fastening devices not permitted.
- .3 Effects of wind: resist positive and negative wind pressures without causing detrimental effects.
- .4 Water control: prevent passage of water.
- .5 Thermal movement: accommodate expansion and contraction of component parts without causing buckling, failure of joints, undue stress on fasteners and other detrimental effects.
- .6 Compatibility: components shall be compatible with dissimilar metals and materials with which they are in contact or fastened to so as to prevent corrosion, staining and other detrimental effects. If required, treat or separate contact surfaces with inert and non-staining insulation material to achieve compatibility.

**1.4 SAMPLES**

- .1 Submit minimum 300 mm long samples of typical flashings showing profile, method of locking and anchoring and corner condition, fabricated from materials specified.

**1.5 JOB CONDITIONS**

- .1 Schedule and co-ordinate installation of metal flashing components with work of other Sections where it is integral or contiguous therewith.
- .2 Install metal counter and cap flashings immediately after installation and inspection of roofing membrane base flashings.

**1.6 WARRANTY**

- .1 Contractor's Warranty: Provide CRCA/OIRCA standard two (2) year warranty on roof flashings covering the replacement of defective work and dated from time of Substantial Performance.
  - .1 Defective work shall include leaks, failure to stay in place, undue expansion, deformation, uplift or displacement from wind or ice; open joints.
- .2 Manufacturer's Warranty: Provide a ten (10) year manufacturer's warranty to include repair of finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

2 Products

## 2.1 MATERIALS

- .1 Sheet Aluminum: ASTM B209/B209M. AA 5005-H14, anodizing quality.
- .2 Pre-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by coil-coating process to comply with ASTM A755/A755M; minimum 0.7 mm base metal thickness.
  - .1 Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A792/A792M, Class AZM150 coating designation, Grade 275; structural quality.
- .3 Galvanized sheet steel: ASTM A446 Grade A, zinc coating designation Z275 (ASTM A653).
- .4 Mechanical fastening devices: non-corrosive metal compatible with sheet metal.
- .5 Sealant: one part low modulus silicone to CAN/CGSB-19.18-M87. Consultant will select colour of sealant exposed in finished work.
- .6 Isolation coating: alkali resistant asphalt based enamel.
- .7 Flashing Underlayment: Ultra High Temperature membrane (exceeding ASTM D-1970 HT Grade), self-sealing, Butyl rubberized asphalt min. 36 mils (0.8mm) bonded to sheet polyethylene, nominal total thickness of 1.0 mm. Provide primer when recommended by underlayment manufacturer.
  - .1 Products: Subject to the requirements provide one of the following;
    - .1 Carlisle Coatings & Waterproofing Inc., Div. of Carlisle Companies Inc.; CCW WIP 300HT.
    - .2 GCP Applied Technologies Inc.; Grace Ultra.
    - .3 Henry Company; Blueskin PE200 HT.

## 2.2 FABRICATION - GENERAL

- .1 Shop fabricate metal flashing components, of prefinished sheet steel to profiles indicated. Where flashings are required but not detailed follow applicable requirements of SMACNA Architectural Manual. Provide the following minimum core thickness material unless otherwise indicated:
  - .1 Sheet Steel Flashings: Minimum 0.5 mm (24 ga)
  - .2 Sheet Steel Lockstrips and cap flashings: Minimum 0.9 mm (20 ga)
  - .3 Aluminum window sill flashing: Minimum 1.3 mm Thick.
- .2 Provide components free from distortion, waves, twists, buckles and other defects detrimental to performance and appearance. Form sections square, true and accurate to size.
- .3 Double back exposed edges at least 12 mm.
- .4 Seams: space seams uniformly at maximum 2.5 m o.c. Unless otherwise indicated, use flat locked seams, lapped 25 mm. Make horizontal seams in directions of water flow. Mitre and seal corners.
- .5 Cleats and edge strips: non-corrosive metal compatible with sheet metal, thickness as required to provide rigid support and positive securement for metal flashings.
- .6 Unless otherwise indicated, counter flashings shall completely cover base flashings.
- .7 Furnish everything necessary for complete metal flashing installation, including clips and fastening devices.
- .8 Back paint metal flashings with asphaltic paint.
- .9 Fabricate scupper drains and downpipes to details and for locations indicated.

## 2.3 SLEEVE FLASHING SYSTEMS

- .1 Aluminum 1.5 mm thick flashing system: by Thaler Roofing Specialties Products.



- .2 Fabricate sleeve flashings square or circular and of size to suit component being flashed. Unless otherwise indicated fabricate sleeves 450 mm high.
- .3 System shall consist of sleeve with flange and rain collar, and where applicable, bitumen protection cup.
- .4 Inside of jacket base flange and all sides of protection cup shall be coated with bituminous paint.
- .5 Size sleeves to allow minimum 25 mm thick insulation between component and sleeve.

## 2.4 VENT STACKS

- .1 Aluminum 1.5 mm thick flashing system insulated with premoulded urethane insulation: SJ-4 by Thaler Roofing Specialties Products
- .2 Fabricate vent stack in size to suit stack.
- .3 Provide flashing jacket with base flange and protection cup. Paint inside of jacket, base flange and protection cup with bituminous paint.
- .4 Fabricate stacks 450 mm high unless otherwise indicated.

## 2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- .1 Downspouts: Fabricate round downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors sheet. Shop fabricate elbows.
  - .1 Fabricate from sheet metal minimum thickness as indicated and in accordance with SMACNA requirements.
- .2 Splash Pads: Precast concrete Splash Pads, purpose made, 300 mm x 900 mm, with recessed channel to divert water.
  - .1 Products: Splash Pads by ARCO Concrete, Inc. or equivalent.
- .3 Parapet Scuppers: Fabricate scuppers to dimensions required, with closure flange trim to exterior, unless otherwise noted, 100-mm-wide wall flanges to interior, and base extending 100 mm beyond cant or tapered strip into field of roof. Fasten gravel guard angles to base of scupper.

## 2.6 GAS LINE PIPE PROTECTION

- .1 Provide minimum 3 mm thick bent aluminum plate pipe protection. C shape, 200 mm x 200 mm x 200 mm with 50 mm flanges with 1800mm height. Flanges to receive fasteners, with 9 mm diameter anchor slots at 300 mm on center, and 50 mm from each end.
  - .1 Finish: Clear anodized aluminum.

## 2.7 FINISH REQUIREMENTS

- .1 Prepare, pre-treat, and apply coating to exposed metal surfaces to conform to coating and resin manufacturers' written instructions.
- .2 Protect painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- .3 Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- .4 Sheet Steel: Coil Coatings, AAMA 621: Minimum 70 percent PVDF resin, by weight, in colour coat and clear topcoat.
- .5 Aluminum: Sheet Coil Coatings, AAMA 2605: 70 percent PVDF resin, by weight, in colour coat and clear topcoat.

- .6 Colour: To match adjacent work, and matching reviewed samples.

3 Execution

**3.1 INSTALLATION**

- .1 Provide sheet metal flashing at roof curbs, copings, penetrations, at junction of roof to wall, and where shown. Provide all wall cap flashings, except those specifically covered by other Sections.
- .2 Protect all membrane flashings with metal counter flashings.
- .3 Clean surfaces to be covered with metal flashings of dirt and other foreign matter. Drive projecting nails flush with substrate. Do not apply metal flashings over substrates likely to cause rupture.
- .4 Provide underlay of resin sized paper under metal flashings installed over masonry, concrete or wood. Lay underlay dry as sheet metal work is installed. Secure in place and lap joints 100 mm.
- .5 Secure flashings to supporting building elements with concealed continuous cleats and locking strips; avoid exposed surface fasteners.
- .6 Provide standing seam corners at cap flashings.
- .7 Where flashing is punctured by bolts, provide sheet lead or neoprene washers, 6 mm larger than bolt hole.
- .8 At reglets in masonry walls, secure metal flashings to reglet with mechanical fasteners at maximum 610 mm o.c.
- .9 Where vertical portion of metal flashing exceeds 300 mm provide vertical standing seams at 600 mm o.c.
- .10 Wherever possible, install sleeve flashing systems at penetrations through roof membrane. Install systems in accord with manufacturer's directions and as follows:
  - .1 Prior to installation of roofing membrane place bead of sealant around pipes, vent stacks and other components penetrating roof. Place bitumen protection cups over pipes into sealant.
  - .2 Insulate between penetrating elements and sleeve with 25 mm thick fibrous insulation.
  - .3 Prime contact surfaces with mastic cement; place flashing jackets onto roof membrane so that base flange is in contact with mastic cement placed on membrane.
  - .4 Sweat solder or weld on rain collar.
- .11 Install vent stacks in accord with manufacturer's directions.
- .12 Imperfections in metal flashing work such as holes, dents, creases, or oil-canning will not be accepted.

**3.2 ROOF-DRAINAGE SYSTEM INSTALLATION**

- .1 General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard, and reviewed shop drawings. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- .2 Downspouts: steel pipe refer to 05 50 00 Metal Fabrication.
  - .1 Parapet Scuppers: Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
  - .2 Provide one (1) Splash Pads at each downspout location.

**3.3 SITE QUALITY CONTROL**

- .1 Provide inspection services in accordance with CRCA guarantee requirements, and as part of and as specified for inspections in Division 07 Section roofing, Field Quality Control article.

### 3.4 CLEANING AND PROTECTION

- .1 Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- .2 Clean off excess sealants.
- .3 Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.
- .4 On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- .5 Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.

**END OF SECTION**

1 General

**1.1 SUMMARY**

- .1 Systems comprising fireproof firestopping and smoke seal materials and accessories, at joints and penetrations in fire resistance rated wall, floor and roof assemblies, materials and components.
- .2 Rated foam seal joint system.
- .3 Manufacturer's site services and site quality control.

**1.2 RELATED REQUIREMENTS**

- .1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

**1.3 REFERENCE STANDARDS**

- .1 Underwriters Laboratories of Canada (ULC):
  - .1 CAN/ULC S115, Standard Method of Fire Tests and Firestop Systems

**1.4 PERFORMANCE REQUIREMENTS**

- .1 Materials, accessories and application procedures listed by ULC, cUL, WHI (Intertek/Warnock Hershey) or OPL (Omega Point Laboratories), or tested in accordance with CAN/ULC-S115 to comply with building code requirements.
- .2 Fire-Resistive Joint Systems:
  - .1 Generally, use listed assemblies types F, FT, FH or FTH, as applicable.
- .3 Firestopping Materials: CAN/ULC-S115 and ASTM E2307, and to achieve fire ratings indicated.
- .4 Surface Burning of Exposed Materials: CAN/ULC-S102 with a minimum flame spread/smoke developed rating of 25/50.
- .5 Engineering Judgment: Where there is no specific third party tested and classified firestop system available for a particular firestop configuration, provide an Engineering Judgment acceptable to the authority having jurisdiction.

**1.5 SUBMITTALS FOR REVIEW**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data: Provide data on product characteristics, performance and limitation criteria, and indicating construction details accurately illustrating Project conditions. Include descriptions sufficient for identification at Project site.
- .3 System Design Listings: Submit system design listings including design designations, locations and illustrations, from a qualified testing and inspection agency applicable, to each firestop configuration.
  - .1 Where Project conditions require modification to a qualified testing agency's illustration for a particular firestopping system condition, submit illustration, with modifications marked, approved by firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire resistance rated assembly.
- .4 Firestop System Engineering Judgments: When required for acceptance by the authority having jurisdiction, Firestop System Engineering Judgment submissions shall:
  - .1 Clearly indicate that the recommended firestop system is an engineering judgment;
  - .2 Identify the job name, project location and firm which the engineering judgment is issued to.

- .3 Be prepared, stamped and signed by a professional engineer, specializing in fire protection and licensed to practice in the place of the work.
- .4 Be presented in appropriately descriptive written form with or without detail drawings where appropriate;
- .5 Reference tested system(s) which the engineering judgment is based on;
- .6 Include clear directions for the installation of the recommended firestop system;
- .7 Include dates of issue and authorization signature as well as the issuer's name, address and telephone number;
- .5 Samples:
  - .1 Submit samples of each type of firestop and smoke seal material and accessory.

#### **1.6 SUBMITTALS FOR INFORMATION**

- .1 Qualifications Data: For manufacturer and installer.
- .2 Installation Data: Manufacturer's special preparation and installation requirements.
- .3 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- .4 Delegated Design Submittals: Design firestopping assemblies required by the Contract Documents to withstand fire ratings indicated and in accordance with the Ontario Building Code.
  - .1 Provide manufacturer's standard listings where site conditions match standard assembly listing.
  - .2 Provide manufacturers engineered judgement with acceptance by authorities having jurisdiction, signed and sealed by the manufacturer's fire protection engineer where assembly does not match standard assembly listing.
- .5 Manufacturer's Field Reports: Indicate environmental conditions under which fireproofing materials were installed. Compatibility and Adhesion Test Reports: From manufacturer indicating the following:
  - .1 Materials have been tested for bond with substrates.
  - .2 Materials have been verified by manufacturer to be compatible with substrate.
  - .3 Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

#### **1.7 QUALITY ASSURANCE**

- .1 Applicator shall be licensed by the manufacturer of fireproofing materials.
- .2 Submit manufacturer's certification that materials meet or exceed specified requirements.
- .3 Maintain flame and temperature ratings equal to surrounding materials.
- .4 Single Responsibility: Perform work using single applicator having undivided responsibility for entire Project, including coordination with plumbing, mechanical and electrical installations.
- .5 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer.

#### **1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION**

- .1 Deliver materials in original, unopened packages bearing name of manufacturer and product identification.
- .2 Store materials off ground, under cover, and away from damp surfaces.

#### **1.9 SITE CONDITIONS**

- .1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Provide ventilation to manufacturer's instructions in areas to receive solvent cured materials.

## 2 Products

### 2.1 MATERIALS

- .1 Select exposed firestopping products in walls and ceilings, capable of receiving specified paints.
- .2 Do not use cementitious or rigid seals for:
  - .1 Re-entry penetrations.
  - .2 Penetrations in sound and vibration control assemblies.
- .3 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- .4 Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .5 Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post installed." Coordinate cast-in-place with Division 03 Concrete.
- .6 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane. The length of the sleeve shall be 12.4 inches. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.
- .7 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11
  - .1 F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- .8 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.
  - .1 F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
  - .2 T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
  - .3 W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.
- .9 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
  - .1 L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- .10 Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.

- .11 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than 1 hour tack free time as tested in accordance with ASTM C 679.

## 2.2 MANUFACTURERS

- .1 Subject to compliance with requirements provide products of one of the following manufacturers:
  - .1 3M Fire Protection Products.
  - .2 Hilti Canada Ltd.
  - .3 Specified Technologies Inc.
  - .4 Tremco Inc.
- .2 Rated foam seal joint system:
  - .1 Emseal Joint Systems Ltd.

## 2.3 MATERIALS

- .1 Exposed firestopping:
  - .1 Pourable (self-levelling) grade for openings in floors and other horizontal surfaces.
  - .2 Nonsag grade for openings in vertical and sloped surfaces unless indicated firestopping limits use of nonsag grade for both opening conditions.
- .2 Formulated Compound of Incombustible Fibres: Formulated compound mixed with incombustible non-asbestos fibres.
- .3 Fibre Stuffing: Minimum 64 kg/ cu.m. mineral or ceramic fibre stuffing insulation.
- .4 Mechanical Device with Fillers: Mechanical device with incombustible fillers or silicone elastomer covered with sheet stainless steel jacket, joined with collars, penetration sealed with flanged stops.
- .5 Intumescent Putty: Intumescent putty compound which expands on exposure to surface heat gain, nonhardening dielectric, water-resistant, containing no solvents, inorganic fibres, or silicone compounds.
- .6 Firestop Pillows: Formed mineral fibre pillows, reusable heat-expanding cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows from being easily removed.
- .7 Composite Sheet: Intumescent rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

## 2.4 RATED FOAM SEAL JOINT SYSTEM

- .1 Rated foam seal joint system for exterior expansion joints for vertical or horizontal applications, exposed "visual" and hidden location inboard "cavity" seals and below expansion joint covers.
- .2 Where rated foam seals are indicated, System shall perform waterproofing, fire-rating, movement-accommodation functions as well as contribute to thermal insulation and sound attenuation as the result of a single installation.
- .3 Sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, 2 hour-rated, sealant system. Sealant system shall be comprised of the following components:
  - .1 Fire-retardant-impregnated foam pre-coated at the outer layers with waterproof silicone,
  - .2 Field-applied epoxy adhesive primer,
  - .3 Field-injected silicone sealant bands.
  - .4 Preformed and pre-compressed silicone "face" seals. Size as indicated on drawings.
  - .5 Movement: +50%, -50%.

- .6 Joint system to maintain continuous air/vapour and moisture barrier in conjunction with adjacent air/vapour barrier systems specified in Section 07 27 13.
- .7 Acceptable Product:
  - .1 Emseal; "EMSHIELD WFR2, and SJS-FR1" to match expansion joint size indicated.
- .8 Colour:
  - .1 Non visible joints in Cavity and below expansion joint cover plate: standard Grey.
  - .2 Exposed to View: Custom colour to match adjacent finishes.

## 2.5 ACCESSORIES

- .1 Provide components for each firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components recommended by firestopping manufacturer in accordance with tested assembly being installed, and acceptable to authorities having jurisdiction.
- .2 Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- .3 Dam Material: Permanent:
  - .1 Mineral fibreboard.
  - .2 Mineral fibre matting.
  - .3 Alumina silicate fire board.
  - .4 Sealants used in combination with other forming, damming and backing materials to prevent leakage of fill materials in liquid state.
  - .5 Fillers for sealants.
- .4 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- .5 Water: Potable, clean and free from injurious amounts of deleterious substances.

## 2.6 FINISHES

- .1 Colour: Red unless otherwise noted.

## 3 Execution

### 3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping are ready to receive the work of this Section.
- .3 Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- .1 Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- .2 Remove incompatible materials which may affect bond.
- .3 Install backing and damming materials to arrest liquid material leakage.
- .4 Mask adjacent surfaces to protect from spillage and over coating; immediately remove material from adjacent surfaces.



### 3.3 APPLICATION

- .1 Apply primer and materials to manufacturer's written instructions, approved tested assemblies and details.
  - .1 Provide materials to maintain the fire separations in the project as indicated on the drawings.
- .2 Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- .3 Apply firestopping material in sufficient thickness to achieve rating and to uniform density and texture.
- .4 Tool or trowel exposed surfaces to a uniform finish.
- .5 Compress fibred material to achieve a density of 25-40 percent of its uncompressed density required for listed system.
- .6 Place material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- .7 Place intumescent coating in sufficient coats to achieve rating required.
- .8 Remove dam material after firestopping material has cured. Dam material to remain.
- .9 Provide identification labels as specified.
- .10 In non-fire rated construction indicated to prevent smoke movement, tightly pack voids of service penetrations and around openings with mineral wool insulation and sealant.

### 3.4 IDENTIFICATION

- .1 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
  - .1 The words: "Warning: Through-Penetration Firestop System - Do Not Disturb"
  - .2 Contractor's name, address and telephone number.
  - .3 Designation of applicable testing and inspection agency.
  - .4 Date of installation.
  - .5 Manufacturer's name for firestop materials.

### 3.5 MANUFACTURER'S SITE SERVICES

- .1 Require site attendance of firestopping product manufacturer during installation of the Work. Schedule manufacturer's review of work procedures at stages listed:
  - .1 Pre-installation Meeting: 1 review at Site and meeting with authorized Installers.
  - .2 Installation: 3 reviews at Site: 1 at commencement of Work; 1 at 50% completion of Work; 1 upon completion of Work.
- .2 Submit manufacturer's written reports to Consultant describing:
  - .1 The scope of work requested.
  - .2 Date, time and location.
  - .3 Procedures performed.
  - .4 Observed or detected non-compliances or inconsistencies with manufacturers' recommended instructions.
  - .5 Limitations or disclaimers regarding the procedures performed.

- .6 Obtain reports within three days of review and submit immediately to Consultant.
- .3 Monitor and report installation procedures and unacceptable conditions.
  - .1 Inspect and review materials and workmanship including storage, handling and protection. Advise Consultant and Owner 48 hours in advance of inspections.
  - .2 Correct identified defects or irregularities.
- .4 Remove and replace unacceptable firestopping assemblies.

### 3.6 SITE QUALITY CONTROL

- .1 Owner will engage an independent testing agency to perform the following special inspections and tests, and prepare reports in accordance with ASTM E2174 and ASTM E2393:
  - .1 Correct size of joint.
  - .2 Placement and anchorage of mechanical supports.
  - .3 Thickness of coatings.
  - .4 Correct use and location of backings and bond breaker materials.
  - .5 Adherence testing to verify material bond with substrate.
- .2 Testing and inspecting of completed joints and seals shall take place in successive stages, and at a rate not less than one test per day for each Installer and material type. Where deficiencies are found or firestopping is damaged or removed because of testing, repair or replace firestopping to conform to requirements.
- .3 Do not proceed with installations for the next area until test results for previously completed installations show conformance to requirements.
- .4 Products and materials will be considered defective if they do not pass tests and inspections.
- .5 Proceed with enclosing firestopping with other construction only after inspection reports are issued and installations conform to requirements.
- .6 Submit testing agency's written reports to Consultant.

### 3.7 CLEANING

- .1 Clean installed work.
- .2 Clean adjacent surfaces of firestopping materials.

### 3.8 PROTECTION OF FINISHED WORK

- .1 Protect installed work.
- .2 Protect adjacent surfaces from damage by material installation.

### 3.9 SCHEDULE

- .1 Firestop the following conditions and as indicated:
  - .1 Penetrations through fire resistance-rated construction.
  - .2 Tops of fire resistance rated walls.
  - .3 Intersections of fire resistance rated walls and non-fire rated walls.
  - .4 Control joints in fire resistant rated construction.
  - .5 Joints at exterior wall/floor intersections.
  - .6 Openings and sleeves installed for future use through fire resistant rated separations.
  - .7 Non-fire rated construction to prevent smoke movement. Pack void space at all service penetrations and other openings with either tightly packed Rock Wool insulation, or sealant, or a combination of both. The sealant need not be rated.

- .2 Rated foam seal joint in rated assemblies including:
  - .1 Rated foam seal joint at fire rated expansion joint location where fire resistance rating is required.
  - .2 Expansion joints in concrete masonry units.
- .3 Service Penetrations shall include but not limited to:
  - .1 Mechanical Pipe Penetrations
  - .2 Mechanical Damper Joints: Top only in floor dampers
  - .3 Electrical Service Penetrations: Bus duct, etc.
  - .4 Electrical Outlet Boxes: Receptacles, switches etc., in fire-rated GWB only.

**END OF SECTION**

3.10

## 1.1 SUMMARY

- .1 Sealants and joint backing.
- .2 Acoustic sealants.
- .3 Compressible seals.
- .4 Site quality control and manufacturer's site services.

## 1.2 RELATED REQUIREMENTS

- .1 Coordinate with Work of other Sections having a direct bearing on Work of this Section.

## 1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
  - .1 ASTM C509, Standard Specifications for Elastomeric Cellular Performed Gasket and Sealing Material
  - .2 ASTM C510, Standard Test Method for Staining and Color Change of Single-or Multicomponent Joint Sealants.
  - .3 ASTM C920, Standard Specification for Elastomeric Joint Sealants.
  - .4 ASTM C1021, Standard Practice for Laboratories Engaged in Testing of Building Sealants.
  - .5 ASTM C1184, Standard Specification for Structural Silicone Sealants.
  - .6 ASTM C1193, Standard Guide for Use of Joint Sealants.
  - .7 ASTM C1248, Standard Test Method for Staining of Porous Substrate by Joint Sealants.
  - .8 ASTM C1330, Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.
  - .9 ASTM D5893/D5893M, Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

## 1.4 SUBMITTALS

- .1 Provide submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Manufacturer's Data: Submit manufacturer's literature describing each material to be used in the work of this Section. Literature shall contain a statement that the material complies with the specified standard.
  - .2 Samples: Submit for approval and colour selection sample of each type of compound, recommended primers and joint filler or fillers proposed to be used.
- .3 Submittals for Information:
  - .1 Qualifications Data: For Manufacturer and Installer.
  - .2 Installation Data: Manufacturer's special installation requirements.
    - .1 Indicate special procedures, surface preparation, perimeter conditions requiring special attention, and field quality control testing.

## 1.5 QUALITY ASSURANCE

- .1 Applicator qualifications:
  - .1 Execute Work by applicators trained and approved by the manufacturer and having 5 years proven experience.
- .2 Manufacturer's representative:

- .1 Review Site conditions, joint design, and installer's qualifications. Report unsatisfactory conditions to Consultant.
- .2 Check container labels, inspect preparation of substrate materials and review installation procedures 48 hours in advance of installation, and randomly test installed Work.
- .3 Mock-up:
  - .1 Construct mock-up for each type of sealant to show location, size, shape, colours, and depth of joints complete with bond breaker, joint backing, primer, and sealant. Accepted mock-up may become part of finished Work.
  - .2 Remove mock-ups that do not form part of Work from Site during final cleanup, or when directed by Consultant.
  - .3 Allow 48 hours for Consultant to review mock-up before proceeding with sealant Work.
- .4 Pre-installation meetings:
  - .1 Conduct meetings 7 Days in advance of sealant installation.
  - .2 Include Consultant, sealant manufacturer's representative, independent inspection and testing agency engaged by Contractor, and parties who are directly affected by the Work of this Section.
  - .3 Verify Contract requirements, substrate conditions, joint conditions and profile, weather conditions, and the manufacturer's installation instructions.
  - .4 Within 72 hours following the pre-installation meeting, prepare a pre-installation meeting report and issue to all parties in attendance.
    - .1 Clearly indicate the recommendations made during the pre-installation meeting, the required actions, and by whom.

## 1.6 SITE CONDITIONS

- .1 Apply sealants only to completely dry surfaces, and at air, substrate and material temperatures above minimum established by manufacturer's written specifications.

## 1.7 DELIVERY, STORAGE HANDLING AND PROTECTION

- .1 Deliver all materials to the jobsite in their original, unopened containers, with all labels intact.
- .2 Receive and store materials as recommended by materials manufacturer.
- .3 Maintain containers and labels in undamaged condition.

## 1.8 WARRANTY

- .1 Provide a five (5) year warranty to include coverage for failure to meet specified requirements.
  - .1 Include coverage for installed sealants and accessories which fail to achieve air tight seal, water tight seal, and exhibit loss of adhesion or cohesion, or do not cure.
- .2 Provide manufacturer's twenty-year material warranty for installed silicone sealant.

## 2 Products

### 2.1 MATERIALS – SEALANTS

- .1 Type A:
  - .1 Single component, non-sag, non-paintable, silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 25, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
  - .2 Colour:
    - .1 To match adjacent substrate.

- .3 Manufacturer's Products:
  - .1 Dow Corning Contractors Weatherproofing Sealant (CWS) by Dow Corning Corp.
  - .2 Tremsil 400 by Tremco Sealants (Canada) Ltd., division of RPM Company.
  - .3 Sikasil-N plus by Sika Canada Inc.
  - .4 GE Silocone SWS by Momentive Performance Materials.
  - .5 Pecora PCS by Pecora Corporation.
- .2 Type B:
  - .1 Silicone joint sealant, in accordance with ASTM D5893/D5893M and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
  - .2 Colour:
    - .1 To match adjacent substrate.
  - .3 Manufacturer's Products:
    - .1 Dow Corning Contractors Concrete Sealant (CCS) by Dow Corning Corp.
    - .2 Spectrum 900 SL by Tremco (Canada) Ltd., division of RPM Company.
    - .3 SikaSil 728 SL by Sika Canada Inc.
    - .4 Tosseal 817 by Momentive Performance Materials.
    - .5 300SL by Pecora Corporation.
- .3 Type C:
  - .1 Anti-microbial (mildew-resistant), non-paintable, silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 25, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
  - .2 Colour:
    - .1 Clear/translucent.
  - .3 Manufacturer's Products:
    - .1 Dow Corning 786 Silicone Sealant by Dow Corning Corp.
    - .2 Tremsil 200 Silicone Sealant (with Fungicide) by Tremco (Canada) Ltd., division of RPM Company.
    - .3 Sikasil-GP by Sika Canada Inc.
    - .4 GE SCS1700 Sanitary by Momentive Performance Materials.
    - .5 898NST by Pecora Corporation.
- .4 Type D:
  - .1 Silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 50, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
  - .2 Colour:
    - .1 To match adjacent substrate.
  - .3 Manufacturer's Products:
    - .1 Dow Corning 795 Silicone Building Sealant by Dow Corning Corp.
    - .2 Spectrem 2 by Tremco (Canada) Ltd., division of RPM Company.
    - .3 Sikasil WS-295 by Sika Canada Inc.

- .4 GE SCS2000 SilPruf Sealant by Momentive Performance Materials.
- .5 Pecora 895NST by Pecora Corporation.
- .5 Type F:
  - .1 Low dirt pick-up, silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 50, and non-staining when tested in accordance with ASTM C510 or ASTM C1248.
  - .2 Colour:
    - .1 To match adjacent substrate.
  - .3 Manufacturer's Products:
    - .1 Dow Corning 756 SMS Building Sealant by Dow Corning Corp.
    - .2 Spectrem 3 by Tremco (Canada) Ltd., division of RPM Company.
    - .3 SikaSil WS-295 by Sika Canada Inc.
    - .4 GE SCS9000 Silpruf NB by Momentive Performance Materials.
    - .5 Pecora 864NST by Pecora Corporation.
- .6 Type G:
  - .1 Silicone joint sealant, in accordance with ASTM C920, Type S, Grade NS, minimum Class 50, and non-staining in accordance with ASTM C510 or ASTM C1248. General purpose type.
  - .2 Colour:
  - .3 To match adjacent substrate. Manufacturer's Products:
    - .1 Dow Corning Contractors Weatherproofing Sealant (CWS) by Dow Corning Corp.
    - .2 Tremsil 200 Silicone Sealant (without Fungicide) by Tremco (Canada) Ltd., division of RPM Company.
    - .3 SikaSil WS-295 by Sika Canada Inc.
    - .4 GE SCS 1000 Contractors by Momentive Performance Materials.
    - .5 Pecora PCS by Pecora Corporation.
- .7 Firestopping and Smoke Seals:
  - .1 Refer to Section 07 84 00.

## 2.2 COMPRESSIBLE SEAL

- .1 Exterior Compressible seal:
- .2 Silicone pre-coated, preformed, pre-compressed, self-expanding, binary sealant system of expanding polyurethane foam impregnated with water based, stabilized, polymer modified acrylic with factory applied silicone coated bellows, complete with field applied liquid silicone corner bead in matching colour, depth of seal as recommended by manufacturer.
  - .1 Colorseal by Emseal Corporation, standard colour.
- .3 Acoustic compressible seals:
  - .1 Preformed Foam Joint Sealant: Manufacturer's standard. Preformed, pre-compressed, open-cell foam sealant manufactured from urethane foam. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated.
  - .2 Acoustic compressible seals: coated on 2 sides for joints between opaque surfaces, coated on 3 sides for compression against clear surfaces.

- .3 Product:
  - .1 At opaque materials: 'Quietjoint SHH' by Emseal Joint Systems, or approved equivalent.
  - .2 At clear materials: 'Quietjoint SHG' by Emseal Joint Systems, or approved equivalent.

## 2.3 ACOUSTIC SEALANT

- .1 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- .2 Product: Subject to compliance with requirements of this Section provide one of the following products:
  - .1 'CP-506 by Hilti.
  - .2 'Sheetrock Acoustical Sealant' by USG.
  - .3 'AC-20 FTR' or 'AIS-919' by Pecora; product as recommended by manufacturer for application indicated.
- .3 Accessories: As recommended by manufacture to achieve minimum STC rating listed.

## 2.4 ACCESSORIES

- .1 Primers:
  - .1 Type recommended by sealant manufacturer for substrate, to promote adhesion and to prevent staining of adjacent surfaces for conditions encountered.
- .2 Joint backing:
  - .1 Extruded, round, solid section, skinned surface, closed cell, soft polyethylene foam gasket stock, compatible with primer and sealant materials.
  - .2 30% to 50% oversized.
  - .3 Shore A hardness of 20, tensile strength 140 kPa to 200 kPa, in accordance with ASTM C1330.
  - .4 Bond breaker type surface.
- .3 Bond breaker tape:
  - .1 Polyethylene tape or other plastic tape recommended by sealant manufacturer to prevent sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint.
  - .2 Provide self-adhesive, pressure sensitive tape where applicable.
  - .3 Do not use material impregnated with oil, bitumen, non-curing polymer or similar deleterious material.
- .4 Cleaning agents:
  - .1 Recommended by sealant manufacturer.
  - .2 Free of oily residues or other substances capable of staining or harming joint substrates and adjacent surfaces.
- .5 Masking tape:
  - .1 Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

## 3 Execution



### 3.1 INSPECTION

- .1 Verify at site that joints and surfaces conditions provided will not adversely affect execution, performance or quality of completed work.
- .2 Ensure masonry and concrete have cured 28 days minimum.
- .3 Ascertain that sealers and coatings applied to substrates are compatible with sealant used and that full bond of the sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and adhesion, if necessary.
- .4 Verify that specified recommended environmental conditions are present before commencing work.
- .5 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.
- .6 Do not start work of this Section until conditions are satisfactory.

### 3.2 PREPARATION

- .1 Clean joint surfaces using joint cleaner as necessary, to remove dust, paint, loose mortar, and other foreign matter and dry joint surfaces.
- .2 Remove dust, silt, scale and coatings from ferrous metals by wire brush, grinding or sandblasting.
- .3 Remove oil, grease and other coatings from non-ferrous metals with approved cleaning solvent.
- .4 Ensure surfaces are free of frost, rust, lacquers, laitance, release agents, moisture or other matter which might adversely affect adhesion of sealant.
- .5 Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's written recommendations for specified sealant.
- .6 Support joint filler on horizontal traffic surfaces against vertical movement which might result from traffic loads or foot traffic.
- .7 Prepare surfaces as recommended by sealant manufacturer.
- .8 Fully remove existing sealant scheduled to be removed and replaced with new sealant, in areas indicated on the Drawings.
  - .1 Follow manufacturers procedures for removal of existing sealant and test areas for adhesion of new sealant. Provide the Consultant with field report identifying results of adhesion testing.
- .9 Install joint backing material or apply bond breaker tape to achieve correct joint depth and prevent three-sided adhesion.
- .10 To protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or sealing.
- .11 Prime sides of joints using two cloth method in accordance with manufacturer's directions immediately prior to sealing.
- .12 Before any sealing is commenced, a test of the material shall be made for indications of staining, poor adhesion or other undesirable effects.
- .13 Seal joints in surfaces to be painted before painting. Where surfaces to be sealed are prime painted in shop before sealing, check to make sure prime paint is compatible with primer and sealant. If incompatible inform Consultant, consult the manufacturer, and change primer and sealant to approved compatible types.
- .14 Check form release agent used on concrete for compatibility with primer and sealant. If incompatible inform Consultant and change primer and sealant to approved compatible types or clean concrete to Consultant's approval.

### 3.3 INSTALLATION

- .1 Perform Work in accordance with manufacturer's recommendations for Products and applications indicated, unless more stringent requirements apply.
- .2 Use Products without additives or adulteration. Use one manufacturer's Product for each location in accordance with Sealant Location Schedule at end of this section.
- .3 Perform Work in accordance with ASTM C1193, and ASTM C919 for Acoustic Sealant.
- .4 Joint backing:
  - .1 Install joint backing to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    - .1 Depth of recess: Maintain 2:1 joint width to depth ratio.
    - .2 Where recess is less than specified depth, cut back surface of recess to specified depth.
  - .2 Do not leave gaps between ends of joint backings.
  - .3 Do not stretch, twist, puncture, or tear joint backings.
  - .4 Remove absorbent joint backings that have become wet before sealant application and replace with dry materials.
  - .5 Support joint backing on horizontal surfaces against vertical movement which might result from pedestrian or vehicular traffic loads.
- .5 Install bond breaker tape between sealant and back of joints where joint backing is not used.
- .6 Apply sealant immediately after adjoining Work is in condition to receive sealant Work and as follows:
  - .1 Apply sealant in a continuous bead using gun with correctly sized nozzle. Use sufficient pressure to completely fill joint recess.
  - .2 Ensure sealant has full, direct uniform contact with, and adhesion to, side surfaces of recess. Superficial pointing with skin bead is not acceptable.
- .7 Tooling:
  - .1 Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified to form smooth, uniform sealant bead, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains, or other defects.
  - .2 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.
  - .3 At recesses in flush surfaces, finish sealant with concave face and flush with face of material at each side.
- .8 Immediately remove excess sealant and droppings.
- .9 Ensure sealant bead is uniform in colour.
- .10 Cure in accordance with the sealant manufacturer's recommendations. Do not cover up sealants until proper curing has taken place.
- .11 Remove defective sealant and reapply.

### **3.4 MANUFACTURER'S SITE SERVICES**

- .1 Require site attendance of each sealant manufacturers, during installation of the Work. Start sealant application in presence of manufacturer's technical representative.
- .2 Monitor and report installation procedures and unacceptable conditions.

### **3.5 CLEANING**

- .1 Clean surfaces adjacent to joints. Immediately remove sealant smears or other soiling resulting from application of sealants.
- .2 Remove masking tape and other residue.
- .3 Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

### 3.6 PROTECTION

- .1 Protect joint sealants:
  - .1 During and after curing period from contact with contaminating substrates.
  - .2 From damages by construction operations or other causes.
- .2 If damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated sealants immediately.

### 3.7 SEALANT LOCATIONS SCHEDULE

Sealant Type	Application Locations
Type A	Above grade level, vertical applications: <ul style="list-style-type: none"> <li>- General perimeter caulking (window, doors and frames, louver frames, shelf angles, thresholds, bedding of mullions, precast and tilt-up panels).</li> <li>- Vertical expansion, control, lap joints application.</li> <li>- Painted metals</li> <li>- Mullion joints</li> <li>- Interior partition head to structure above</li> <li>- Interior metal frames joints</li> <li>- Exterior metal flashing</li> <li>- Locations not indicated on drawings and required sealant for Work.</li> </ul>
Type B	Above grade level, horizontal applications: <ul style="list-style-type: none"> <li>- Horizontal expansion joints</li> <li>- Saw cut horizontal joints</li> <li>- Precast slab horizontal joints</li> <li>- Horizontal expansion and control joints in parking garages, plazas, terraces, decks, floors, and sidewalks.</li> </ul>
Type C	Above grade level, horizontal and vertical applications: <ul style="list-style-type: none"> <li>- Around sinks, urinals, and bathroom fixtures</li> <li>- Tiled areas' horizontal and vertical control and expansion joints</li> <li>- Between vanity and mechanical fixtures/ fittings</li> <li>- Between access panels and tiles</li> <li>- At corners of tiled walls</li> </ul>
Type D	Above grade level, horizontal and vertical applications: <ul style="list-style-type: none"> <li>- Panel stiffener applications</li> <li>- Suitable for wood, vinyl and aluminium surfaces</li> </ul>
Type F	Above grade level, horizontal and vertical applications: <ul style="list-style-type: none"> <li>- Required non-staining to building materials</li> <li>- Expansion and control joints in concrete panels, non-staining to building materials is required</li> <li>- Metal curtain wall</li> <li>- Porous surface including marble, granite, stone and concrete, where non-staining to building materials is required</li> <li>- EIFS</li> <li>- Exterior and interior metal panels</li> <li>- Masonry, where non-staining to building materials is required</li> </ul>

Sealant Type	Application Locations
Type G	Above grade level, both vertical and horizontal: <ul style="list-style-type: none"><li>- Glazing.</li><li>- Conventional glazing and replacement glazing of glass and plastic</li><li>- Aluminium sheet cover for insulation on metal pipes in exterior locations</li></ul>

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this section.

**1.2 SUMMARY**

- .1 This Section includes requirements for supply and installation of the following:
- .1 Exterior and Interior Steel Doors
  - .2 Exterior and Interior Steel Door Frames
  - .3 Sidelight Frames
  - .4 Fire rated door and frame assemblies
  - .5 Fire rated window frames

**1.3 RELATED REQUIREMENTS**

- .1 Section 07 92 00: Joint Sealants
- .2 Section 08 71 00: Door Hardware
- .3 Section 08 81 00: Glass and Glazing
- .4 Section 09 91 00: Painting

**1.4 DEFINITIONS**

- .1 Base Metal Thickness: Thickness dimensions are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic coated steel sheets.
- .2 Opening Sizes: Standard metric door sizes indicated on Drawings are considered nominal dimensions, measured from frame rabbet width and height, with allowances for nominal clearances between head, jamb and door bottom in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

**1.5 REFERENCES**

- .1 American National Standards Institute (ANSI):
  - .1 ANSI/SDI A250.8-2014, Specifications for Standard Steel Doors and Frames (SDI-100)
  - .2 ANSI/SDI A250.11-2012, Recommended Erection Instructions for Steel Frames.
- .2 American Society for Testing and Materials (ASTM):
  - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .2 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
  - .3 ASTM A924/A924M-14a, Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process.
- .3 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB 1.132-M90, Primer, Zinc Chromate, Low Moisture Sensitivity
  - .2 CAN/CGSB 41-GP-19Ma-78(1984), Rigid Vinyl Extrusions for Windows and Doors
  - .3 CAN/CGSB 82.5-M88, Insulated Steel Doors
- .4 Canadian Standards Association (CSA):

- .1 CSA W59-13, Welded Steel Construction (Metal Arc Welding)
- .5 Canadian Steel Door Manufacturers Association (CSDMA):
  - .1 Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2007
  - .2 Fire Labelling Guide, 2009
- .6 National Fire Protection Association (NFPA):
  - .1 NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives
  - .2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies
- .7 Underwriters Laboratories Canada (ULC):
  - .1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies
  - .2 CAN/ULC S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC S104
  - .3 CAN4 S106-1980 (R1985), Standard Method for Fire Tests of Window and Glass Block Assemblies

## 1.6 SUBMITTALS

- .1 Provide requested information in accordance with Section 01 33 00 - Submittals.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Product Data:
    - .1 Submit product data for each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, fire resistance ratings, and finishes.
  - .2 Shop Drawings:
    - .1 Show each type of frame, door, hardware blanking, reinforcing, tapping and drilling arrangements, metal gauges, thicknesses and finishes.
    - .2 Show details of doors including vertical and horizontal edge details.
    - .3 Submit door and frame schedule identifying each unit. Each unit shall bear a legible identifying mark corresponding to that listed in the door and frame schedule.
  - .3 Samples:
    - .1 Supply for Consultant's review, if requested, sample of frame corner showing construction, workmanship and finish.
  - .4 Informational Submittals: Provide the following submittals when requested by the Consultant:
    - .1 Source Quality Control Submittals: Submit information on zinc coating treatment and primer spot treatment, including instructions for surface treatment before site painting and any restrictions or special coating requirements.
  - .5 Certificates: Submit the following certificates or letters of compliance:
    - .1 Oversize Compliance: Submit oversize construction evidence indicating compliance with fire labelling for door and frame assemblies required to be fire protection rated and exceeding size limitations of labelled assemblies.

## 1.7 QUALITY ASSURANCE

- .1 Manufacturer: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer, and as follows:

- .1 Fabricate work of this Section to meet the requirements of the Canadian Steel Door and Frame Manufacturer's Association, Manufacturing Specification for Doors and Frames as a minimum, and as further modified in this section.
- .2 Fabricator shall be a member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.
- .2 Supplier: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer.
- .3 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.
- .4 Testing Agencies: Provide doors produced under label service program of a testing agency acceptable to Authorities Having Jurisdiction, and as follows:
  - .1 Steel Fire Rated Doors and Frames: Labelled and listed by an organization accredited by Standards Council of Canada for ratings specified or indicated.
  - .2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:
    - .1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
    - .2 Fabricate all rated doors, frames and screens to labelling authority standard.

## 1.8 DELIVERY, STORAGE AND HANDLING

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Adequately protect units against rust and damage during manufacture, delivery and storage.
- .3 Store materials on planks in a dry area and cover to protect from damage. Make good immediately any damage done. Clean scratches and touch-up with rust-inhibitive primer.

## 1.9 SITE CONDITIONS

- .1 Site Measurements: Verify actual dimensions of openings by site measurements before fabrication and indicate measurements on shop drawings; coordinate fabrication schedule with construction progress to avoid delaying the Work.
- .2 Established Measurements: Establish dimensions and proceed with fabricating doors and frames without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions.

## 2 Products

### 2.1 MATERIALS

- .1 Sheet Steel:
  - .1 Exterior Doors and Frames: Galvanized, A5120, steel sheets in accordance with ASTM A924/M924-14; coated to meet requirements of ASTM A653/A653M, Commercial Steel (CS), Type B; stretcher levelled standard of flatness where used for face sheets.
  - .2 Interior Doors and Frames (Normal Humidity): Electrolytic zinc coated steel sheets in accordance with ASTM A879/A879M-12, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher levelled standard of flatness.
- .2 Gauges:
  - .1 Door and Screen Frames:
    - .1 Gauge: 16 msg

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- .2 Doors (Honeycomb or Polystyrene Core):
    - .1 Door Faces:
      - .1 Gauge: 18 msg.
  - .3 Top and Bottom End Channels:
    - .1 Gauge: 18 msg.
  - .4 Reinforcements:
    - .1 Lock and Strike Reinforcements:
      - .1 Gauge: 16 msg.
    - .2 Hinge Reinforcements:
      - .1 Gauge: 10 msg.
    - .3 Flush Bolt Reinforcements:
      - .1 Gauge: 16 msg.
    - .4 Door Closer or Holder Reinforcements:
      - .1 Gauge: 12 msg.
  - .3 Anchors:
    - .1 As required to suit condition.
  - .4 Rubber Bumpers:
    - .1 3 per door.
  - .5 Weatherstripping - Exterior Doors:
    - .1 Extruded aluminum with vinyl inserts for head and jambs and for pairs of doors without mullions, manufactured by KN Crowder Limited, or approved alternate.
  - .6 Door Cores:
    - .1 Interior doors, except fire rated doors: Structural small cell; 1" maximum, kraft paper honeycomb; minimum weight 36 kg/ream; minimum density 16.5 kg/m<sup>3</sup>; sanded to required thickness.
    - .2 Exterior doors: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701-11, Type 4, minimum thermal resistance R-Value 4.5/1" thickness.
  - .7 Adhesives:
    - .1 Core Adhesive: Heat resistant, single component adhesive recommended by manufacturer.
  - .8 Touch-Up Primer: Rust inhibitive primer meeting CAN/CGSB 1.132, touch up zinc coatings using shop applied primer; grey or red coloured primer, clear primer not acceptable; provide additional primer for site touch-up to repair damaged zinc and shop applied coatings.
  - .9 Accessories:
    - .1 Glazing Stops:
      - .1 Glass mouldings: Formed steel having 1/32" metal core thickness, screw fixed.
      - .2 Accurately fit and butt at corners glazing trim and stops; located on secure side of door, or interior of room window frame.
    - .2 Sealant: As specified in Section 07 92 00.
    - .3 Glass and Glazing: As specified in Section 08 81 00.



- .4 Door Silencers (Bumpers or Mutes): Manufacturer's standard black or grey neoprene silencers; three silencers on strike jambs of single door frames; two silencers on heads of double-door frames; stick on bumpers are not acceptable.
- .10 Materials for fire rated doors shall conform to ULC or ULI requirements.

## 2.2 FABRICATION AND MANUFACTURE

- .1 Gauges of metal shall be as specified. No deviations or substitutions will be accepted
- .2 Reinforcing specified is the minimum acceptable. Provide additional reinforcement where required to ensure a permanent, rigid, trouble free installation able to withstand the stresses of heavy commercial usage.
- .3 Cut, shear, straighten and work the steel in manner to prevent disfigurement of the finished work.
- .4 Punch frames for rubber door bumpers.
- .5 Fill seams, joints and weld depressions with epoxy metal filler, disc sand to a smooth, flat, uniform scratch-free surface, with all arrises sharp and true to line. Drilled and punches holes shall be reamed and have all burrs removed.
- .6 Finished work shall be free of warp, open seams, buckles, weld and grind marks and other surface defects detrimental to the production of a good paint finish.
- .7 Fastenings shall be concealed except those required for loose glazing stops.
- .8 Welding shall conform to CSA W59-03 (R2008).
- .9 Hardware Requirements:
  - .1 Blank, mortise, reinforce, drill and tap doors and frames to receive templated hinges and other hardware as required. Check hardware lists for requirements.
- .10 Frames:
  - .1 Fabricate frames to profiles shown. Frames shall be fabricated to suite the header conditions of masonry work. Mitre corners of frames. Cut frame mitres accurately and weld continuously on inside of frame. Fabricate header frame to suit. Where site welding or splicing is required due to size of unit, the location of field joints shall be shown on the shop drawings and strictly adhered to.
  - .2 Protect strike and hinge reinforcements and other openings with mortar guard boxes welded to frame.
  - .3 Cutouts in doors for mortise lock sets shall be fitted with leaf spring clips and back limit stop to facilitate easy positioning and setting of locksets.
  - .4 Weld floor clip angles to inside of each jamb profile, two holes in each for anchorage to floor. Where required provide adjustable type floor clip angles.
  - .5 Fit frames with channel or angle spreaders, two per frame, to ensure proper frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting and during construction.
  - .6 Where frames occur in masonry provide and adjustable T-strap type or wire type anchor for every 2'-0" of jamb length. Special anchors for frames to be set in concrete shall be as detailed.
  - .7 Construct door frames of labelled fire doors as approved by ULC or ULI. Ratings for frames shall match doors. Locate label on the frame jamb midway between the top hinge and the head of door frame so that it is concealed when the door is closed.
  - .8 Provide continuous weatherstripping at head and jambs of exterior door frames. Properly secure in place with screws and adjust as required.
  - .9 Insulate exterior frames to provide continuous thermal barrier in exterior frames.
- .11 Doors:

- .1 Fabricate doors to present one continuous face free from joints, tool markings and abrasions.
- .2 Reinforce, stiffen honeycomb doors with small cell honeycomb core laminated to the inside faces of panels. The core shall completely fill the inside hollow of the door.
- .3 Reinforce around frame openings required for glazing or louvres. Provide glazing stops with countersunk oval head screws.
- .4 Exterior doors shall be completely filled with polystyrene foam core.
- .5 Reinforce door edges with channel reinforcing. Bevel stiles 1/8". Assemble by tack welding and fill.
- .6 Provide flush top edge on exterior doors.
- .7 Fabricate fire rated door assemblies in accordance with ULC or ULI requirements. Provide labels for all fire rated doors. Locate label on the door midway between the top hinge and the head of the door so that it is concealed when the door is closed.
- .8 Provide cutouts in doors for glazed lites as indicated on drawings and schedules. Glazing stops shall be square formed steel in single piece lengths sized to suit. Accurately mitre corners and finish in proper plane. Secure stops in place with flush, countersunk screws.
- .12 Finishing
  - .1 Shop apply zinc rich primer to repair damaged zinc coatings arising from fabrication; cure primer fully before shipping to site; include compatible primer for site finishing and correction of surface abrasions to zinc coatings and factory applied primer.
  - .2 Remove weld slag and splatter from exposed surfaces.
  - .3 Fill and sand smooth tool marks, abrasions and surface blemishes to present smooth uniform surfaces.

3 Execution

3.1 EXAMINATION

- .1 Examine substrates, door swing arcs, areas of installation and conditions affecting installation for compliance with requirements for manufacturers installation tolerances and other conditions affecting performance of work of this Section.
- .2 Verify roughing-in for embedded and built-in anchor locations before installing frames.
- .3 Verify door and frame size, door swing and ratings with door opening number before installing frames.
- .4 Installation of hollow metal doors and frames will denote acceptance of site conditions.

3.2 INSTALLATION

- .1 Install steel doors, frames, and accessories in accordance with reviewed shop drawings, ANSI A250.11, CSDMA Installation Guide, manufacturer's data, and as specified in this Section.
- .2 Door Frames:
  - .1 Remove temporary spreaders before installing door frames, leaving exposed surfaces smooth and undamaged.
  - .2 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 1/16" out of plumb measured on face of frame, maximum twist corner to corner of 1/8"; align horizontal lines in final assembly.
  - .3 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to

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- support head of frames 4' and wider in accordance with ANSI A250.1; do not use temporary metal spreaders for bracing of frames.
- .4 Install glazing materials and studded door silencers.
  - .5 For frames over 1220mm (4') in width, provide vertical support at the centre of head.
  - .3 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11, and as follows:
    - .1 Squareness: Maximum 0.8mm (1/32") measured across opening between hinge jamb and strike jamb.
    - .2 Plumbness: Maximum 0.8mm (1/32") measured from bottom of frame to head level.
    - .3 Alignment: Maximum 0.8mm (1/32") measured offset between face of hinge jamb and strike jamb relative to wall construction.
    - .4 Twist: Maximum 0.8mm (1/32") measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.
  - .4 Doors:
    - .1 Fit hollow metal doors accurately in frames within clearances required for proper operation; shim as necessary for proper operation.
    - .2 Install hardware in accordance with manufacturers' templates and instructions.
    - .3 Adjust operable parts for correct clearances and function.
    - .4 Install glazing materials and door silencers.
    - .5 Install fire rated doors within clearances specified in NFPA 80-2010.
    - .6 Install louvers and vents.
  - .5 Adjusting and Cleaning
    - .1 Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of air-drying primer compatible with factory applied primer, and as follows:
      - .1 Clean exposed surfaces with soap and water to remove foreign matter before site touch-up.
      - .2 Finish exposed site welds to a smooth uniform surface and touch-up with site applied rust inhibitive primer.
      - .3 Site apply touch-up primer on exposed surfaces where zinc coating or factory applied primer has been damaged during installation or handling.

**END OF SECTION**

1 General

**1.1 GENERAL**

- .1 All conditions of the contract apply to the work of this Section.

**1.2 SUMMARY**

- .1 This Section of the contract includes all wood doors and accessories indicated on the Drawings, as required to provide a complete installation.
- .2 The work includes but is not limited to the following:
- .1 Interior wood doors
- .2 Interior fire-rated wood doors

**1.3 RELATED REQUIREMENTS**

- .1 Section 08 11 00: Metal Doors and Frames
- .2 Section 08 71 00: Door Hardware
- .3 Section 08 81 00: Glass and Glazing
- .4 Section 09 91 00: Painting

**1.4 REFERENCES**

- .1 AWMAC (Architectural Woodwork Manufacturers' Association of Canada) - Quality Standards Illustrated (QSI), latest edition.
- .2 CAN/CGSB-11.3-M87, Hardboard
- .3 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies
- .4 CAN/ULC-S113-07, Standard Specification for Wood Core Doors Meeting the performance Required by CAN/ULC-S104 for Twenty Minute Fire Rated Closure Assemblies.
- .5 NFPA 252, Standard Methods of Fire Tests of Door Assemblies

**1.5 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Shop Drawings:
- .1 Submit shop drawings showing types of cores and construction details, glazing and stops, openings required, material designation and door schedules.
- .3 Samples:
- .1 Submit for Consultant's review, if requested, two 12" x 12" corner samples of each type of door specified herein showing construction, workmanship and finish including face veneers, core materials, edge strips and stops.

**1.6 QUALITY ASSURANCE**

- .1 Except where otherwise specified, meet requirements of CAN/CSA-0132.2 Series and applicable provisions of AWMAC Quality Standards Illustrated (QSI), Custom Grade.
- .2 Fire rated doors shall conform to NFPA for fire rated class and bear label of an approved testing agency.

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**1.7 REGULATORY REQUIREMENTS**

- .1 Submit certification that fire rated doors have been tested in conformance to CAN/ULC-S104 and NFPA 252 to ratings indicated on Door Schedule.

**1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location.
- .2 Do not permit delivery of work to job site until building is sufficiently dry, wet trades are completed and the moisture readings of surfaces in proposed storage area is less than 18%.
- .3 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Store doors flat on level surface. Protect materials with suitable non-staining waterproof coverings, but allow air circulation at sides.
- .4 Label each door with manufacturers' name, product identification, door size and type.

**1.9 EXTENDED WARRANTY**

- .1 Submit written warranty that doors will be free from defects in materials or workmanship in accordance with General Conditions but for a period of three (3) years.
- .2 Make good defects promptly during warranty period by replacing defective doors.
- .3 Defects shall include, but not be limited to delamination of edges, warp, twist, bow exceeding 1/4". "Replace" as used herein includes installing hardware, finishing, hanging and fitting.

**2 Products**

**2.1 MANUFACTURERS**

- .1 Wood doors shall be flush, solid particle core with reinforced styles and rails to CAN/CSA 0132.2-M1990.
- .2 Acceptable products and corresponding manufacturers shall be as follows:
  - .1 Cambridge Doors Ltd.
  - .2 Baillargeon Door Inc
  - .3 Lampton Doors
  - .4 Mowhawk Flush Doors
  - .5 VT Industries
  - .6 Marshfield Wood Doors
  - .7 JWS Manufacturing Inc.
- .3 Doors of equal quality and construction are also acceptable subject to conformance to specifications and door schedule.

**2.2 MATERIALS**

- .1 Conform to CAN/CSA-0132.2 Series for wood flush doors.
- .2 All wood doors to be supplied from same manufacturer.
- .3 Door Construction
  - .1 Solid Particleboard Wood Flush Doors
    - .1 Construction: 5 ply.
  - .2 Fire Rating: 20 or 30 minutes.

- .3 Particle Board for Cores: CAN3-O188.1-M, extruded particle board having spruce particles in melamine based binder, minimum density of 480 kg/cu.m. (30 pcf).
- .4 Mineral Cores (for fire-rated doors): Comply with the requirements of the label issuing authority for the scheduled fire ratings, as acceptable to the authorities having jurisdiction.
- .5 Clear hardwood edges minimum 13 mm thick.
- .6 Adhesive: Type I: Waterproof phenol, resorcinol and phenol - resorcinol resin adhesive.
- .4 Face Veneer for Flush Wood Doors Scheduled to have Plastic Laminate Finish:  
Refer to door schedule for location.
  - .1 0.049" thick high pressure, paper based, decorative plastic laminate conforming to CAN3-A172-M79, Grade GP, Type S.
  - .2 Plastic laminate finish to be selected by consultant.

## 2.3 FABRICATION

- .1 Conform to Quality Standards for Architectural Woodwork published by Architectural Woodwork Manufacturers Association of Canada (AWMAC) for Architectural Grade Doors, except where specified otherwise.
- .2 Size doors for 1.6 mm clearance of heads and jambs and 9 mm at bottom. Undercut doors for air intake where indicated on Door Schedule.
- .3 Wood Stiles, Rails and Hardware Reinforcement: Low density hardwood species, kiln dried to 8% moisture content.
- .4 Stiles and Rails: Hardwood. Stile thickness minimum 1-1/2" and rail thickness minimum 1-1/8".
- .5 Bevel vertical edges of single acting doors 3 mm in 50 mm or lock side and 1.5 mm in 50 mm on hinge side.
- .6 Radius vertical edges of double acting doors to 60 mm radius.
- .7 Seal wood edges and edges of cut outs before units are placed in unheated storage areas.
- .8 Fabricate doors using 5 ply hot press construction technology. Bond stiles and rails to core using Type I adhesive. Sand for uniform thickness. Laminate door facing, cross banding and assembled core in hot press.
- .9 Factory cut glass light openings. Ensure openings are square with internal corners slightly rounded. Provide metal glass tops, paint finished to match face veneer for vision panels in unrated doors
- .10 Factory fit doors for frame opening dimensions identified on shop drawings.
- .11 Provide inner blocks at lock edge and top of door closer for hardware reinforcement.
- .12 Completely seal wood top, bottom and edges and edges of cut-outs, before units are shipped from the manufacturer's mill or are placed in the open air or unheated storage areas at the mill which would allow change in the specified moisture content of the wood.
  - .1 Apply sealer in accordance with the manufacturer's printed instructions without dilution or alteration of any kind. Give particular attention to finish.
  - .2 Obtain approval of Consultant of the finishes before proceeding with sealing. Should this procedure not be followed replace all doors which have been improperly sealed.
- .13 Provide blocking for closers, panic hardware, locksets and other door hardware as required.

## 2.4 FABRICATION - FIRE RATED FLUSH WOOD DOORS

- .1 As listed by ULC, ULI or WHI, and bearing their label, as acceptable to authorities having jurisdiction.
- .2 Fabricate fire-rated flush wood doors with scheduled facing material over cross banding.
- .3 Fabricate fire-rated doors as required for rating indicated, with water resistant non-combustible mineral core, minimum 3/4" fire retardant treated hardwood stiles and minimum 1-1/2" fire retardant treated hardwood rails. Reinforce doors with minimum 1-1/4" solid wood blocking for finish hardware.
- .4 Locate the label on the hinged edge of the door midway between the top hinge and the head of the door.
- .5 Seal fire-rated doors as specified for non-rated doors.

### 2.5 FABRICATION - FACTORY FINISH

- .1 Complete fabrication of doors before applying factory finishes including, but not limited to fitting doors for openings and machining for recessed hardware.
- .2 Factory finish all four edges, edges of cut outs, and mortises the same as for faces, except that stains and fillers may be omitted on bottom edges, edges of cut outs, and mortises, and as follows:
  - .1 Finish doors at factory that are indicated to receive finish, other than paint finish.
- .3 Steam out deep scratches and ease sharp edges by sanding before starting factory finishing; block sand using 150/180 grit in direction of grain on all surfaces to remove handling marks and fingerprints.
- .4 Perform filling, sanding and finishing in horizontal position wherever possible.

## 3 Execution

### 3.1 EXAMINATION

- .1 Verify that frames are in accordance with indicated requirements for type, size, location, and swing characteristics and are installed with level heads and plumb jambs.
- .2 Exam all doors thoroughly before installation or finishing; reject any defective doors and obtain replacements from manufacturer at no additional cost to the Owner or Project.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- .1 Install doors and hardware in accordance with manufacturer's instructions.
- .2 Accurately fit doors into frames to ensure smooth operation without binding. Doors shall have 1.5 mm clearance at head and jambs and 6 mm over finished floor surfaces unless otherwise indicated.
- .3 Undercut doors where shown, and as required to accommodate floor finish thickness.
- .4 Install hardware in accordance with hardware supplier's instructions.
- .5 Install mineral core fire doors in accordance with NFPA 80; install metal fire rating label to door, do not cover over with subsequent finishes; do not trim fire rated doors any greater than 1/8" in width from lock side only and 3/4" from bottom of door.
- .6 Glaze doors at site with glass of type and thickness indicated, in accordance with Section 08 81 00 using elastomeric glazing sealant as specified in Section 07 92 00; secure glass in place with removable wood stops.
- .7 Adjust operable parts to ensure proper door operation.

- 
- .8 Install louvres and glazing stops where required.

**3.3 CLOSEOUT ACTIVITIES**

- .1 Deficient Work: Replace, rework or refinish work that does not meet AWS requirements as directed by Consultant.
- .2 Adjusting and Cleaning: Readjust doors and hardware just prior to completion of building to function freely and properly and as follows:
- .1 Re-hang or replace doors that do not swing or operate freely.
- .2 Replace doors that are damaged or that do not comply with requirements of this Section; doors may be repaired or refinished where work complies with requirements and shows no evidence of repair or refinishing in completed work.

**END OF SECTION**



1 General

1.1 GENERAL REQUIREMENTS

- .1 Comply with requirements of Division 1.

1.2 SUMMARY

- .1 This Section includes requirements for supply and installation of aluminum windows having fixed sealed glass units, and internal projecting units, with internal weep drainage.

1.3 RELATED REQUIREMENTS

- .1 Section 07 92 00: Joint Sealants
- .2 Section 08 81 00: Glass and Glazing

1.4 WORK SUPPLIED BUT NOT INSTALLED

- .1 Supply to other Sections anchors, inserts and items required to be built into work of other Sections.
- .2 Ensure accurate setting of built-in items; where necessary provide templates, diagrams or other suitable means of instruction.

1.5 DESIGN AND PERFORMANCE REQUIREMENTS

- .1 Design systems to withstand, without any detrimental effects to appearance and performance, wind loads and temperature range expected in geographical area of this project, (OBC climatic information, 50 year probability), unless specified otherwise.
- .2 Design window and curtain wall systems to perform as an effective air and vapour barrier.
- .3 Design systems to accommodate without detrimental effects on appearance and performance of system.
  - .1 Thermal expansion and contraction of systems components.
  - .2 Movement deflection and creep of building structural frame.
- .4 Limit deflection of component parts under maximum design load to 1/200 of span or less if required by glass manufacturer.
- .5 Prevent water infiltration through curtain wall systems, when tested in accordance with ASTM E331, with static pressure difference across system of 500 Pa.
- .6 Limit air infiltration and exfiltration through curtain wall systems of maximum 0.0003 m<sup>3</sup>/s.m<sup>2</sup> under a static pressure of 300 Pa when tested in accordance with ASTM E283.
- .7 Appearance:
  - .1 Fasteners and anchors: concealed.
  - .2 Joints between components: hairline, with adjacent surfaces accurately aligned.

1.6 QUALITY ASSURANCE

- .1 Work of this Section shall be executed by fabricator and installer approved by system manufacturer and with a minimum of five year's experience in the type of work specified herein, having adequate equipment and skill to expediently complete the work in an efficient manner. Only products from manufacturers listed will be accepted unless written approval is issued by the Consultant.
- .2 Installer Qualifications: installation shall be by forces approved by manufacturer.
- .3 Fabrication Tolerances: overall height, width and diagonal dimensions of frames shall be within the following tolerances:

- .1 Dimension of 2 m and less: +/- 2 mm
- .2 Dimension more than 2m: +/- 3.5 mm
- .4 Caulking: comply with requirements of Section 07 92 00 except where specifically stated otherwise herein.
- .5 Glazing: Comply with requirements of Section 08 81 00 except where specifically stated otherwise herein.
- .6 Windows and vents shall meet or exceed the following minimum performance criteria, contained in CSA-A440-00:
  - .1 Air tightness rating, operable windows: A3
  - .2 Air tightness rating, fixed windows: Fixed.
  - .3 Water tightness: B3
  - .4 Wind load resistance: C5
  - .5 Thermal break condensation resistance: D2

#### 1.7 SUBMITTALS

- .1 Prior to preparation of shop drawings submit a letter from the system manufacturer, certifying that the subcontractor has issued a purchase order, letter of intent or otherwise entered into a contract with the manufacturer. The letter must be dated and include:
  - .1 name of the project
  - .2 Name of the sub-contractor
  - .3 complete list of product series or style
  - .4 manufacturers contact with telephone and telefax numbers
- .2 Submit detailed shop drawings showing fabrication, assembly and installation requirements. Shop drawings shall bear seal and signature of professional engineer licensed to practice in Ontario. Include on shop drawings system manufacturer's review stamp.
- .3 Shop drawings for windows and curtain wall shall bear seal and signature of professional engineer licensed to practice in Ontario.
- .4 Upon Consultant's request submit test report from recognized testing agency verifying that systems provided will meet design and performance requirements.
- .5 Upon Consultant's request submit sample section and assembled corner of each system specified used.
- .6 Submit 2 sets of samples minimum 50 x 100 mm of each type of metal finish specified.

#### 1.8 WARRANTY

- .1 At no cost to Owner remedy any defects in work of this Section for a period of 5 years from date of Substantial Performance. For the purposes of this paragraph, defects shall include but not necessarily be limited to:
  - .1 Water infiltration in excess of requirements specified.
  - .2 Air infiltration / exfiltration in excess of requirements specified.
  - .3 Deflection of system components in excess of requirements specified.
  - .4 Failure of joint seal.
  - .5 Cracked glass (except where caused by vandalism).
  - .6 Delamination, cracking, blistering, excessive fading of metal finishes.

- .2 At no cost to Owner, replace factory sealed window units should obstruction of vision develop due to dust or film forming on inner glass surfaces caused by perimeter seal failure within a period of 10 years from date of Substantial Performance.

## 2 Products

### 2.1 SYSTEMS

- .1 Fixed Windows: 127mm deep frame, from one of the following systems:
  - .1 'Series 518 Thermal Window – Fixed' by Kawneer.
  - .2 'ShadowLine Series 970' by Alumicor.
- .2 Operable Windows: One of the following systems:
  - .1 '1350 UniVent' by Alumicor
  - .2 'GLASSvent UT' by Kawneer.

### 2.2 MATERIALS

- .1 Framing Components:
  - .1 Aluminum extrusions: AA 6063-T5 alloy.
  - .2 Aluminum plate and sheet: AA 1100 alloy.
  - .3 Screws, bolts, nuts, washers, rivets and other fasteners, incorporated into aluminum sections: aluminum or ANSI Series 300 stainless steel, or hot dip galvanized steel.
  - .4 Anchoring devices: aluminum, non-magnetic stainless steel or hot dip galvanized steel.
  - .5 Steel: CSA-G40.21-04 Grade 300 W structural quality steel and Grade 350W, Class H tubular members and ASTM A446 Grade A sheet steel.
- .2 Glass and Glazing Materials:
  - .1 Setting blocks: Neoprene, Shore "A" durometer hardness of 70 to 90 points; spacer shims, 40 to 50 points, as recommended by glass manufacturer.
  - .2 Thermal barrier between pressure plate and mullion extrusions: extruded hard PVC.
  - .3 Glazing sealant: one part polysulphide meeting requirements of CAN2-19.13-M87 or as recommended by window and glass manufacturer.
  - .4 Glazing tape: preshimmed polyisobutylene: Polyshim Tape by Tremco Manufacturing Co.Ltd.
  - .5 Glazing wedges and splines: solid extruded neoprene or PVC having Shore "A" Durometer hardness of 50 to 70 points as recommended by window manufacturer.
  - .6 Glazing: As indicated in Section 08 81 00.
- .3 Caulking Materials:
  - .1 Sealant: one part low modulus silicone: Dow Corning 790 Building Sealant.
  - .2 Primer: as recommended by sealant manufacturer.
  - .3 Joint backing: non-gassing foam rope compressed when installed; SOF-ROD by Tremco.
- .4 Spandrel Back-up Panels:
  - .1 Aluminum Sheet and Plate:
    - .1 ASTM B209, suitable for purpose and finish required, "H14" or other approved manufacture, special hardness for flat panel application, re-squared saw-cut edges.

- .2 Sheet aluminum: Aluminum alloy AA1100-H14. Thickness to be 1.29 mm (0.051"/16 gauge) for panels less than 610 mm (24") wide and 2.05 mm (0.081"/12 gauge) for panels of a greater dimension, minimum unless otherwise specified.
- .2 Spandrel Panels Insulation:
  - .1 Fibrous glass or mineral wool rigid board insulation meeting CAN/CGSB 51.10, minimum "RSI" value of 0.739 per 25 mm thickness ("R" value of 4.2 per inch).
    - .1 'CurtainRock' by Roxul inc,
    - .2 'Fiberglas 703' by Owens Corning,
- .3 Stick clips: Consisting of a 50 mm diameter perforated disc base with integral 3 mm square sharpened pin of moulded polyvinylchloride. Pin lengths to suit insulation thickness. Clips shall have 25 mm x 25 mm galvanized sheet steel retainers punched to catch on pins.
- .4 Adhesive for applying stick clips: High-strength, resilient adhesive having a drying time of 0 to 30 minutes (rapid initial set), and 24 hours final set. Adhesive shall be compatible with the specified insulation, galvanized steel and polyvinylchloride. Primer for adhesives as recommended by the adhesive manufacturer for the particular materials to be adhered.
- .5 Miscellaneous Materials:
  - .1 Concealed membrane flashing: As recommended by manufacturer.
  - .2 Bituminous paint: alkali resistant asphaltic enamel.
  - .3 Bedding compound: non-hardening and non-skinning.
  - .4 Weatherstripping at Operable Sash: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature.
- .6 Insect Screens
  - .1 Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches, and as follows:
    - .1 Fabricate screens and frames in accordance with CAN/CSA A440 and CAN/CGSB 79.1.
    - .2 Fabricate insect screens to fully integrate with window frame.
    - .3 Locate screens on outside of window and provide for each operable exterior sash.
  - .2 Screen Frames:
    - .1 Extruded Aluminum or Aluminum Tubular Framing Sections: Aluminum sections having 0.8mm (1/32") minimum nominal wall thickness, with finish matching aluminum window members.
  - .3 Screen Fabric:
    - .1 Screen Class: Class A in accordance with CAN/CGSB 79.1.
    - .2 Screen Strength: S2 in accordance with CAN/CSA A440 and CAN/CGSB 79.1.
    - .3 Screen Style: Style 1 in accordance with CAN/CGSB 79.1.
    - .4 Fabric Mesh Material: Aluminum Wire: Charcoal grey or black finish; in accordance with CAN/CGSB 79.1.

## 2.3 FABRICATION

- .1 Aluminum components shall be extruded sections and shapes, unless otherwise specified.

- .2 Window framing shall consist of inner and outer aluminum sections joined by means of extruded polyvinyl chloride or polyurethane thermal break without use of other fasteners and thermal bridging elements. Provide exterior cap matching curtain wall framing.
- .3 Size window units to allow for structural deflection of surrounding construction.
- .4 Design work so that it will not be distorted, nor fasteners overstressed, from expansion and contraction of metal.
- .5 Reinforce members as required to withstand loads and to maintain deflection within allowable limits.
- .6 Internally reinforce framing members where work of other Sections is to be fastened thereto. Provide heavy duty reinforcing at all door and frame hardware fastening points. Provide continuous reinforcing at hinge side of door frames.
- .7 Fastenings shall be concealed where possible. Where concealed fastenings cannot be used, use countersunk flathead screws. Exposed fastenings shall match base metal on which they occur.
- .8 Mechanically joined sections shall have hairline joints.
- .9 Removable glazing stops shall be fabricated in sections not exceeding length of the pane of glass being restrained.
- .10 Fabricate extruded or formed aluminum sills to profiles indicated to suit wall condition and minimum 3 mm thick. Provide drip deflectors at sill ends and at abutting vertical surfaces. Open ends of sills shall be fitted with neatly applied closure plates. Anchors shall be designed not to work loose after installation. Unless otherwise detailed provide flush slip joint at intermediate sill joints.
- .11 Stools, closures, covers, flashings and trim shall be extruded or formed to profiles shown and unless otherwise shown, minimum 2 mm thick.
- .12 Make provision to accommodate vertical expansion and contraction of curtain wall framing without causing detrimental effects.
- .13 Make provisions to drain to exterior any moisture entering or forming inside systems.
- .14 Opening Vents:
  - .1 Casement style.
  - .2 Provide aluminium framed stainless steel mesh insect screen at each vent location. Screens shall be removable from the outside without the use of tools.
- .15 Spandrel Panels:
  - .1 Refer to drawings for size type and location of spandrel panels. Panel facings include decorative aluminum panels.
    - .1 Liner Panels:
      - .1 Fabricate liner panel from not less than 22 gauge galvanized sheet steel with airtight seams, brakeformed at the edges of 90 degrees.
      - .2 Laminate to interior side of spandrel panel minimum 18 ga aluminum sheet metal panel matching face finish.
      - .3 Seal perimeter of liner panels with non-permeable sealant to maintain vapour barrier. Install weatherseal, rain deterrent and vent where detailed and required.
      - .4 Isolate dissimilar metal surfaces using bitumastic paint.
      - .5 Reinforce with galvanized steel sections as required for rigidity and to meet design criteria, and to eliminate noises due to thermal and air pressure changes.

- .6 Adhesive bond or tack weld impaling pins to panels for securement of insulation.
- .7 Insulate liner panels with semi-rigid insulation held in place by insulation fasteners (impale clips) to form continuous thermal barrier behind spandrel panels.
- .2 Aluminum Panels:
  - .1 Decorative panels shall be 12 ga. aluminum sheet, depending on panel size. All joints to be tight fitting hairline joints sealed with silicone and backed with splicer plates to ensure proper alignment.
  - .2 Form return edges maintaining design profile where indicated on drawings.
  - .3 Finish on decorative metal spandrels to match exposed aluminum members.
  - .4 Fabricate panels in manner to maintain complete thermal and vapour barrier seal at inner panel, yet to ensure moisture is weeped to exterior.

## 2.4 FINISHES

- .1 Clear Anodizing (Class II):
  - .1 All aluminum surfaces exposed in the finished work shall have integral clear anodic coating, minimum 0.4 mils thickness, and conforms to Aluminum Finish Designation AA-M12C22A31, Architectural Class II.
  - .2 Protect finish with strippable protective film.
- .2 Steel Supports (Concealed):
  - .1 Hot-dip galvanized in accordance with CAN/CSA-G164, with minimum coating of 2 oz./sq.ft., or zinc rich paint.
- .3 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

## 3 Execution

### 3.1 FRAMING

- .1 Erect and secure window units plumb, square, and level, free from warp, twist and superimposed loads.
- .2 Anchor systems to supporting building elements; provide brackets, anchors and clips as required. All devices for anchorage shall have sufficient adjustment to permit correct and accurate alignment. After alignment rivet, weld or otherwise positively lock anchoring devices to prevent movement other than that required to accommodate expansion, contraction, creep and deflection.
- .3 Anchor intermediate vertical frame members to structure above as required. Where support for intermediate vertical frame members is not available directly above head, provide frame extensions to structure above. Provide flexible connection at structure to allow for movement.
- .4 Anchor window jamb members to adjacent building elements near top and bottom and at maximum 600 mm in between.
- .5 Provide necessary inserts to be built into work of other Sections as required for anchorage of framing.
- .6 Set frame members in bedding compound to ensure watertight assembly.
- .7 Metal to metal joints between abutting components shall be sealed weathertight.
- .8 Use concealed fastenings where possible; where not possible use flathead screws in countersunk holes. Match exposed fastenings with base metal on which they occur.

- .9 Pack voids between framing and surrounding building elements with fibrous insulation.
- .10 Where indicated provide membrane flashing located within or abutting window systems. Secure membrane flashings to window frames and to adjacent work mechanically or with adhesive lap membrane flashings at joints minimum 100 mm and seal.

### **3.2 GLAZING**

- .1 Unless otherwise shown provide insulating glass at all locations.
- .2 Glaze openings in accordance with window and glass manufacturer's recommendations so as to achieve weathertight installation. Provide sealant heel bead at windows and vents.
- .3 Glass thickness: unless specific thickness is indicated or unless thicker glass is required by design and performance requirements, provide minimum 6 mm thick glass at all locations.
- .4 Install spandrel metal face panels into framing similar to spandrel glass.
- .5 Insulating glass units for exterior screens shall have tempered glass inside and outside.

### **3.3 CAULKING**

- .1 Seal joints in accordance with window and sealant manufacturer's recommendations. Prime contact surfaces prior to installation of sealant.
- .2 Provide caulking between framing members and adjoining work and where required to render work of this Section weathertight.
- .3 Provide for continuity of air / vapour barriers; seal at junction with air / vapour barriers of adjacent systems.

### **3.4 SILLS**

- .1 Provide aluminum sills, complete with chairs, anchors, expansion plates and drip deflectors where windows and curtain wall are located on top of masonry walls.
- .2 Provide sills in longest practicable lengths. Provide flush slip joints at maximum 3 m o.c. Locate joints as directed by Consultant.

### **3.5 STOOLS, COVERS, CLOSURES AND TRIM**

- .1 Provide stools, covers, closures and trim as indicated and as required to provide complete and finished installation.
- .2 Wherever possible provide concealed fastenings unless approved otherwise by Consultant.
- .3 Locate joints as directed by Consultant.

### **3.6 CLEANING AND ADJUSTMENT**

- .1 Remove protective elements and thoroughly clean aluminum and glass surfaces with solution of mild domestic detergent in warm water. Exercise care in removing dirt from corners. Wipe surfaces dry using soft cloths.
- .2 Just prior to takeover of building by Owner, check test vent operation and, if necessary adjust or replace hardware to ensure proper and smooth operation.

### **END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 06 41 00: Architectural Wood Casework
- .2 Section 08 11 00: Metal Doors and Frames
- .3 Section 08 14 00: Wood Doors

**1.3 QUALITY ASSURANCE**

- .1 Meet requirements of Ontario Building Code and other applicable regulations.
- .2 Upon completion of finish hardware installation, hardware supplier's qualified representative shall inspect work and shall certify in writing that all items and their installation are in accordance with requirements of Contract Documents and are functioning properly. This document shall be included in maintenance manuals.

**1.4 SUBMITTALS**

- .1 Upon Consultant's request submit samples of finish hardware.
- .2 Prepare and submit six copies of a detailed hardware schedule and cut sheets based on the drawings
- .3 Furnish other Sections with templates required for hardware preparation and installation. Issue templates when requested so as not to cause any delays but not before hardware list has received final review by Consultant.
- .4 The Board will provide the keying schedule.
- .5 Contractor will be required to carry one of the following Hardware suppliers; Group 87 Architectural Hardware, Rivett Architectural Hardware Ltd approved equal, refer to attached Hardware schedule (Door Listing)

**1.5 PRODUCT DELIVERY, HANDLING & STORAGE**

- .1 Deliver each hardware item packaged separately in individual containers with necessary screws, keys, instructions and installation templates.
- .2 Mark each container with item number corresponding to number shown on hardware schedule with respective door number.
- .3 Store hardware in dry, lockable area.

2 Products

**2.1 FINISH HARDWARE – GENERAL**

- .1 Supply as specified to Board standard.
- .2 Type: heavy duty commercial grade.
- .3 Hardware shall comply with requirements of jurisdictional authorities.
- .4 Door closers shall have back checking features and shall be of proper size to operate door efficiently.
- .5 Confirm kick plate and threshold sizes before ordering them.
- .6 Do not use wall stops on drywall.
- .7 Exposed screws for installing hardware shall have Phillips or Robertson heads.



- .8 Detail degree of swing for door holders, closers.
- .9 The following products may be used. Include for preparation of doors and frames accordingly.
  - .1 Butt hinges: full mortise type;
  - .2 Locks and latch sets: Cylindrical type with through-bolted trim.
  - .3 Exit devices: rim type, flat bar push and pad style; Von Duprin XP feature at exterior doors.
  - .4 Door closers: surface mounted.
  - .5 Overhead stop: where wall stops cannot be used, surface/concealed mounted except where door closer necessitates concealed mounting.

## 2.2 KEYING

- .1 Permanent cores by allowance, see Division 1.
- .2 Construction key Schlage cylinders, provide 6 ea Construction key and 2 Construction Control Keys.
- .3 Permanent cylinder keyed to owner standard by Board Locksmith, see allowance, Division 1.
- .4 Medeco cylinders by owner.

## 3 Execution

### 3.1 INSTALLATION

- .1 Meet requirements of ANSI/DHI A115.1G-94 "Installation Guide for Doors and Hardware".
- .2 Confirm locations and mounting heights of finish hardware with Consultant.
- .3 Install finish hardware in accordance with hardware suppliers' directions. Ensure that hardware is installed correctly. Issue instructions if required to Sections concerned.
- .4 Unless otherwise directed by the Consultant, or unless otherwise dictated by glass height or rail location, install finish hardware at the following heights above finish floor:
  - .1 Locksets and Latchsets 1025 mm to centre of strike
  - .2 Deadlocks 1200 mm to centre of strike
  - .3 Panic Bolts 1025 mm to underside of push bar
  - .4 Push Plates 1025 mm to centre of plate
  - .5 Guard Bars 1065 mm to centre of bar
  - .6 Door Pulls 1065 mm to centre of pull

### 3.2 HARDWARE SCHEDULES SPEC NOTE: EDIT TO BE PROJECT SPECIFIC

- .1 Refer to attached Hardware Schedule prepared by Allegion Canada Inc. (four pages, attached).

**END OF SECTION**

Hardware Group No. 01

For use on Door#(s)

A100A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	700CS	441	IVE
1	EA	FIRE EXIT HARDWARE	XP98-EO-F 4'	626	VON
1	EA	RIM CYLINDER	MEDECO RIM CYLINDER BY OWNER.		MED
1	EA	MORTAR GUARD	TA-6410-ES	BLK	TAC
1	EA	ELECTRIC STRIKE	6111 FSE DS CON 12VDC	630	VON
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4111 EDA ST-1586	689	LCN
1	EA	KICK PLATE	8400 205MM X 40MM LDW B-NH-A	630	IVE
2	EA	JAMB GASKET	328AA X DR HT	BK	ZER
1	EA	HEAD GASKETING	429AA-S Install prior to mounting soffit hardware	AA	ZER
1	EA	DOOR SWEEP	8192AA X DR WIDTH	AA	ZER
1	EA	THRESHOLD	625A X DR WIDTH	A	ZER
1	EA	WIRE HARNESS	CON-6W		SCH
1	EA	AIPHONE	BY SECURITY SUPPLIER		UNK
1	EA	DOOR CONTACT	7764	628	SCE
1	EA	MORTAR GUARD	TA-6410-DC	BLK	TAC
1	EA	POWER SUPPLY	PS902 120/240 VAC	LGR	SCE

Hardware Group No. 02

For use on Door#(s)

A100B

A102

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 127X114MM	652	IVE
1	EA	DOOR PULL, 1" ROUND	8103HD 255MM L	630	IVE
1	EA	PUSH PLATE	8200 150X405MM	630	IVE
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 205MM X 40MM LDW B-NH-A	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	FINGER GUARD	MK1A X DR H		FIN
1	EA	FINGER GUARD	MK1B X DR H		FIN

Hardware Group No. 03 - DOOR OPERATOR

For use on Door#(s)

A103A

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
2	EA	CONT. HINGE	700CS	441	IVE
1	EA	REMOVABLE MULLION	KR4854 STAB	689	VON
2	EA	PANIC HARDWARE	CD-XP98-EO	626	VON
1	EA	MORTISE CYLINDER	20-061 ICX (MULLION)	630	SCH
2	EA	MORTISE CYLINDER	20-061 ICX XQ11-948 36-083	626	SCH
3	EA	PRIMUS CORE	20-740-XP BY ALLOWANCE	626	SCH
1	EA	RIM CYLINDER	MEDECO RIM CYLINDER BY OWNER.		MED
1	EA	ELECTRIC STRIKE	6111 FSE DS CON 12VDC	630	VON
1	EA	DOOR PULL	VR910 DT	630	IVE
1	EA	DOOR PULL	VR910 NL	630	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	OH STOP	100S ADJ	630	GLY
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	SURF. AUTO OPERATOR	9542 MS AS REQ (120/240 VAC)	ANCLR	LCN
1	EA	WEATHER RING, 6"DIA	8310-802	PLA	LCN
1	EA	KEYSWITCH	8310-806K	BLK	LCN
2	EA	ACTUATOR, WALL MOUNT 6"DIA	8310-852	630	LCN
2	EA	ESCUTCHEON,6"DIA	8310-876	689	LCN
1	EA	MOUNTING PLATE	9540-18	689	LCN
2	EA	JAMB GASKET	328AA X DR HT	BK	ZER
1	EA	HEAD GASKETING	429AA-S Install prior to mounting soffit hardware	AA	ZER
2	EA	DOOR SWEEP	8192AA X DR WIDTH	AA	ZER
2	EA	MEETING STILE	8195AA	AA	ZER
1	EA	THRESHOLD	625A X DR WIDTH	A	ZER
1	EA	WIRE HARNESS	CON-6W		SCH
1	EA	CARD READER	BY SECURITY SUPPLIER		UNK
2	EA	DOOR CONTACT	679-05HM	BLK	SCE
2	EA	MORTAR GUARD	TA-6410-DC	BLK	TAC

Hardware Group No. 04

For use on Door#(s)

A103B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 127X114MM NRP	652	IVE
1	EA	CLASSROOM SECURITY	ND75TD ATH XN12-035	626	SCH
2	EA	PRIMUS CORE	20-740-XP	626	SCH
			BY ALLOWANCE		
1	EA	KICK PLATE	8400 205MM X 40MM LDW B-NH-A	630	IVE
1	EA	WALL STOP	WS401/402CVX	626	IVE
1	EA	FINGER GUARD	MK1A X DR H		FIN
1	EA	FINGER GUARD	MK1B X DR H		FIN

Hardware Group No. 05

For use on Door#(s)

A165

Provide each SL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	FASCIA	CC-982		KNC
2	EA	END CAP	CC-981		KNC
1	EA	COMPLETE KIT 1 DOOR	CC-2-993 TRACK(BARN STYLE)		KNC
2	EA	FLUSH PULL	955	626	IVE



1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- |    |                   |  |
|----|-------------------|--|
| .1 | Section 04 20 00: | Unit Masonry                           |
| .2 | Section 06 41 00: | Architectural Wood Casework            |
| .3 | Section 07 21 00: | Thermal insulation                     |
| .4 | Section 07 27 13  | Modified Bituminous Sheet Air Barriers |
| .5 | Section 07 84 00: | Firestopping                           |
| .6 | Section 07 92 00  | Joint Sealants                         |
| .7 | Section 08 11 00: | Metal Doors and Frames                 |
| .8 | Section 09 91 00: | Painting                               |

**1.3 DEFINITION**

- .1 Drywall = gypsum board.

**1.4 FIRE PROTECTION REQUIREMENTS**

- .1 Provide fire rated gypsum board components and assemblies as indicated.
- .2 Where firehose cabinets, electrical panels or other fixtures or equipment are recessed into fire rated gypsum board partitions, provide fire rated backing to maintain required fire rating.
- .3 Protect recessed fixtures in fire rated gypsum board ceilings in accordance with fire rated assembly design report and/or as indicated.
- .4 Gypsum bulkheads/partitions in ceiling spaces above fire rated glazed screens, doors or other elements shall have same fire rating as screens/doors over which they occur.
- .5 Fire rated bulkheads are required in first floor ceiling spaces where construction changes from fire rated floor assembly to non-fire rated roof assembly. Carefully examine Drawings to determine locations.

**1.5 WORKMANSHIP STANDARDS**

- .1 Interior metal framing and furring: comply with applicable requirements of ASTM C754 and ASTM C840 unless otherwise shown.
- .2 Gypsum board application and finishing: comply with requirements of ASTM C840, unless otherwise shown.

**1.6 PRODUCT HANDLING & STORAGE**

- .1 Handle gypsum board panels to prevent damaged and broken edges.
- .2 Store materials in dry place so as to preserve their quality and fitness for work.

**1.7 JOB CONDITIONS**

- .1 Install and finish gypsum board when ambient temperature is between 14 and 22°C. Maintain this temperature range in areas to receive gypsum board for 24 hours before and during application and until joint cement and adhesives are fully cured.
- .2 Apply gypsum board after building has been completely enclosed. Ensure that work to be concealed by gypsum board has been installed, tested, inspected and approved before starting work.

2 Products

**2.1 FRAMING, FURRING AND TRIM**

- .1 Unless otherwise specified, provide framing members of minimum 0.5 mm core thickness steel hot dip galvanized (wipe coat) to ASTM A653.
- .2 Studs, interior locations: channel shaped screw-on type: depth as indicated; with knurled supporting flanges at least 34 mm wide; with service pass-through holes at 610 mm o.c. in web. Provide minimum 0.9 mm thick studs where stud depth exceeds 92 mm and where cementitious board and abuse resistant gypsum board is supported.
- .3 Top and bottom runners: channel sections, 35 mm legs. Depth to suit studs. Provide oversized top runner where required to accommodate deflection of structure.
- .4 Rough framing members: 38 x 19 x 1.2 mm and 19 x 13 x 1.2 mm galvanized steel channels.
- .5 Furring and strapping members to receive gypsum board: 19 mm deep channel shaped section with outstanding flanges and 35 mm wide knurled supporting face.
- .6 Corner beads: beaded angle with perforated flanges.
- .7 Casing beads: channel shaped; beaded corners.
- .8 Hangers: minimum 3 mm galvanized steel wire.
- .9 Tie wire: minimum 1.5 mm soft annealed galvanized steel.
- .10 Metal control joint section: bellows shaped section with perforated flanges.
- .11 Reveal mouldings: extruded aluminum, profiles as indicated, by Fry, Gordon or Pittcon Softforms.

**2.2 GYPSUM BOARD**

- .1 Exposed gypsum board for interior use: tapered edge; ASTM C1396.
- .2 Unexposed gypsum board for interior use: backing board: ASTM C1396.
- .3 Fire rated gypsum board: Type 'X' board ASTM C1396.
- .4 Moisture resistant gypsum board: ASTM C1396.
- .5 Abuse resistant gypsum board: 16 mm thick fire rated with tapered edge: Fiberock VHI by CGC.

**2.3 FASTENING & FINISHING MATERIALS**

- .1 Drywall screws: self-drilling, self-tapping, case hardened. Use zinc, nickel or cadmium plated screws for fastening of gypsum sheathing and cementitious board.
- .2 Laminating adhesive: CGC Durabond 90 compound by Canadian Gypsum Co.Ltd., or similar by Westroc or Domtar.
- .3 Joint tape: 50 mm perforated type.
- .4 Joint filler and topping cement: vinyl or latex base, slow setting.

**2.4 ACOUSTICAL MATERIALS**

- .1 Acoustic Insulation: Acoustical Fire Batt by Roxul or equivalent product by Owens Corning.
- .2 Caulking: to CAN/CGSB-19.21-M87: Acoustical Sealant by Tremco, or CGC Acoustical Sealant.
- .3 Steel deck closures: Emseal 25V Expanding Foam Sealant, sized and shaped to fit flutes.

**2.5 THERMAL BREAK**

- .1 Adhesive face rubberized cork 3 mm thick or self adhesive closed cell neoprene sponge tape "Permastik" 122X by Jacobs and Thompson Ltd., or foamed vinyl tape "Arnofoam" by Arno Adhesive Tape Inc.

3 Execution

3.1 METAL FRAMING

.1 General:

- .1 Framing and furring indicated is schematic and shall not be considered exact or complete. Location and spacing of members, bracing, supports and securement shall be in accord with referenced standards as required to provide complete and finished work.
- .2 Make provision for supporting recessed and surface mounted fixtures and equipment. Provide additional framing, supports and stiffeners as required.
- .3 Neatly frame around recessed fixtures and openings.
- .4 Examine mechanical and electrical drawings and coordinate with Mechanical and electrical specifications to determine openings required.

.2 Partitions:

- .1 Unless specified or shown otherwise, extend steel studs to underside of structural slab or deck above. Make provisions to accommodate structural creep and deflection.
- .2 All steel studs shall be spaced at 400 mm maximum, except where indicated otherwise. At curved walls/partitions space studs closer so as to maintain uniform curvature.
- .3 Install runner channels at top and bottom of partition and secure to supporting building elements at maximum 610 mm o.c.
- .4 At partition corners extend one runner channel to end of corner and butt other runner channel; allow clearance for gypsum board thickness; do not mitre runner channels.
- .5 Install steel studs vertically; fix studs to runner channels by crimping or screwing on both sides of stud.
- .6 Install additional studs as detailed and required at partition intersections, openings and terminations at dissimilar materials. Place studs not more than 50 mm from abutting walls, openings and each side of corners.
- .7 Stiffen partitions over 3.6 m in height at mid-height with at least one 19 mm horizontal bracing channel extending full length of partition.

.3 Ceilings and Soffits:

- .1 Erect suspension and furring system level with a maximum tolerance of  $\pm 3$  mm over a 3000 mm length.
- .2 Suspension system shall support ceiling assemblies, with maximum deflection of  $L/360$ ,  $L$  being span between supports.
- .3 Hangers for suspended ceilings shall support grillage independent of walls, columns, pipe and ducts. Space hangers at maximum 1220 mm o.c. along rough furring members and not more than 150 mm from ends. Do not suspend framing from steel roof deck.
- .4 Space rough furring members at maximum 915 mm and not more than 150 mm from perimeter walls.
- .5 Space furring channels transverse to runner channels at maximum 610 mm o.c. except at exterior soffits, and secure to each support with clip or saddle tie with 2 loops of tie wire. Install furring channels so as not to contact perimeter walls.
- .6 Where ductwork, piping and other elements within ceiling spaces interfere with direct suspension of ceiling from structure, install additional framing securely fastened to main structure to accommodate proper hanging of ceiling.



- .7 Erect exterior soffit framing in accordance with reviewed erection drawings. Suspend soffit framing with metal studs and brace system to withstand positive and negative wind pressures without detrimental effects. Fasten furring members to surrounding walls. Use minimum 1.2 mm thick framing members.
- .4 Bulkheads, Coves, Furring:
  - .1 Frame to profiles shown, rigid, square, true to line and securely fastened to supporting building elements.
  - .2 Space furring members to receive gypsum board at maximum 610 mm o.c.
  - .3 Provide rough framing and bracing members as required to ensure stability and accuracy of work.

### 3.2 GYPSUM BOARD INSTALLATION

- .1 Unless otherwise specified, erect gypsum board vertically or horizontally, whichever results in fewer end joints.
- .2 Locate board end joints over supporting members.
- .3 Cut and fit gypsum board as required to accommodate other work.
- .4 Unless otherwise shown or specified, extend gypsum board on both sides of partitions to underside of structural deck above. Fasten gypsum board to studs, not to top channel. Allow for 13 mm deflection.
- .5 Do not install gypsum board until wood blocking or other back-up components are installed. Remove and reinstall gypsum board at no extra cost to Contract where this requirement is not complied with.
- .6 Provide corner beads at external corners.
- .7 Provide casing beads around openings and where gypsum board abutts dissimilar material and construction.
- .8 Fasten gypsum board to supports with screws spaced at maximum 305 mm o.c.
- .9 Install gypsum sheathing horizontally at outside of exterior wall steel studs. Fasten each board at each stud with minimum 3 screws.
- .10 Adhesive bonded gypsum board; apply 13 x 13 mm ribbons of laminating adhesive to back side of board, parallel to long dimension; space adhesive ribbons at max.150 mm o.c. temporarily brace boards until complete adhesive bond develops.
- .11 Where double layer is required screw fasten second layer through first into steel framing. Select screws of suitable length to ensure positive fastening. Offset joints in second layer.

### 3.3 GYPSUM BOARD FINISHING

- .1 Tape and fill exposed joints, fastener heads, edges, corners, to produce an acceptable surface ready for decoration.
- .2 Conceal exposed flanges of corner beads, casing beads and other trim sections with at least 3 coats of cement, feathered out minimum 200 mm.
- .3 Fill depressions at fastener head with cement, then apply 2 additional coats of cement to produce smooth, level surface.
- .4 Treat joints using 3 coat method as follows:
  - .1 Apply thin uniform layer of cement and embed joint tape.
  - .2 Immediately apply thin skim coat of cement over tape and allow to dry.
  - .3 Apply 2 additional coats of cement. Allow first coat to dry before applying second coat.

- .5 Sand each coat of topping cement with fine sandpaper as required to produce smooth surface. Do not sand paper face of gypsum board.
- .6 Finish concealed fastener heads at fire rated gypsum board elements in manner specified for exposed work.
- .7 Finish concealed joints at fire rated and at acoustically insulated gypsum board elements in manner specified for exposed work.

### 3.4 CONTROL AND RELIEF JOINTS

- .1 Control Joints:
  - .1 Provide control joints where shown and at maximum 8 m o.c.
  - .2 Break continuity of gypsum board and framing system at control joints; install continuous metal control joint section.
- .2 Relief Joints:
  - .1 Provide relief joints where shown and where gypsum board assemblies abutt dissimilar construction.
  - .2 Stop gypsum board 6 mm from abutting construction at dissimilar building elements, unless otherwise indicated.
  - .3 Where gypsum board comes into contact with window frames or exterior door/screen frames install thermal break. Adhere self-sticking tape to casing bead and compress during installation of gypsum board.
  - .4 Where indicated, install reveal mouldings.

### 3.5 SOUND CONTROL

- .1 Acoustical Insulation: Provide acoustical insulation in gypsum board partitions and ceilings as indicated. Unless otherwise noted provide 50 mm thick insulation. Extend acoustical insulation over full height of partition, including portions located above ceiling.
- .2 Acoustical Caulking:
  - .1 Provide acoustical caulking at all partitions, bulkheads and ceilings scheduled to receive acoustical insulation as follows:
    - .1 At perimeter of gypsum board partitions and ceilings.
    - .2 Around objects penetrating gypsum board elements.
  - .2 Provide 2 bead caulking system around horizontal and vertical perimeters of partitions. Apply continuous sealant beads at each side of horizontal runner tracks and vertical end studs, between gypsum board and adjacent construction.
  - .3 Caulk around objects such as electrical outlets, light switches, electrical and mechanical panels and boxes, grilles, and other objects penetrating. Caulk behind metal control joint sections.
- .3 Where acoustically insulated partitions meet steel deck running perpendicularly to partition, provide steel deck closures.

### 3.6 DOOR FRAMES / ACCESS DOORS

- .1 Install access doors supplied by Mechanical and electrical Specifications. Build doors into gypsum board elements flush and parallel to walls and securely fastened.
- .2 Install steel door frames occurring in gypsum board partitions. Follow installation requirements specified in Section 08 11 00.

### 3.7 GYPSUM BOARD SCHEDULE

- .1 Use Type 'X' gypsum board at fire rated elements.

- .2 Use moisture resistant gypsum board where indicated.
- .3 Use abuse resistant gypsum board where indicated.
- .4 Use glass-face gypsum board sheathing in exterior applications.
- .5 Unless otherwise specified or shown, provide 16 mm thick standard gypsum board.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 03 35 00 Concrete Finishing  
.2 Section 07 92 00: Joint Sealants

**1.3 QUALITY ASSURANCE**

- .1 Installer Qualifications: not used

**1.4 SUBMITTALS**

- .1 Of each type of tile required, submit sample consisting of minimum 4 tiles bonded to rigid board back-up and joints filled with grout. Select tiles to show full range of tile to be used. Resubmit sample if required until tile range and group colour is approved by the Consultant.  
.2 Submit list of mortar mixes and grouts to be used. In each case products proposed must be suitable for the purpose intended and they shall be capable to produce top quality work. Upon Consultant's request submit evidence of material manufacturer's endorsement of products proposed.  
.3 Upon Consultant's request submit samples of bases, trim and fittings.  
.4 Maintenance materials: provide an additional 2% of each type/colour tile required. Clearly identify each package and store where directed. Obtain receipt.

**1.5 JOB CONDITIONS**

- .1 Maintain minimum air temperature of 10°C during installation and curing period.  
.2 Exclude construction traffic from areas to receive tile during installation and curing period.  
.3 Protect tile flooring subjected to construction traffic with non-staining protective covers.

2 Products

**2.1 MATERIALS**

- .1 Products by Laticrete listed herein are specified to establish a standard of acceptance. Equivalent products, subject to Consultant's review, by Mapei and H.B. Fuller (TEC) are also acceptable.  
.2 Water: potable and non-staining.  
.3 Portland cement: CAN/CSA-A5-03.  
.4 Sand: CSA A82.56-M1976.  
.5 Thick bed mortar: high strength latex-portland cement mix: Laticrete 226/3701/8510.  
.6 Thin set mortar: latex-portland cement mix: Laticrete 211/4237.  
.7 High strength mortar: 100% solids epoxy adhesive: Latapoxy 300.  
.8 Organic adhesive: latex adhesive to ANSI A136.1: Laticrete 15 Multi-Mastic.  
.9 Wall grout: Unsanded dry set, coloured: Laticrete 600 Series/1776; colours selected by Consultant.  
.10 Control joints: Schlüter DILEX-BWB, height to suit tile thickness, colour selected by Consultant.  
.11 Primer: ECO Prim Grip by Mapei.

- .12 Wall Tile: 150mm x 150mm, glazed wall tile; Allow for two (2) colours, as selected by the Consultant from the manufacturer's standard product line.
  - .1 Colour and Dimension Collection by Olympia, or
  - .2 Metropolis by Royal Mossa, or
  - .3 Bright and Matte Glazed Wall Tile by American Olean
- .13 Floor Tile: Size and colours as selected by the Consultant from the manufacturer's standard product line. Allow for two (2) colours.
  - .1 Centura
  - .2 Olympia Regal Series (Porcelain)
- .14 Cleaning compound: TTMAC 1001

## 2.2 MIXES

- .1 Mortar and grout: mix using suitable mechanical mixers in accordance with material manufacturer's directions.
- .2 Place liquid into mixer, start mixer and add dry material. Mix only long enough to wet out batch; do not overmix. Dump mixed material from mixer promptly and clean out mixer with water after each batch.

## 3 Execution

### 3.1 PREPARATION

- .1 Substrates shall be clean and free of foreign matter and minimum 10°C.
- .2 Clean substrates as required to produce acceptable surface.
- .3 Where substrate conditions require it, apply levelling coat and allow to cure.

### 3.2 TILE INSTALLATION

- .1 Unless otherwise specified, meet applicable requirements of TTMAC Tile Installation Manual 09°30°00; 2014 edition.
- .2 Bond tiles to substrate in accordance with mortar / adhesive manufacturer's directions and as follows:
  - .1 All locations except where indicated otherwise: thin set mortar.
  - .2 Gypsum board substrate: organic adhesive.
  - .3 Cement board substrates: high strength mortar.
- .3 Finished work shall be level, plumb, true, square and free of defective, chipped, broken, discoloured or blemished tiles. Maximum allowable finished surface variation shall be 3 mm in 3 m when measured, in any direction, with a 3 m straightedge.
- .4 Lay out tile patterns symmetrically within each area and to patterns shown. Unless otherwise indicated provide stacked pattern. Provide checkerboard pattern at quarry tile floors.
- .5 Joints shall be parallel, uniform, neat, straight, square and of width directed by Consultant.
- .6 Fit tile neatly against and around interruptions, penetrations and abutting dissimilar surfaces. Wherever possible, drill holes for penetrating elements to ensure neat fitting.
- .7 After setting, sound tiles and replace hollow backed tiles.
- .8 Provide tile manufacturer's standard trim pieces at changes in direction and at terminations. Unless otherwise indicated provide the following corner and edge conditions:
  - .1 Internal horizontal corners: coved joint.
  - .2 External vertical and horizontal corners and edges: bullnose.

- .3 Internal vertical corners and unexposed edges: square butt joint.
- .4 At steps provide tread tiles complete with right and left angle corner tiles where required.
- .9 Where tile abuts dissimilar flooring, install edge strip.

### **3.3 CONTROL JOINTS**

- .1 Provide control joints at substrate control joint locations, at abutting dissimilar materials and at maximum 8 m in tile field. Review control joint locations with Consultant prior to start of work.
- .2 Install control joints as recommended by material manufacturer. Set control joints slightly lower than finish tile surface.

### **3.4 GROUTING**

- .1 Commence grouting not earlier than 24 hours after setting tiles unless otherwise directed by grout manufacturer.
- .2 Force grout into joint so as to fill them flush, leaving no voids.
- .3 Promptly as work progresses remove excess grout from adjacent tile surfaces before grout establishes tight permanent adhesion.
- .4 Cure grout in accord with manufacturer's directions.
- .5 Provide epoxy grout for all floor joints.

### **3.5 CLEANING**

- .1 Thoroughly clean and polish all ceramic tile surfaces in accordance with material manufacturer's recommendations.
- .2 Remove grout haze from exposed tile surfaces; use acid wash if necessary.

### **END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 SUMMARY**

- .1 This Section includes requirements for supply and installation of ceilings consisting of acoustic panels, complete with exposed suspension system and trim.

**1.3 RELATED REQUIREMENTS**

- .1 Section 05 50 00: Metal Fabrications  
.2 Section 09 21 16: Gypsum Board Assemblies  
.3 Division 20: Mechanical fixtures  
.4 Division 26: Electrical fixtures

**1.4 QUALITY ASSURANCE**

- .1 The Contractor executing work of this Section shall have a minimum of five (5) years continuous Canadian experience in successful and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.  
.2 Comply with applicable requirements of ASTM C636.

**1.5 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.  
.2 Action Submittals: Provide the following submittals before starting any work of this Section:  
.1 Product Data: Submit product data for each type of product specified.  
.2 Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling mounted items indicating the following:  
.1 Ceiling suspension system members.  
.2 Method of attaching suspension system hangers to building structure.  
.3 Ceiling mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special mouldings at walls, column penetrations, and other junctures of acoustic ceilings with adjoining construction.  
.3 Samples for Initial Selection: Manufacturer's colour charts consisting of sections of acoustic panels, suspension systems, and trim showing the full range of colours, textures, and patterns available for each type of ceiling assembly indicated.  
.4 Samples for Verification: Full size units of each type of ceiling assembly indicated; in sets for each colour, texture, and pattern specified, showing the full range of variations expected in these characteristics:  
.1 150mm (6") square samples of each acoustic panel type, pattern, and colour.  
.2 Set of 305mm (12") long samples of exposed suspension system members, including trim, for each colour and system type required.  
.5 Maintenance and Materials:  
.1 Provide five percent (5%) of each type of acoustic ceiling panels and two percent (2%) of each suspension system and trim for future repairs. Identify cartons and place where directed by the Owner.  
.2 Maintenance materials shall be of same production run as installed materials.

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**1.6 DELIVERY, STORAGE, HANDLING AND PROTECTION**

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

**1.7 SITE CONDITIONS**

- .1 Install ceiling systems after building has been completely enclosed and not before cementitious building elements are complete and cured and humidity levels are acceptable in the opinion of the Consultant.
- .2 Ensure that work to be concealed by ceiling systems has been installed, tested, inspected and approved before starting work.
- .3 Co-ordinate with Divisions 20 and 26 for work to be built into work of this Section.

**2 Products**

**2.1 MANUFACTURERS**

- .1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include the following:
  - .1 Armstrong World Industries, Inc.
  - .2 Chicago Metallic
  - .3 CertainTeed
  - .4 CGC Ceilings, a USG Company

**2.2 DESIGN CRITERIA**

- .1 Superimposed Loads: Determine superimposed loads applied to suspension systems by components of the building and verify that adequate hangers are installed to support additional loads in conjunction with normal loads of the ceiling system, and as follows:
  - .1 Maximum Deflection: Limit deflection to L/360 in accordance with ASTM C635 deflection test.

**2.3 MATERIALS**

- .1 Acoustic Panels (ACT-1): Provide manufacturer's standard panels of configuration indicated in accordance with ASTM E1264 classifications as designated by the nominal values for types, patterns, acoustic ratings, and light reflectance class listed in this Section; with flame spread rating of 25 or less and smoke developed rating of 50 or less when tested in accordance with CAN/ULC S102 and as follows:
  - .1 Physical Properties: Type: III; Form: 2; Dimensions: 24" x 48" x 5/8"
  - .2 Edge Profile: Square Edge
  - .3 Colour: White.
  - .4 Acoustic and Visual Performance (Minimum Nominal):
    - .1 Noise Reduction Coefficient: 0.55
    - .2 Ceiling Attenuation Class: 35
    - .3 Light Reflectance: 0.82



- .5 Basis of Design Material: Cortega 769 by Armstrong World Industries, Inc., or Baroque #BET-197 by CertainTeed or approved alternate, as accepted by the Consultant.
- .2 Metal Suspension System - Acoustical Panel Ceilings: Manufacturer's standard direct hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635 requirements and as supplied by same materials supplier as acoustic panels for intermediate duty, exposed tee bar and as follows:
  - .1 Tee Bar Grid Face Width: 15/16".
  - .2 Module: Sized as appropriate to acoustic panel size.
  - .3 Hangers, Braces and Ties: Nominal 14 ga. diameter steel wire, galvanized.
  - .4 Exposed Finish: Manufacturer's standard satin, white finish.
  - .5 Corrosion Resistance: Hot-dip galvanized or stainless steel components.
  - .6 Basis of Design Material: 15/16" Prelude XL by Armstrong World Industries, Inc.
- .3 Tie Wire: 3/64" galvanized soft annealed steel wire.
- .4 Accessories: Miscellaneous 'U' clips, splicers, screws, anchors, nails, wire, hold-down clips for complete installation.
  - .1 Wall moulding: prefinished exposed face galvanized steel angle.

### 3 Execution

#### 3.1 CEILING LAYOUTS

- .1 Lay out ceilings in accordance with reflected ceiling plans and symmetrical within each area to obtain uniform borders. Where layout is not shown install ceilings as directed by Consultant.
- .2 Finished work shall be plumb, level and square with adjoining work.

#### 3.2 SUSPENSION SYSTEM

- .1 Suspend ceilings directly from structural elements. Do not suspend from ducts, pipes, conduits, steel roof deck.
- .2 Erect suspension systems level with a maximum tolerance of 3 mm over 3 m length.
- .3 Install main tees in accordance with module size. Suspend at maximum 1220 mm o.c.
- .4 Install cross tees perpendicular to main tees in accord with module size. Interlock with main tees.
- .5 Hangers for suspended ceilings shall support grillage independently of walls, columns, pipes and ducts. Space hangers at maximum 1220 mm o.c. along supporting grillage and not more than 150 mm from ends.
- .6 Make provisions for carrying fixtures occurring on and in suspended ceilings. Install additional hangers and reinforcing to ensure that loads being carried do not compromise integrity of system. Frame around fixtures and openings as required.
- .7 Where ductwork, piping and other elements within ceiling spaces interfere with direct suspension of ceiling from structure, install additional framing securely fastened to main structure to accommodate proper hanging of ceiling.
- .8 Exposed members shall be as long in length as practical to minimize joints. Distribute joints to prevent clustering in one area. Joints shall be made square, tight and flush so that exposed faces of intersecting members are on same plane.
- .9 Joints in suspension system members shall be reinforced with splines or other suitable methods.
- .10 Install perimeter moulding at abutting vertical surfaces.
- .11 Provide aluminum channel trim at perimeter of freefloating ceilings. Suspend trim independently. Mitre corners.

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- .12 Where work of other Sections is fastened to acoustical ceilings, reinforce suspension system and/or acoustical panels in manner acceptable to Consultant.

### **3.3 ACOUSTICAL PANELS**

- .1 Install panels so that work is clean and unmarked.
- .2 Neatly cut and fit panels as required to suit ceiling layout and to accommodate other work.
- .3 Recessed items shall replace or be centred on panel unless otherwise indicated.

### **3.4 CLEANING**

- .1 After installation, clean and touch up minor surface defects on acoustical panels and gypsum board panels.
- .2 Remove damaged and badly marked units and replace with new unmarked material.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 SUMMARY**

- .1 This Section includes, but is not limited to, the following:
- .1 Resilient tile materials:
    - .1 Vinyl composition floor tile for classrooms
  - .2 Resilient accessories:
    - .1 Resilient wall bases
    - .2 Resilient accessories for transition strips, area dividers

**1.3 RELATED REQUIREMENTS**

- .1 Section 03 35 00: Concrete Finishing
- .2 Section 09 21 16: Gypsum Board Assemblies
- .3 Section 09 30 00: Tiling
- .4 Section 09 91 00: Painting

**1.4 REFERENCES**

- .1 American Society for Testing and Materials (ASTM):
  - .1 ASTM F1066-04(2014)e1, Standard Specification for Vinyl Composition Floor Tile
  - .2 ASTM F1516-13, Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended)
  - .3 ASTM F1861-08(2012)e1, Standard Specification for Resilient Wall Base
  - .4 ASTM F1869-11, Standard Test Method for Measuring Moisture Vapour Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- .2 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction

**1.5 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Close spaces to traffic during flooring installation and until time period after installation recommended in writing by manufacturer; install flooring and accessories after other finishing operations, including painting and ceiling construction have been completed.
- .2 Pre-Installation Conference: Conduct conference at Project site in accordance with requirements of Section 01 31 19 Project Meetings, to verify project requirements, substrate conditions, patterns and layouts, coordination with other Sections affected by work of this Section, manufacturer's installation instructions and manufacturer's warranty requirements.

**1.6 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00 Submittals.
- .2 Action Submittals:
  - .1 Product Data: Submit one copy of product data for each type of product specified.

- .2 Shop Drawings: Submit shop drawings indicating:
  - .1 Location of seams and edges
  - .2 Location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cut-out locations
  - .3 Type and style of resilient transition strip used between adjacent flooring types
- .3 Samples for Selection: Submit manufacturer's colour charts and samples for initial selection consisting of full range of colours and patterns available for each type of product indicated.
- .4 Samples for Verification:
  - .1 Resilient Flooring: Submit samples of each different specified product for verification of colour and pattern in manufacturer's standard size, but not less than 6" x 6" in size for tile or sheet material, or 6" long for resilient accessories.
- .3 Informational Submittals: Provide the following submittals during the course of the work:
  - .1 Site Quality Control Test Results: Submit results or moisture emission testing of concrete subfloors prior to installation of flooring. Results shall include comparison of manufacturer's recommended moisture content to actual moisture vapour emission rate.
- .4 Maintenance Data and Operating Instructions:
  - .1 Operation and Maintenance Data: Submit manufacturer's written instructions for maintenance and cleaning procedures, include list of manufacturer recommended cleaning and maintenance products, and name of original installer and contact information in accordance with Section 01 33 00 Submittals: Operation and Maintenance Data.
- .5 Safety Data Sheets:
  - .1 Submit WHMIS safety data sheets for incorporation into the Operation and Maintenance Manual. Keep one copy of WHMIS safety data sheets on site for reference by workers.
- .6 Maintenance Materials:
  - .1 Provide 5% of each colour of vinyl composition tile and 30'-0" lineal feet coil stock of each colour of resilient base specified, boxed and labelled.
  - .2 Store maintenance materials on the premises as directed by the Owner.

## 1.7 QUALITY ASSURANCE

- .1 Contractor executing work of this Section shall have a minimum of five (5) years continuous Canadian experience in successful and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
- .2 Resilient Flooring Installer: Use an installer who is competent in heat welding and have a minimum of five (5) years documented experience in the installation of resilient sheet flooring and seams in accordance with manufacturer's training or certification program:

## 1.8 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with Construction Schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.
- .4 Restrict traffic by other trades during installation.

- .5 Provide adequate protection of completed tiled surfaces to prevent damage by other trades until final completion of this project. Minimum protection shall consist of kraftpaper.

## 1.9 ENVIRONMENTAL CONDITIONS

- .1 Temperature of room, floor surface and materials shall not be less than 21 deg C for 48 hours before, during and for 48 hours after installation. Concrete floors shall be aged for a minimum of 28 days and shall be dry before application of the resilient floor tile.
- .2 Moisture content of floor shall not exceed a maximum of 3 lbs. of water per 1,000 sq. ft. of concrete slab area over a 24 hour period as measured by one of the following methods, as approved by Consultant:
- .1 Rubber Manufacturer's Association (RMA) moisture test using anhydrous calcium chloride.
- .2 Does not exceed 3% as measured by Calcium Carbide Hygrometer procedure.
- .3 Does not exceed 5% as measured by normal Protimeter.
- .3 Avoid exposure to high humidity, cold drafts and abrupt temperature changes.

## 1.10 WARRANTY

- .1 Warrant the work of this Section against defects in materials and workmanship in accordance with the General Conditions but for an extended period of five (5) years and agree to repair or replace faulty materials or work which become evident during warranty period without cost to the Owner. Defects shall include, but not limited to, bond failure, and extensive colour fading.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Basis-of-Design Manufacturers: Manufacturers named in this Section were approved to provide work specified in this Section. Additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements indicated and provided requests for substitution are provided in accordance with Section 01 33 00 Submittals, a minimum of five (5) days in advance of Bid Closing.
- .2 Approved manufacturers:
- .1 Johnsonite
- .2 Armstrong Flooring

### 2.2 TILE FLOORING MATERIALS

- .1 Vinyl Composition Floor Tile (VCT): Asbestos free uniform in thickness with uniform colour and pattern through the full thickness, with straight, sharp and square edges and corners, accurately cut to size, conforming to ASTM F1066 and the following:
- .1 Classification: Class 2 – Through Pattern
- .2 Colour: As selected from manufacturer's standard range.
- .3 Thickness: 1/8"
- .4 Size 12" x 12"
- .5 Basis of Design Material: Standard Excelon Imperial Texture by Armstrong Flooring.
- .6 Wear-layer Thickness: 0.02"
- .7 Overall Thickness: 0.125"

### 2.3 RESILIENT ACCESSORIES

- .1 Resilient Wall Base (RB): Smooth, buffed exposed face and ribbed or grooved bonding surface supplied in maximum practical length, with pre-moulded end stops and external corners to match base, conforming to ASTM F1861 and as follows:
  - .1 Type: TP – Thermoplastic Rubber
  - .2 Group: 1 – Homogeneous
  - .3 Style: B – Cove
  - .4 Height: 4"
  - .5 Thickness: 1/8"
  - .6 Length: Manufacturers standard maximum length
- .2 Resilient Transition and Edge Strips: Extruded vinyl shapes meeting or exceeding ADA Recommendations for change of level transitions for transition between floors finishes having different levels, i.e.: between resilient flooring on underlayment to carpet with no cushion or underlayment; acceptable materials as follows:
  - .1 The following list is included to indicate the most commonly used transition and edge strip accessories; additional materials may be required where transition heights differ from the products listed and shall be included as a part of the Contract.
  - .2 Transition Strip: TS4 – Resilient Flooring to Concrete Slab Transition:  
Johnsonite SSR-XX-B Transitional Moulding between materials having a thickness to materials having no thickness; colour: selected from manufacturer's standard range.
- .3 Fillers and Primers:
  - .1 Types and brands approved, acceptable to flooring material and resilient base manufacturers for the applicable conditions. Use non-shrinking latex compound.
- .4 Resilient Floor Tile Adhesive:
  - .1 Standard Tile: Waterproof, clear setting type and brands as recommended by the tile manufacturer.
- .5 Polyethylene: 6" thickness conforming to CAN/CGSB-51.34.
- .6 Tape: Self adhesive 3" wide cloth tape.

### 3 Execution

#### 3.1 EXAMINATION

- .1 Testing and Inspections: Test moisture emission rate of concrete subfloor prior to installing flooring, using the calcium chloride test method in accordance with ASTM F1869.
- .2 Examine substrates, areas, and conditions affecting work are in accordance with manufacturer's requirements, and as follows:
  - .1 Verify that floor surfaces are smooth and flat to plus or minus 1/8" over 10'; notify Consultant in writing where floor tolerances are not within acceptable values.
  - .2 Verify that concrete slabs exhibit normal alkalinity of between 5 and 9 and that they are free of carbonization or dusting deleterious to flooring installation or adhesive bond.
  - .3 Verify that subfloors are free of cracks, ridges, depressions, scale, and foreign deposits that could interfere with flooring installation.

#### 3.2 PREPARATION

- .1 Comply with resilient flooring manufacturer's written installation instructions for preparing substrates indicated to receive flooring.
- .2 Fill cracks, holes, and depressions in substrates using trowellable levelling and patching compounds in accordance with manufacturers written instructions and as follows:

- .1 Levelling and patching shall be restricted to correcting minor deviations or imperfections to bring floor surface finish to within flooring manufacturers tolerances for flatness.
- .3 Remove coatings from concrete substrates, including curing compounds and other substances that are incompatible with flooring adhesives, and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer; do not use solvents.
- .4 Broom and vacuum clean substrates immediately before installing flooring.

### 3.3 INSTALLATION

- .1 Comply with resilient flooring manufacturer's written installation instructions.
- .2 Unroll flooring and allow stabilizing before cutting and fitting in accordance with manufacturer's installation instructions.
- .3 Apply primer in strict accordance with manufacturer's printed instructions. Permit primer to dry.
- .4 Apply adhesive uniformly with an approved notchtooth spreader at the recommended rate. (Mechanical spreader not approved). Do not spread more adhesive than can be covered before initial set takes place. Use waterproof adhesive throughout. Follow manufacturer's instructions.
- .5 Layout tile flooring as follows:
  - .1 Lay tile with joints parallel to building lines or as indicated on drawings to produce a symmetrical tile pattern.
  - .2 Install tile flooring so that perimeter tile width is minimum 1/2 full size.
- .6 Layout resilient base as follows:
  - .1 Fit joints tight and vertical.
  - .2 Joints along one plane shall be at minimum 23' spacing, at inconspicuous locations.
  - .3 Mitre internal corners, use pre-moulded sections for external corners and exposed ends.
  - .4 Install base on solid backing. Adhere tightly to wall and floor surfaces.
  - .5 Scribe and fit to door frames and other obstructions.
  - .6 Install outside corners prior to installation of straight sections.
  - .7 Install straight and level to variation of plus or minus 1/8" over 10' straight edge.
  - .8 Do not stretch base during installation.
  - .9 Shave back of base where necessary to produce snug fit to substrate.
- .7 Layout resilient accessories as follows:
  - .1 Install edge strips at unprotected and exposed edges where flooring terminates.
- .8 Accurately scribe tile around walls, and other floor conditions.
- .9 Each type of material used shall be from one manufacturer throughout the work and material in each area shall be of same production run.
- .10 Remove and replace loose, damaged and defective tiles where required and as directed by Consultant.

### 3.4 CLEANING, SEALING AND FINISHING

- .1 Cleaning, sealing and finishing of resilient tile flooring shall be performed using the cleaning, sealing and finishing materials specified of one manufacturer in accordance with the manufacturer's instructions and recommendations. Allow a minimum of four (4) days to elapse after completion of each resilient flooring installation before commencing cleaning, sealing, and finishing operations.
- .2 Work shall be handed over to the Owner free of blemishes and in perfect condition.

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END OF SECTION



1 General

1.1 GENERAL REQUIREMENTS

- .1 Comply with requirements of Division 1.

1.2 RELATED REQUIREMENTS

- .1 Section 04 20 00: Unit Masonry  
.2 Section 06 41 00: Architectural Wood Casework  
.3 Section 08 11 00: Metal Doors and Frames  
.4 Section 08 14 00: Wood Doors  
.5 Section 09 21 16: Gypsum Board Assemblies  
.6 Section 32 12 16: Asphalt Paving

1.3 SUBMITTALS

- .1 List of Materials:  
.1 Before ordering materials, submit written request in form acceptable to Consultant, for approval of paint materials. List each of the materials proposed and surfaces to be covered. State manufacturer's name and brand name of materials.  
.2 List of materials shall be endorsed by manufacturer as being the best material for the applicable condition.  
.3 Do not order material or commence work until list of materials is approved by Consultant.  
.2 Samples:  
.1 Submit two 200 mm x 250 mm colour draw downs of each paint colour coated with manufacturer's paint system to confirm colour match with colour chips supplied by Consultant.  
.2 Submit sample of natural and stained finishes on each species and grade of wood to receive such finishes.  
.3 Prepare full size samples showing each type of door finish.  
.4 Prepare sample panels of each wall and ceiling paint system specified, as directed by Consultant.  
.3 Maintenance Materials:  
.1 Upon completion of work provide one sealed and properly identified 1 L can of each type and colour paint used on this project.  
.2 Only top coating paints used in building interior are required.

1.4 MOCK-UP ROOM

- .1 Prior to start of any painting, prepare a mock-up room designated by Consultant.  
.2 Paint all surfaces including but not limited to walls, ceilings, doors and frames.

1.5 PRODUCT HANDLING

- .1 Deliver paint materials to site in sealed original labelled containers bearing manufacturer's name, brand name, type of paint and colour designation.  
.2 Store materials in strict accordance with manufacturer's recommendations.  
.3 Store paints, stains, varnishes, equipment in designated area inside building. Maintain separate workshop / storage area for duration of work by this Section.

## 1.6 SITE CONDITIONS

- .1 Environmental Conditions:
  - .1 Maintain temperature in interior areas to receive coatings between 15°C and 25°C for at least 24 hours before, during application and until coatings have cured after application. Apply exterior coatings only when temperature is above 10°C.
  - .2 Do not apply exterior coatings during periods of precipitation nor when precipitation is imminent.
  - .3 Do not apply coatings under direct sunlight during hot weather.
  - .4 Adequately ventilate areas where coatings are being applied. Maintain a reasonably dust-free atmosphere for duration of work.
- .2 Protection:
  - .1 Protect adjacent surfaces not scheduled to receive coatings from damage.
  - .2 Remove electrical plates, surface hardware, fittings and fastenings prior to painting operations. These items shall be carefully stored, cleaned and replaced on completion of work in each area. No solvent shall be used to clean hardware that will remove permanent lacquer finish on these items.
  - .3 Mask labels and specification plates occurring on equipment to be painted.
  - .4 Post "wet coating" signs and "no smoking" signs while work is in progress and while coatings are curing.
  - .5 Keep oily rags, wastes and other combustible materials in closed metal containers and remove at end of each work day. Take every precaution to avoid spontaneous combustion.
- .3 Work Schedule:
  - .1 Unless otherwise permitted, apply coatings only after all other Sections have completed their work.
  - .2 Co-ordinate work of this Section with that of Section 07 92 00 and review order of installation with Consultant where sealants are installed adjacent to painted surfaces.
  - .3 If it becomes necessary for the Owner to occupy areas of the building prior to their completion, schedule work of this Section to hours when occupants have vacated building.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Unless otherwise specified, materials shall be manufactured and supplied by one of the following:
  - .1 Benjamin-Moore
  - .2 or equal by Para Paints or PPG Canada Inc.- Architectural Finishes.

### 2.2 MATERIALS

- .1 Materials shall be "top line quality" products and shall be supplied by a single manufacturer except for specialty products not available from paint manufacturer.
- .2 Materials wherever possible shall be low odour products, free or low in VOC content.
- .3 Paints shall be factory mixed unless otherwise specified, except any coating in paste or powder form, or to be field-catalyzed shall be field-mixed in accordance with manufacturer's directions.
- .4 Primers shall be as specified by manufacturer and fully compatible with finish coats.

- .5 The contractor shall in all cases leave on-site in the property sealed can a minimum of one gallon of each colour and or type of paint used.
- .6 Metal and Glazed Surfaces Primed with: Fresh start All-Purpose 100% (K023)
- .7 Classrooms & all other areas not specified: Eco-Spec WB Semi-Gloss Finish (K376)
- .8 Interior Doors & Trim: Eco-Spec WB Semi-Gloss Finish (K376)
- .9 Millwork: Eco-Spec WB Semi-Gloss Finish (K376)
- .10 Exterior Doors & Trim: Impervo Alkyd High Gloss Enamel (K133)
- .11 Ceilings: Moores Latex Ceiling Paint (K258)
- .12 Natural Wood: Stays Clear Acrylic Urethane Satin Finish (K422)
- .13 Hallways: Eco-Spec WB Semi-Gloss Finish (K376)
- .14 Concrete floor sealer: S.C. Johnson "Securethane", Proseal "Prothane", Euclid "Ecuo-Thane" or Tennant "420 System".
- .15 New conc. block: Prime with block filler (K160) – by Benjamin Moore.
- .16 Driveway and Parking Line Marking: Super Spec HP Safety & Zone Marking Latex P58 by Benjamin Moore.

## 2.3 FINISHES

- .1 Paint colours and other finishes will be selected by Consultant. Do not start work until after receiving colour schedule.
- .2 Colours selected by the Consultant will not necessarily be from manufacturer's standard colours.
- .3 A variety of colours may be used. Consultant may select different colours for different elements such as ductwork, bulkheads, exposed decks, slabs and structural steel. Include for up to 15 colours, not including mechanical room colours listed below. Of these colours, up to 50% may be deep tones.
- .4 Confirm gloss levels for all surfaces with Consultant before starting work. Unless otherwise indicated, allow:
  - .1 Walls: semi-gloss
  - .2 Ceilings: semi-gloss
  - .3 Frames, doors, trim: semi-gloss.
- .5 Paint exposed piping, ductwork and conduits in mechanical and boiler rooms in colours directed by Consultant.

## 3 Execution

### 3.1 CONDITIONS OF SUBSTRATES

- .1 Sound, non-dusting, and free of grease, oil, dirt, and other matter detrimental to adhesion and appearance of coatings.
- .2 Temperature: minimum 13°C.
- .3 Moisture content: maximum 12%. Test for moisture content using moisture meter.
- .4 Alkalinity: test cementitious substrates for alkalinity. Use method recommended by coating manufacturer.

### 3.2 PREPARATION OF SUBSTRATES

- .1 All substrates: clean as required to produce an acceptable surface. If wood, metal or any other surface to be finished cannot be put in proper condition for finishing by cleaning, sanding and

- filling as specified, notify Consultant in writing or assume responsibility for an rectify any unsatisfactory finish resulting.
- .2 Wood generally: clean soiled surfaces; sand smooth and dust off; putty nail holes, splits, scratches, after prime coat has been applied and dried; colour putty to match finish; putty stained wood after stain application.
  - .3 Wood for paint: clean knots, pitch streaks and sappy sections of residue and seal with sealer before applying prime coat.
  - .4 Wood for transparent finish: clean knots, pitch streaks and sappy sections of residue and seal with white shellac; seal after applying stain. Apply filler to open grained woods, prior to application of stain unless directed otherwise by Consultant. Do not apply satin varnish coat until Consultant has inspected and approved gloss varnish coat.
  - .5 Bare ferrous metal: remove rust and scale; wash with solvent; chemically clean; apply coat of metal primer.
  - .6 Previously primed metal: remove rust, oil, grease and loose shop paint by washing or wire brushing; make good shop coat; feather out edges of touch-up.
  - .7 Zinc coated metal: wash and etch to dull paint receptive surface using an approved crystalline zinc phosphate or vinyl pretreatment.
  - .8 Hot dip galvanized steel: light brush blast.
  - .9 Unit masonry & concrete: fill minor cracks, holes and fissures with Polyfilla and smooth to a flush surface. Texture filled areas to match surrounding surface.
  - .10 Plaster: fill minor cracks, holes and fissures with patching plaster, allow to dry, smooth to a flush surface and texture filled area to match surrounding surface.
  - .11 Gypsum board: fill minor cracks, holes and imperfections with patching plaster; allow to dry and sand smooth; sand taped joints and remove dust.
  - .12 Alkaline surfaces: wash and neutralize using proper type of solution compatible with paint to be used.
  - .13 Previously painted surface need to be cleaned with TSP prior to priming.
  - .14 Existing gloss surface shall be dulled down with wet sandpaper.
  - .15 Existing oil based surfaces to be primed with Fresh start by Benjamin Moore.

### **3.3 BACK PRIMING**

- .1 Back prime wood schedule for paint or enamel finish immediately on arrival at site with interior or exterior primer as applicable.
- .2 Back prime wood scheduled for stain, varnish or natural finish immediately on arrival at site, with gloss varnish reduce 25% with mineral spirits.

### **3.4 APPLICATION OF COATINGS**

- .1 Apply paint by brush or roller, except on wood and metal surfaces where paint shall be applied by brush only.
- .2 Spray painting may be permitted where deemed advantageous and shall be subject to Consultant's approval. When spray painting is permitted, use only airless spray guns. Consultant may prohibit use of spray painting at any time for such reasons as carelessness, poor masking or protective measures, drifting paint fog, disturbance to other trades or failure to obtain a uniform satisfactory finish.
- .3 Applied and cured coatings shall be uniform in thickness, sheen, colour and texture and free of brush or roller marks, sags, crawls and other defects detrimental to appearance and performance.

- .4 Regardless of the number of coats specified for any surface, apply sufficient paint to completely cover and hide substrate and to produce a solid uniform appearance.
- .5 Thoroughly mix materials before application. Use same brand of paint for primer, intermediate and finish coats.
- .6 Where two or more coats of same paint are to be applied, undercoats shall be tinted in lighter shades of final coat to differentiate from final coat.
- .7 Touch up suction spots after application of first coat. Sand lightly between coats with fine sandpaper.
- .8 Each coat of finish shall be dry and hard before succeeding coats are applied with a minimum of 24 hours between coats, unless manufacturer's instructions state otherwise. Do not proceed with any coat until the last preceeding coat is approved by the Consultant.
- .9 Stained woodwork shall be covered with a uniform coat of stain and wiped off if required. Wood shall have uniform shade. Match stain so that dissimilar woods have uniform finished appearance.

### 3.5 PATCHING / TOUCH-UP

- .1 Prior to takeover of project by Owner, inspect work of this Section and touch-up or refinish damaged finishes and finishes unsatisfactory to Consultant.

### 3.6 SCHEDULE OF FINISHES

- .1 General Requirements:
  - .1 Paint or otherwise finish surfaces of building materials, building services and building accessories not otherwise protected or covered, as shown on Room Finish and Door Schedule, Drawings and as specified herein.
  - .2 In addition to finishing required by Room Finish and Door Schedules, Drawings and these Specifications, and unless otherwise specified, all work which is exposed to view and which is not prefinished shall be finished by this Section.
  - .3 In areas specifically designated as "unfinished" painting is not required except for bare, primed and zinc coated metal surfaces and insulated ductwork and pipes.
  - .4 Where exposed to view paint bare metals, previously primed metals and zinc coated metals unless specified otherwise.
  - .5 Paint behind surface mounted fixtures on walls and ceilings with full coats of paint.
  - .6 Paint walls behind wall mounted heating units with full coats of paint.
  - .7 Paint inside surfaces of light coves white.
  - .8 Finish tops of doors, trim, projections and other work as specified for surrounding work whether above site lines or not.
  - .9 Finish edges of doors to match face of door. Refinish edges of doors after fitting.
  - .10 Finish drawers on all sides, inside and outside. Unless otherwise indicated finish drawers with two coats of varnish.
  - .11 Paint tops, bottoms and edges of shelves with full specified coats, whether exposed to view or not.
  - .12 Paint interior of ducts at grilles and diffusers with two coats of flat black paint, so that duct interior is not visible when grilles and diffusers are installed.
  - .13 Paint piping, ducts and conduits in colours matching background wall or ceiling colours, unless otherwise directed by the Consultant. Ducts in mechanical rooms require only one finish coat in addition to primer. Other exposed ductwork to receive two finish coats.

- .14 Paint all gas piping whether exposed to view or not, with high-visibility yellow-orange paint meeting CGSB Colour Code #1-GP-12, Code 505-101 or equal.
  - .15 Unless specifically indicated to be painted, all finish carpentry work shall receive transparent finish.
  - .16 Unless specifically indicated otherwise paint all rooftop equipment and components, regardless of material and finish, including but not necessarily limited to mechanical rooftop equipment, vent stack flashings, sleeve flashings window washing anchors, but not including prefinished sheet steel flashings.
  - .17 Where finishing formula for surfaces requiring painting is not included hereunder, follow recommendations of Canadian Painting Contractor's Association Architectural Painting Specification Manual, latest issue.
- .2 Interior Finishing:
- .1 Concrete and concrete block:
    - .1 2 coats block filler
    - .2 1 coat primer, latex or PVA based
    - .3 2 coats acrylic latex
  - .2 Metal, prime painted:
    - .1 spot prime with alkyd metal primer
    - .2 2 coats acrylic latex
  - .3 Metal, zinc coated:
    - .1 1 coat galvanized primer
    - .2 2 coats acrylic latex
  - .4 Woodwork, painted:
    - .1 1 coat alkyd enamel undercoat
    - .2 2 coats acrylic latex
  - .5 Woodwork, stained and varnished (transparent finish):
    - .1 1 coat stain
    - .2 1 coat sanding sealer, sand lightly
    - .3 1 coat alkyd or polyurethane varnish, gloss
    - .4 1 coat alkyd or polyurethane varnish, satin
  - .6 Gypsum board:
    - .1 1 coat drywall primer
    - .2 2 coats acrylic latex
  - .7 Exposed piping, wrapped:
    - .1 1 coat block filler
    - .2 2 coats acrylic latex
  - .8 Exposed piping and conduit, unwrapped:
    - .1 1 coat alkyd metal primer
    - .2 2 coats acrylic latex
  - .9 Exposed ductwork, insulated:

- .1 1 coat block filler and primer
    - .2 2 coats acrylic latex
  - .10 Concrete floor (sealed)
    - .1 2 coats of sealer
- .3 Exterior Finishing:
  - .1 Metal, zinc coated (hot dip galvanized):
    - .1 1 coat epoxy primer
    - .2 2 coats aliphatic polyurethane
  - .2 Metal, zinc coated (inorganic zinc rich primer):
    - .1 1 coat epoxy primer
    - .2 2 coats aliphatic polyurethane
  - .3 Wood:
    - .1 2 coats solid colour stain
  - .4 Asphalt or Concrete Basketball Court:
    - .1 1 coat 100% acrylic emulsion.
    - .2 Second coat is required. Allow first coat 3-4 hours drying prior to application of second coat.
  - .5 Asphalt Driveway and Parking Line Marking:
    - .1 1 coat fast-dry latex coating.
- .4 Existing Interior Finishing:
  - .1 Previously painted Concrete and concrete block: (same finished colour)
    - .1 1 coat primer, latex or PVA based
    - .2 1 coat acrylic latex
  - .2 Previously painted Concrete and concrete block: (different finished colour)
    - .1 1 coat primer, latex or PVA based
    - .2 2 coats acrylic latex
  - .3 Previously painted Metal:
    - .1 1 coat acrylic latex primer
    - .2 1 coat acrylic latex
  - .4 Previously stained and varnished Woodwork, (transparent finish):
    - .1 Sand lightly
    - .2 1 coat sanding sealer, sand lightly
    - .3 1 coat alkyd or polyurethane varnish, gloss
    - .4 1 coat alkyd or polyurethane varnish, satin
  - .5 Previously painted Gypsum board:
    - .1 1 coat primer
    - .2 1 coats acrylic latex
  - .6 Previously painted Exposed piping:

- 
- .1 1 coat acrylic latex primer
  - .2 1 coat acrylic latex
- END OF SECTION



1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 SUMMARY**

- .1 Furnish all labour and materials necessary for the completion of work in this Section as shown on the Contract Drawings and specified herein.
- .2 Work in this Section includes but is not limited to:
- .1 Solid Phenolic Toilet Partitions
  - .2 Solid Phenolic Urinal Screens
  - .3 Hardware

**1.3 RELATED REQUIREMENTS**

- .1 Section 05 50 00: Metal Fabrications
- .2 Section 09 21 16: Gypsum Board Assemblies
- .3 Section 09 30 00: Tiling
- .4 Section 10 28 13: Washroom Accessories

**1.4 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Shop Drawings:
- .1 Submit shop drawings showing and describing in detail materials, finishes, dimensions, details of connections and fastenings elevations, plans, sections, thicknesses, hardware and any other pertinent information.
- .3 Samples:
- .1 Submit necessary templates and instructions where supports or anchors have to be built-in by others.
  - .2 Submit one sample of each of the following:
    - .1 Hinge, latch, panel fitting.
    - .2 Corner section, 305 mm x 305 mm (12" x 12") showing colour, corner, edge and core construction.

**1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION**

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location.
- .2 Do not permit delivery of work to job site until building is sufficiently dry, wet trades are completed and the moisture readings of surfaces in proposed storage area is less than 18%.
- .3 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Store materials flat on level surface. Protect materials with suitable non-staining waterproof coverings, but allow for air circulation at sides.

**1.6 EQUIVALENTS**

- .1 Items of this Section are listed by manufacturer's name and model for the purpose of establishing the standard required. Equivalent manufacturer's models will be accepted providing they comply in all respects with the published specifications and tests of the named manufacturer and are approved for design and workmanship.

## 1.7 WARRANTY

- .1 Warrant that the solid phenolic partitions and screens shall be free from defects in materials or workmanship in accordance with General Conditions for a period of ten (10) years and agree to promptly make good defects by replacing defective solid phenolic partitions and screens in finish to match original finish and in a manner satisfactory to Owner. Defects shall include, but not be limited to, bubbling, delamination of faces, or edges, warp, twist, bow exceeding 1/4" and telegraphing of core. "Replace" as used herein includes installing panels, pilasters, hardware, shoes including hanging and fitting doors.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Basis-of-Design products are named in this Section; additional manufacturers offering similar solid phenolic toilet partition systems may be incorporated into the work provided they meet the performance requirements established by the named products.
- .2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
  - .1 Floor Anchored Toilet Partitions:
    - .1 Phenolic Black Core by ASI Global Partitions
    - .2 Solid Phenolic DuraLine Series 1080 by Bobrick Washroom Equipment Inc.
    - .3 Phenolic Black Core Floor Anchored Toilet Compartments by Global Partitions or approved equal.

### 2.2 MATERIALS

- .1 Solid Phenolic, Melamine Surfaced, Panels, Pilasters and Doors:
  - .1 Plastic Laminate Face Sheets: High pressure, paper based, melamine surfaced, laminated plastic sheets, conforming to CAN3-A172-M, with thickness tolerances in accordance with Table 1 of CAN3-A172-M and plastic laminate grades as follows:
    - .1 Cores: Solid phenolic type core material.
      - .1 Colour: Black.
      - .2 Thicknesses: As specified herein.
- .2 Bituminous Paint: Conforms to CAN/CGSB-1.108-M, Type 2.
- .3 Butyl Tape: Extruded, High grade macro-polyisobutylene tape of width and shore hardness to suit conditions.
- .4 Building Paper: Conforms to CAN/CGSB-51.32-M.
- .5 Hardware and Fittings (Institutional):
  - .1 Hinges: 0.063" thick (16 gauge) x 2" wide continuous stainless steel piano hinge with 1/8" diameter stainless steel pin and extends full height of doors.
  - .2 Door Latches: 0.079" thick (14 gauge) stainless steel type slide type on nylon track. Provide "C" type pulls at compartments for handicapped.
  - .3 Door Keepers: 0.125" thick (11 gauge) stainless steel type.
  - .4 Coat Hooks: Stainless steel type with rubber bumper on end.
  - .5 Door Stops: 0.125" thick (11 gauge) stainless steel type designed to prevent the door from being kicked out of compartment.

- .6 'U' Channels: 0.047" thick (18 gauge) continuous 'U' shaped stainless steel channel extending full height of panels and screens.
- .7 Hardware Material and Finish: Stainless steel shall be AISI 18-8 type 304 alloy conforming to ASTM A167-92b.
- .8 Hardware Fasteners: Vandal resistant, torx stainless steel machine screws installed from inside compartments. Door hardware shall also have factory installed threaded metal inserts in doors and pilasters.
- .9 Provide reinforcement for washroom accessories as required to preserve integrity of partition panels and as required to ensure secure attachment of accessories.
- .10 Top connection of pilaster for ceiling hung partitions shall consist of 3/4" diameter threaded rods complete with spacer and nuts and a 3" die-formed stainless steel pilaster shoe. Stainless steel shall be 0.024" thick, AISI type 304 stainless steel alloy conforming to ASTM A167-92b.
- .11 Install matching 3/4" thick x 4" wide overhead bracing between pilasters for reinforcing. Fasten with stainless steel plates and screws on the inside of each stall.

## 2.3 FINISHES

- .1 Melamine Surface Sheet Colours:
  - .1 Colours: As selected by the Consultant from the manufacturers standard product line.
- .2 Stainless Steel:
  - .1 "No.4" brushed finish.

## 2.4 FABRICATION AND MANUFACTURE

- .1 Shop fabricate toilet partitions. Overall dimensions 1000mm X 1000mm.
- .2 Take site measurements for areas where partitions are to be located and fabricate to suit site dimensions
- .3 Fabricate doors, panels and pilasters from solid phenolic core material with high pressure matte plastic laminate surfaces fused to core. Edges shall be "black". Stiles and doors shall have a finished thickness of 3/4" thick. Panels shall be 1/2" thick.
- .4 Check sizes and locations for washroom accessories and if necessary, reinforce panels.
- .5 Prepare panels to accept tissue dispensers and grab bars where indicated on drawings.
- .6 Design supports to withstand, within acceptable deflection limitations, their own weight, the weight of the toilet partitions, loads imposed by the motion of partition doors and all live loads, which might be applied to the toilet partitions in the course of their normal function. Design supports as required to accommodate structural deflection. Build in reinforcing to support the grab bars and withstand a downward pull of 500lbs. at any point on the grab bar. Provide additional stainless steel brackets as required to stabilize pilasters to consultants approval.

## 3 Execution

### 3.1 INSPECTION

- .1 Check areas scheduled to receive partitions and urinal screens for correct dimensions, plumbness of walls and soundness of surfaces that would affect installation of holding brackets.
- .2 Verify spacing of plumbing fixtures to assure compatibility with installation of partitions.
- .3 Do not begin installation of partitions until conditions are satisfactory and agreement on details with the owners or contractors were well understood.

### 3.2 INSTALLATION

- .1 Install partitions and urinal screens in strict accordance with manufacturer's installation recommendations.
- .2 Install partitions and urinal screens plumb, level and securely fastened in the locations shown on the drawings.
- .3 Perform drilling of steel, masonry and concrete necessary to install the work of this Section.
- .4 Co-ordinate installation with the work of trades providing wall and floor finishes, washroom accessories and other adjacent partitions and constructions.
- .5 Isolate contact surfaces to prevent electrolysis due to metal contact with masonry, concrete or dissimilar metal surfaces. Use bituminous paint, building paper, butyl tape or other approved means.
- .6 Install hardware supplied under this Section and ensure that it is visually aligned.
- .7 Securely install panels to walls and pilasters with fittings to make a strong and rigid installation.
- .8 Locate wall channels so that holes for mounting occur in ceramic tile joints.
- .9 Install urinal screens to locations on walls as indicated on drawings, plumb, level and rigidly secured in place.
- .10 Install partitions allowing the following clearances and tolerances:
  - .1 Between panel edges and wall: 1" + 1/8".
  - .2 Between partition panel edge and pilaster panel: 1/2" + 1/8".
  - .3 Between pilaster panel edge and door edge: 3/16" + 1/16". Ensure that partitions are visually aligned from all view points.

### **3.3 ADJUSTMENT**

- .1 Upon completion of the work or when directed, remove all traces of protective coating or paper, and polish compartments.
- .2 Test hinges, locks and latches and where necessary, adjust and lubricate. Set hinges so that doors stand open 30° when compartment is not in use. Ensure that compartments are in working order.

### **3.4 CLEANING**

- .1 Clean and make good surfaces soiled or otherwise damaged in connection with the work of this Section. Replacing finishes or materials that cannot be satisfactorily cleaned.
- .2 Upon completion of the work, remove all debris, equipment and excess material resulting from the work of this Section from the site.

### **END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 SUMMARY**

- .1 Furnish labour, materials and other services to complete the fabrication and installation of;
- .1 Washroom accessories and framed mirrors and
  - .2 Attachment hardware.
- .2 Include all materials and fitments required for the operation of any unit furnished, in the manner, direction and performance shown on the shop drawings and specified herein.

**1.3 RELATED REQUIREMENTS**

- .1 Section 06 10 00: Rough Carpentry
- .2 Section 09 21 16: Gypsum Board Assemblies
- .3 Section 09 30 00: Tiling
- .4 Section 10 21 13.19: Solid Phenolic Toilet Compartments

**1.4 REFERENCES**

- .1 American Society for Testing and Materials (ASTM):
- .1 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
  - .2 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .3 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
  - .4 ASTM A1008/A1008M-12a, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

**1.5 SUBMITTALS**

- .1 Provide submittals specified and as required to assess conformance with the Contract Documents, in accordance with Section 01 33 00 Submittals.
- .2 Shop Drawings: Show and describe in detail, materials, finishes, dimensions, details of connections and fastenings, elevations, plans, sections, metal gauges, hardware and any other pertinent information.
- .3 Coordinate the work of this Section with the placement of internal wall reinforcement.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, under cover storage location.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store materials in original, undamaged containers or wrappings with manufacturer's seals and labels intact.
- .4 Unsatisfactory materials shall be removed from the site.

- .5 Adequately protect the structure and work of other Sections during delivery, storage, handling and execution of the work of the Section.
- .6 Provide tools, plant and other equipment required for the proper execution of the work of this Section.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Section 01 33 00 Submittals.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
  - .1 ASI Watrous - Global Partitions
  - .2 Bobrick
  - .3 Frost
  - .4 Koala Kare
  - .5 Dyson

### 2.2 MATERIALS

- .1 Provide one of the products indicated for each designation in the Washroom and Custodial Accessory Schedule below, subject to compliance with specified requirements.
- .2 Stainless Steel: In accordance with ASTM A666, Type 304, with No. 4 finish (satin); minimum nominal thickness as established by product type.
- .3 Sheet Steel: Steel: In accordance with ASTM A1008/A1008M, cold rolled, commercial quality; minimum nominal thickness as established by product type; surface preparation and metal pretreatment as required for applied finish.
- .4 Galvanized Steel Sheet: In accordance with ASTM A653/A653M, minimum Z180 coating designation.
- .5 Galvanized Steel Mounting Devices: In accordance with ASTM A153/A153M, hot dip galvanized after fabrication.
- .6 Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

### 2.3 FABRICATION

- .1 Washroom and Custodial Accessories:
  - .1 Surface Mounted:
    - .1 Fabricate units with tight seams and joints, and exposed edges rolled.
    - .2 Hang doors and access panels with continuous stainless steel hinge.
    - .3 Provide concealed anchorage where possible.
  - .2 Recessed Mounted:
    - .1 Fabricate units of all welded construction, without mitred corners.
    - .2 Hang doors and access panels with full length, stainless steel hinge.
    - .3 Provide anchorage that is fully concealed when unit is closed.

- .2 Workmanship shall be best grade of modern shop practice known to recognized manufacturers specializing in this work. Joints and intersecting members shall be accurately fitted, made in true planes with adequate fastening. Wherever possible fastenings shall be concealed.
- .3 Isolate where necessary to prevent electrolysis between dissimilar metal to metal or metal to masonry or concrete contact.
- .4 Fabricate and erect work square, plumb, straight, true and accurately fitted. Provide adequate reinforcing and anchorage.
- .5 Drilling shall be reamed and exposed edges left clean and smooth.
- .6 Include anchors and fastenings necessary to anchor work of this Section.
- .7 Coordinate with Section 06 10 00: Rough Carpentry, for wood blocking for attachment of washroom accessories.
- .8 Keys: Provide universal keys for internal access to accessories for servicing and re-supplying. Provide minimum of six (6) keys to Owner's representative.

### 3 Execution

#### 3.1 EXAMINATION

- .1 Inspect surfaces over which the work of this Section is dependent for any irregularities detrimental to the application and performance of the work. Notify Consultant in writing of all conditions which are at variance with those in the Contract Documents and/or detrimental to the proper and timely installation of the work of this Section. The decision regarding corrective measures shall be obtained from the Consultant prior to proceeding with the affected work.
- .2 Commencement of work of this Section implies acceptance of surfaces and conditions.

#### 3.2 INSTALLATION

- .1 Make thorough examination of drawings and details, determine the intent, extent, materials, conditions of interfacing with other work and be fully cognizant of requirements.
- .2 Work of this Section shall include complete installation of items specified herein. Installation shall be in strict accordance with manufacturer's printed instructions.
- .3 Securely fasten accessories, level and plumb in the locations shown on the drawings and specified herein. All fastenings shall be concealed.
- .4 Co-ordinate the work of this Section with the work of other Sections to provide the necessary recesses, edge conditions wood blocking for the accessories as required.
- .5 Do all drilling of steel, masonry and concrete necessary for the anchorage of the work.
- .6 Installed grab bars shall be capable of supporting a downward pull of 500 lbs. per lineal foot.

#### 3.3 ADJUSTING

- .1 Check mechanisms, hinges, locks and latches, adjust and lubricate to ensure that accessories are in perfect working order.

#### 3.4 CLEANING

- .1 Upon completion of the work of this Section or when directed by Consultant, remove all protective coatings, and coverings. Clean and polish exposed surfaces.

#### 3.5 WASHROOM AND CUSTODIAL ACCESSORY SCHEDULE

No.	Description / Model
MR	Mirror (Flat): Framed, 610mm (24") high x 460mm (18") wide, fixed installation, mounted 1000mm (40") to bottom of frame:

	ASI Bobrick	0600-1824 B-290x1824
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**3.6 WASHROOM ACCESSORY SCHEDULE – SUPPLIED BY THE SCHOOL BOARD**

PTD	Paper Towel Dispenser: Supplied by school board and installed by Contractor.
TTD	Toilet Tissue Dispenser: Supplied by school board and installed by Contractor.
SD	Soap Dispenser: Supplied by school board and installed by Contractor.

**END OF SECTION**



1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 DELIVERY, STORAGE, AND HANDLING**

- .1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.

**1.3 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.
- .2 Shop drawings:
- .1 Indicate the following: methods of anchoring, thickness and finishes of materials, relationship of work of other sections, including all required cutouts, and all other pertinent data and information.
- .3 Maintenance data: Three copies of instructions covering cleaning, replacement and other relevant maintenance data.
- .4 Extended Warranty: Submit a written warranty in accordance with Section 01 33 00.
- .1 Warranty period of 5 years
- .2 Commencement: Substantial Performance of the Work

2 Products

**2.1 MATERIALS**

- .1 Provide reinforcing, fastenings, and anchorage required for building in.
- .2 Insulate between dissimilar metals, and metal and incompatible materials to prevent electrolysis with bituminous paint or other approved means.
- .3 Do not attach manufacturer's name or trademark, plates, imprints or labels to products unless approved by Consultant.

**2.2 FABRICATION**

- .1 Verify site dimensions prior to fabrication. Fabricate work true to dimensions and square. Finished work shall be free from distortion and defects detrimental to appearance and performance.

**2.3 MISCELLANEOUS SPECIALTIES**

- .1 Refer to drawings and schedules for items required but not specified herein.

**2.4 FLOOR EXPANSION JOINTS**

- .1 Interior Floor-to-Floor Joint System:
- .1 Type: Elastomeric Seal.
- .2 Exposed Metal: Aluminum; Finish: Mill.
- .3 Seal Materials: Thermoplastic Rubber (TPR).
- .4 Colour: Black.
- .5 Gaskets to be dual durometer, flat profile, free of ridges/reveals.
- .6 Attachment" Mechanical anchors.

- .7 Load Capacity: Standard duty.
- .8 Basis of Design Materials: Model GFT by Construction Specialties.

3 Execution

**3.1 INSTALLATION**

- .1 Securely fasten work level and plumb in the locations shown on the drawings and as specified herein.
- .2 Co-ordinate installation with the work of Sections providing adjacent construction as required.
- .3 Execute electrical work by qualified electricians and in compliance with the Canadian Electrical Code and other requirements of authorities having jurisdiction.

**3.2 ADJUSTMENT**

- .1 Upon completion of the work or when directed, remove all traces of protective coatings or paper.
- .2 Test operation, adjust, lubricate and ensure that accessories are in perfect working order.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

**1.2 SUMMARY**

- .1 This Section includes supply and installation of manual chain operated roller type fabric shade assembly consisting of the following:
- .1 Shade housing complete with fascia
  - .2 Single, blackout sunscreen fabric shade material

**1.3 RELATED REQUIREMENTS**

- .1 Section 08 51 13: Aluminum Windows
- .2 Section 09 21 16: Gypsum Board Assemblies
- .3 Section 09 51 00: Acoustical Ceilings
- .4 Section 09 91 00: Painting

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-Construction Conference: Arrange a site meeting attended by the Contractor, the Subcontractor, the Consultant, materials supplier(s), and other relevant personnel before commencement of work for this Section; as indicated in Section 01 31 13 Project Meetings.

**1.5 SUBMITTALS**

- .1 Submit submittals in accordance with the Contract Requirements and Section 01 33 00.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
- .1 Shop Drawings: Submit shop drawings showing and describing details of opening sizes, clearances, handing of operating chains, anchorage, assembly, materials, components, finishes and assembly.
  - .2 Samples: Submit 305 mm x 305 mm (12" x 12") samples of the manufacturer's full range of shade fabric and colours available for later selection by the Consultant.
- .3 Closeout Submittals:
- .1 Operation and Maintenance Data: Submit copies of manufacturers maintenance data sheets in accordance with Section 01 33 00 Submittal Procedures, and as follows:
    - .1 Provide written literature and instructions to Owner's personnel addressing maintenance and replacement of fabric shades specified in this Section.
    - .2 Provide specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
    - .3 Record Documentation: Submit as constructed information in accordance with Section 01 31 13 Project Coordination.

**1.6 QUALITY ASSURANCE**

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
- .1 Manufacturer / Supplier: Obtain materials from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties

- .2 Installers: Execute Work of this Section using qualified personnel skilled in installation of work of this Section, having a minimum of five (5) years proven experience of installations similar in material, design, and extent to that indicated for this Project.

## 1.7 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange for suitable storage (if required).
- .2 Fabric shades shall be carefully checked, handled, unloaded and stored to prevent damage. If damaged during delivery, handling, unloading, storage or installation, fabric shades shall be returned to the fabrication shop for repairs or replacement as deemed necessary by the Consultant.
- .3 Store fabric shades in fabricator's original, undamaged containers.

## 1.8 WARRANTY

- .1 Manufacturer Warranty: Provide manufacturer's warranty from commencing from date of Substantial Performance covering the following minimum requirements for materials:
  - .1 Shade Fabric/Shade Cloth: ten (10) years.
  - .2 Metal Coatings: ten (10) years.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Basis-of-Design products are named in this Section; form the basis-of-design materials for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests a minimum of five (5) days in advance of Bid Closing.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - .1 Solarfective Products Limited
  - .2 MechoShade Systems Inc.
  - .3 Silent Gliss Canada Limited

### 2.2 COMPONENTS

- .1 Shade Roller Tubes:
  - .1 Minimum 2.3 mm thick x 38 mm diameter (0.09" thick x 1-1/2" diameter) extruded AA 6063-T5 aluminum alloy tube having three equally spaced internal reinforcing fins and two shade fabric mounting "keyway" type channels running full lengths of outside surface of the roller tubes. Roller tubes shall be removable, interchangeable without; removing the drive assembly, resetting the block or re-adjusting preset stops.
- .2 End Brackets:
  - .1 Two piece, moulded ABS type end brackets with nylon drive sprocket colour matched to fascia/soffit.
- .3 Mounting Brackets/Clips:
  - .1 Formed from minimum 1.6 mm (0.063") thick electro-galvanized, bonderized cold rolled steel with baked enamel finish.
  - .2 Mounting brackets/clips shall be capable of mounting inside, or outside, or to the ceiling with spring clutch drive assembly on either side for right hand or left hand operation.

- .4 Drive Assemblies:
  - .1 Factory set, spring clutch type drive assembly to suit size and travel of fabric shades, complete with built-in shock absorber system to prevent chain breakage under normal conditions, and balancing spring or lift assist mechanism.
  - .2 Drive assemblies shall be capable of being field adjusted from exterior of shade without having to disassemble the shades
- .5 Drive Chains:
  - .1 No. 10 nickel plated brass bead type chain or "bright" finished AISI Series 300 stainless steel alloy bead type chain forming continuous loops and capable of withstanding 400N pull test.
  - .2 Provide drive chains with upper and lower stops to prevent overwinding or underwinding.
- .6 Fascias/Soffits:
  - .1 Minimum 1.7 mm (0.067") thick extruded AA 6063-T5 aluminum alloy fascia/soffits of single lengths to suit each shade panel, designed to snap onto end brackets without any exposed fasteners and having spray painted baked enamel finish.
- .7 Custom Trims:
  - .1 Minimum 1.7 mm (0.067") thick extruded AA 6063-T5 aluminum alloy custom trims to shapes and profiles as indicated, of single lengths to suit conditions, designed to snap onto end brackets without any exposed fasteners and having spray painted baked enamel finish.
- .8 Shade Mounting Splines:
  - .1 Continuous, single piece, extruded vinyl type shade mounting spline having asymmetrical "keyway" insertion locking channels, embossed fabric guides and having sufficient holding capacity to hold fabric shade when spline is snapped in and locked in roller tube.
  - .2 Shade mounting splines shall be readily removable without removing roller tubes from end brackets or removing brackets from wall/window framing.
- .9 Shade Hem Bars:
  - .1 Provide electro-galvanized, bonderized steel flat bar, or prefinished extruded AA 6063-T5 aluminum alloy type shade hem bars, of single lengths to suit each shade panel and sufficient weight to hang shade fabric panel without buckling or distortion.
- .10 Shade Operation:
  - .1 Window Blind (WB-1): Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
- .11 Shade Fabric:
  - .1 Blackout fabric, 4 ply construction consisting of 1 ply woven fibreglass and 3 ply PVC film; meeting NFPA 701.
    - .1 Weight Per Sq. Yd.: 12 oz.
    - .2 Width: 72".
  - .2 Fabric shall be dimensionally stable, tensioned in the finishing range prior to heat setting to keep warp ends straight and minimize or eliminate weave distortion and keep fabric flat. Fabric shall hang flat, without buckling or distortion. Edges when trimmed, shall hang straight without raveling. Unguided shade fabric shall roll true and straight without shifting sideways more than  $\pm 1/8$ " in either direction due to warp distortion or weave design.
  - .3 Shade fabric shall be from same dye lot.

- .4 Colour: As selected later by Consultant from the manufacturer's standard project line.
- .5 Basis of Design Materials: Solarstop by Solarfective.
- .12 Fasteners:
  - .1 AISI 300 Series stainless steel alloy, self-tapping type metal screws concealed in completed installation.
- .13 Butyl Tape:
  - .1 Extruded, high grade, macro-polyisobutylene tape of size, width and shore hardness to suit conditions.
- .14 Miscellaneous:
  - .1 Provide all non-corrosive anchors, washers, shims, butyl tape, drills tools and equipment necessary to complete the work of this Section.

## 2.3 CONTROLS

- .1 Basic Control Functions: Manual Switch Control: Shade manufacturer's standard control system including the following characteristics:
  - .1 Zone Control:
    - .1 Power roller shade motor shall using 3 conductor (plus ground) wire connected to dry contact relay system; supplied in groupings of even units mounted in junction boxes supplied under this section; include identification labels clearly indicating Zones that are controlled.
    - .2 Wire Zone control switches to dry contact relays using a low voltage 4 conductor wire.
    - .3 Terminate wiring in dry contact relays using disconnect plug configuration.
    - .4 Control system shall have the ability to upgrade to fully computerized control system without adding any additional wiring.

## 2.4 FABRICATION

- .1 Prior to fabrication, the actual dimensions of openings must be verified by accurate site measurements taken by the fabricator himself.
- .2 Fabricate fabric shades to completely fill the openings from head to sill and from jamb to jamb, excluding fabrication and installation clearances.
- .3 Install hem bars at bottoms of fabric shades, providing double thickness of shade fabric on room side and securely sew-in hem bar, with continuous hem just above hem bar and at both ends of hem bar.
- .4 Securely install fabric shades in roller tubes "keyway" channels with shade mounting splines.
- .5 Fabricate aluminum fascia/soffits and custom trims of single length piece to suit location of each fabric shade, free of splices or joints.
- .6 For multiple window installations, fabricate fabric shades so that the ends occur only over mullions or over defined vertical separations.
- .7 Fabricate fabric shades for full operation.
- .8 Hand manual chain operators in suitable positions for each room, confirmed by the Consultant and Owner/Tenant.
- .9 Manual Operation:
  - .1 Fabric shades shall be operated by chain and sprocket assembly incorporating an adjustable slip clutch to control the rate of fall, from free running to zero friction factor, to 100% friction factor.

- .2 Fabric shades shall be adjustable to stop and hold at an infinite number of positions, to be adjustable at any percentage of friction and to control the fall rate of the fabric shades.
- .3 When position of fabric shades are set as free fall, system shall be mechanical by use of chain retainer.
- .4 Highest and lowest fabric shade position shall have automatic stops to prevent overwinding or unrolling.

## 2.5 FINISHES

- .1 Aluminum Fascia/Soffits and Custom Trims:
  - .1 Ultra-violet light resistant polyester powder coating finish in colours to match adjacent aluminum framing finish colour.
  - .2 Protect finish with strippable protective film.
- .2 Mounting brackets/clips shall have painted finish, with colour, gloss and sheen to match baked enamel finish.
- .3 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use butyl tape or other approved divorcing material.

## 3 Execution

### 3.1 EXAMINATION

- .1 Prior to installation, inspect fabric shades for damage and correct sizing. Do not install damaged or incorrectly sized fabric shades. Send fabric shades back to fabricator for repairs and/or replacement.

### 3.2 INSTALLATION

- .1 Coordinate work of this Section with work of other sections.
- .2 Install fabric shades to windows as indicated on drawings using fasteners as specified herein, plumb, true, square, straight and level in proper planes, complete with all fascias/soffits, custom trims and accessories in strict accordance with the manufacturer's written instructions.

### 3.3 ADJUSTMENT AND CLEANING

- .1 Adjust, correct and lubricate fabric shades as required, to provide smooth and efficient operation without binding.
- .2 Clean fabric shade surfaces and remove all finger marks and smudges from fascias/soffits and custom trim surfaces. Remove all protective metal films. Where fabric and surfaces cannot be satisfactory cleaned, in the opinion of the Consultant/Owner/Tenant, then such fabric and surfaces shall be replaced without cost to Owner/Tenant.
- .3 Leave fabric shades in raised position and in first-class condition upon completion of the work of this Section.

## END OF SECTION

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 31 50 00 Excavation Support and Protection

**1.3 PROTECTION**

- .1 Prevent damage to adjacent property and to areas scheduled to remain unchanged. Make good any damage caused by site clearing operations.
- .2 Ensure that temporary fencing / hoarding is in place prior to start of work.

2 Products

**Not Used**

3 Execution

**3.1 EXAMINATION**

- .1 Visit the site and examine existing conditions and so as to understand the extent of work required.

**3.2 SALVAGE**

- .1 Prior to start of general site clearing operations carefully remove and salvage items required for reuse and items designated to be turned over to the Owner. Store salvaged items on site, in protected area, designated by Consultant.

**3.3 CLEARING OPERATIONS**

- .1 Remove existing items, components, features as required to accommodate new work, including but not limited to trees, shrubs, fences, poles, paving curbs.
- .2 Notwithstanding requirements specified herein, retain existing items specifically indicated to be retained.
- .3 Trees and shrubs:
  - .1 Cut down existing trees and shrubs where indicated and as required to accommodate new work. Review with Consultant prior to start of work, extent of trees to be removed.
  - .2 Grub out stumps and root systems to minimum 750 mm below new finish grade or deeper where required by new work. Below building and paved areas, grub out root systems completely.
  - .3 Grub out, where encountered, root systems of existing trees, previously cut by others.
- .4 Topsoil:
  - .1 Strip topsoil in areas of building, paving and where grades are altered.
  - .2 Strip topsoil to its full depth, but do not contaminate with subsoil.
  - .3 Stockpile topsoil required and suitable for reuse.

**3.4 DISPOSAL OF MATERIAL**

- .1 Except where specifically indicated otherwise herein, remove from site and legally dispose of all materials, rubbish and debris resulting from site clearing operations.



- .2 Disposal of material from the site and all disposal fees associated are to be included in the contract.

**END OF SECTION**

1 General

**1.1 RELATED SECTIONS**

- .1 Section 312310 – Removals, Excavating, Trenching and Backfilling.
- .2 Section 320191 - Tree and Shrub Preservation.

**1.2 DEFINITIONS**

- .1 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .2 Grubbing consists of excavation and disposal of stumps and roots to not less than a specified depth below existing ground surface.

**1.3 STORAGE AND PROTECTION**

- .1 Prevent damage to trees, landscaping, natural features, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
  - .1 Repair any damaged items to approval of Project Manager / Consultant.
  - .2 Replace any trees designated to remain, if damaged, as directed by Project Manager / Consultant.

2 Products

**2.1 MATERIALS**

- .1 Soil Material for Fill: Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

3 Execution

**3.1 PREPARATION**

- .1 Inspect site and verify with Project Manager / Consultant, items designated to remain.
- .2 Locate and protect all utility lines. Preserve in operating condition active utilities traversing site.
- .3 Notify all utility authorities before starting clearing and grubbing.

**3.2 ISOLATED TREES**

- .1 Apply and obtain tree permits from City of Kingston as required.
- .2 Cut off isolated trees as directed by Project Manager / Consultant at height of not more than 300mm above ground surface.
- .3 Grub out isolated tree stumps.

**3.3 GRUBBING**

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m<sup>3</sup>.
- .4 Fill depressions made by grubbing with suitable material and make new surface conform to existing adjacent surface of ground.

**3.4 REMOVAL AND DISPOSAL**

- .1 Remove cleared and grubbed materials, including timber, off site.
- .2 Burning not allowed on construction site.

### **3.5 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of Project Manager / Consultant.

**END OF SECTION**

1 General

1.1 NOT USED

.1 Not Used.

2 Products

2.1 NOT USED

.1 Not Used.

3 Execution

3.1 STRIPPING OF TOPSOIL

- .1 Remove topsoil before any construction procedures commence to avoid compaction of topsoil.
- .2 Handle topsoil only when it is dry and warm.
- .3 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.
- .4 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.
- .5 Strip topsoil to depths as directed by Project Manager / Consultant. Avoid mixing topsoil with subsoil.
- .6 Pile topsoil in berms in locations as directed by Project Manager / Consultant. Stockpile height not to exceed 2.5 - 3 m.
- .7 Dispose of unused topsoil off site or in location as indicated by Project Manager / Consultant.
- .8 Protect stockpiles from contamination and compaction.

3.2 PREPARATION OF GRADE

- .1 Verify that grades are correct. If discrepancies occur, notify Project Manager / Consultant and do not commence work until instructed by Project Manager / Consultant.
- .2 Grade area only when soil is dry to lessen soil compaction.
- .3 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.
- .4 Remove debris, roots, branches, stones in excess of 25mm diameter and other deleterious materials. Remove soil contaminated with calcium chloride, toxic materials and petroleum products. Remove debris which protrudes more than 25 mm above surface. Dispose of removed material off site.
- .5 Cultivate entire area which is to receive topsoil to minimum depth of 100mm. Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.3 PLACING OF TOPSOIL

- .1 When replacing topsoil use a small mechanical hoe 0.96 - 1.15 cu m to allow for aeration of soil.
- .2 Place topsoil only after Project Manager / Consultant has accepted sub-grade.
- .3 During dry conditions spread topsoil in uniform layers not exceeding 150mm, over unfrozen sub-grade free of standing water.
- .4 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

- .5 Establish traffic patterns for equipment that will prevent driving on topsoil after it has been spread to avoid compaction.
- .6 Cultivate the soil following spreading procedures.

#### **3.4 SUB-SOILING**

- .1 Following the spreading and cultivating procedures, sub-soil the area to improve drainage and agricultural potential of soil.
- .2 With a vibrating sub-soiler, work the area to a depth of 40 cm. Follow the contour lines of the natural grades of the area.
- .3 Cross sub-soil the area following the first pass.
- .4 Cultivate the soil with a chain harrow to de-clod the soil.

**END OF SECTION**

1 General

1.1 SCOPE

- .1 This Section specifies removals within the site limits, as indicated in the contract drawings.

1.2 RELATED REQUIREMENTS

- .1 Section 31 14 13 – Soil Stripping and Stockpiling.  
.2 Section 32 01 91 - Tree and Shrub Preservation.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)  
.1 ASTM C 136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.  
.2 ASTM D 422-63(R2007), Standard Test Method for Particle-Size Analysis of Soils.  
.3 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).  
.4 ASTM D 4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.  
.2 Canadian General Standards Board (CGSB)  
.1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.  
.3 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation  
.1 OPSS.MUNI 1004 (November 2013), Material Specification for Aggregates - Miscellaneous.  
.2 OPSS.MUNI 1010 (November 2013), Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

1.4 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.  
.1 Rock: solid material in excess of 1.00 m<sup>3</sup> and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m<sup>3</sup> bucket. Frozen material not classified as rock.  
.2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.  
.2 Topsoil:  
.1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.  
.2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters 1 inch in any dimension.  
.3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.  
.4 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work.  
.5 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.

- .6 Unsuitable materials:
- .1 Weak, chemically unstable, and compressible materials.
- .2 Frost susceptible materials:
- .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D 4318, and gradation within limits specified when tested to ASTM D 422 and ASTM C 136: Sieve sizes to CAN/CGSB-8.1.
- .2 Table:
- | Sieve Designation | % Passing |
|-------------------|-----------|
| 2.00 mm           | 100       |
| 0.10 mm           | 45 - 100  |
| 0.02 mm           | 10 - 80   |
| 0.005 mm          | 0 – 45    |
- .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

## 1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01330 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01450 - Quality Control.
- .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
- .2 Submit for review by Project Manager / Consultant proposed dewatering and heave prevention methods as described in PART 3 of this Section.
- .3 Submit to Project Manager / Consultant written notice when bottom of excavation is reached.
- .4 Submit to Project Manager / Consultant testing and inspection results and report as described in PART 3 of this Section.
- .5 Submit supply production quality control verification test information for granular materials prior to use.
- .3 Preconstruction Submittals:
- .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, and location plan of relocated and abandoned services, as required.
- .4 Samples:
- .1 Submit samples in accordance with Section 01330 - Submittal Procedures.
- .2 Inform Project Manager / Consultant at least 4 weeks prior to beginning Work, of proposed source of fill materials and provide access for sampling.
- .3 Submit 5 kg samples of type of fill specified including representative samples of excavated material.
- .4 Ship samples prepaid to Project Manager / Consultant, in tightly closed containers to prevent contamination and exposure to elements.

## 1.6 QUALITY ASSURANCE

- .1 Testing of materials and compaction of backfill and fill will be carried out by Contractor's testing Project Manager / Consultant.

- .1 Reports of sampling results shall be submitted to Project Manager / Consultant.
- .2 Not later than one week before backfilling or filling, provide to designated testing agency, 5 kg sample of backfill for fill material proposed for use.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Project Manager / Consultant.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Project Manager / Consultant.
- .5 Before commencing work, conduct, with Project Manager / Consultant, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

#### **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01355 - Construction/Demolition Waste Management and Disposal.
- .2 Divert excess aggregate materials from landfill to local facility for reuse as directed by Project Manager / Consultant.

#### **1.8 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Before commencing work verify and establish location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to beginning excavation Work, notify applicable authorities having jurisdiction to establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
  - .6 Confirm locations of buried utilities by careful test excavations or soil hydrovac methods.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of Project Manager / Consultant before removing or re-routing.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Conduct, with Project Manager / Consultant, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
  - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Project Manager / Consultant
  - .3 Where required for excavation, cut roots or branches as directed by Project Manager / Consultant in accordance with Section 02901 - Tree and Shrub Preservation.



2 Products

**2.1 MATERIALS**

- .1 Granular A fill: Granular A in accordance with OPSS.MUNI 1010.
- .2 Granular B Type I fill: Granular B Type I in accordance with OPSS.MUNI 1010.
- .3 Granular B Type II fill: Granular B Type II in accordance with OPSS.MUNI 1010.
- .4 Select fill: Selected material from excavation or other sources, approved by Project Manager / Consultant for use intended, unfrozen and free from rocks larger than 75 mm, topsoil, cinders, ashes, sods, refuse or other deleterious materials.

3 Execution

**3.1 SITE PREPARATION**

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Remove existing asphalt pavement to lines and grades as indicated.
- .3 Remove granular surface, irrigation lines, and other items as specified in the contract drawings.
- .4 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

**3.2 PREPARATION/PROTECTION**

- .1 Protect existing features as specified and in accordance with applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Project Manager / Consultant approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

**3.3 STRIPPING OF TOPSOIL**

- .1 Stripping of topsoil in accordance with Section 311413 – Soil Stripping and Stockpiling.

**3.4 STOCKPILING**

- .1 Stockpile topsoil in accordance with Section 311413 – Soil Stripping and Stockpiling.
- .2 Stockpile fill materials in areas designated by Project Manager / Consultant.
  - .1 Stockpile materials on site in locations as indicated unless directed otherwise by Project Manager / Consultant. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile materials in sufficient quantities to meet Project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different materials by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
  - .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Project Manager / Consultant within 48 h of rejection.

- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max 1.5 m for coarse aggregate and base course materials.
  - .2 Max 1.5 m for fine aggregate and sub-base materials.
  - .3 Max 1.5 m for other materials.
- .8 Uniformly spot-dump materials delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- .12 Stockpile minimum 50% of total aggregate required prior to beginning operation.
- .3 Protect fill materials from contamination.
- .4 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries.

### **3.5 SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Ontario Regulation 213/91 under the Occupational Health and Safety Act for the Province of Ontario. According to the Act.
  - .1 Where conditions are unstable, Contractor's Engineer who designed shoring, bracing and underpinning to verify and advise methods.
- .2 Construct temporary Works to depths, heights and locations as designed by qualified professional Engineer engaged by Contractor who is registered or licensed in Province of Ontario.
- .3 During backfill operation:
  - .1 Unless otherwise indicated or directed by Project Manager / Consultant, remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .4 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .5 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore to conditions which are better or equal to those which existed before the work.

### **3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Project Manager / Consultant's review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Obtain necessary dewatering permits.
- .4 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
  - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .5 Protect open excavations against flooding and damage due to surface run-off.

- .6 Dispose of water in accordance with erosion and sedimentation control plan to approved runoff areas and in manner not detrimental to public and private property, or portion of Work completed or under construction.
  - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .7 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers or drainage areas.

### **3.7 EXCAVATION**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Trench excavation
  - .1 Remove unsuitable material below the conduit subgrade level, including topsoil, fill material, former topsoil and other deleterious materials.
  - .2 Replace unsuitable material with Granular B Type II compacted to not less than 95% of maximum dry density in accordance with ASTM D698. Place and compact fill in maximum 300 mm thick lifts.
- .3 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
  - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Project Manager / Consultant in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material off site.
- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Project Manager / Consultant when bottom of excavation is reached.
- .13 Obtain Project Manager / Consultant approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Project Manager / Consultant.
- .15 Correct unauthorized or authorized over-excavation as directed by the Project Manager / Consultant.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
  - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
  - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Project Manager / Consultant.

### **3.8 FILL TYPES AND COMPACTION**

- .1 Use types of fill as indicated or specified below. Compaction densities are percentages of maximum dry densities obtained from ASTM D 698.
  - .1 In utility trenches:

- .2 Under asphalt paving: Select fill which matches materials exposed on the trench walls. Compact to 98% in maximum 150 mm thick lifts.
- .3 Under landscaped areas: Select fill to underside of topsoil. Compact to 95% in maximum 150 mm thick lifts.
- .2 Under asphalt paving and within frost zone (1.5 m from surface): Select fill which matches materials exposed on the trench walls. Compact to 98% in maximum 150 mm thick lifts.
- .3 Under asphalt paving and below frost zone (1.5 m from surface): Select native material approved by Project Manager / Consultant or imported Granular B Type I or II. Compact to 95% in maximum 300 mm thick lifts.
- .4 Under landscaped areas: Select fill to underside of topsoil. Select native material approved by Project Manager / Consultant or imported Granular B Type I or II. Compact to 95% in maximum 150 mm thick lifts.

### 3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
  - .1 Project Manager / Consultant has inspected and approved installations.
  - .2 Project Manager / Consultant has inspected and approved of construction below finish grade.
  - .3 Inspection, testing, approval, and recording location of underground utilities.
  - .4 Removal of concrete formwork.
  - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding compacted thickness specified up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Under proposed generator slab, imported granular materials shall be placed such that side slopes of 1H:1V maximum are provided.
- .6 Backfilling around installations:
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed Work to equalize loading.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Project Manager / Consultant or:
    - .2 If approved by Project Manager / Consultant, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Project Manager / Consultant.

### 3.10 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris, trim slopes, and correct defects as directed by Project Manager / Consultant.
- .2 Replace topsoil as directed by Project Manager / Consultant.

- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by Project Manager / Consultant.
- .6 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

**END OF SECTION**

1 General

1.1 SCOPE

- .1 This Section specifies requirements for rough grading within contract limits.

1.2 RELATED SECTIONS

- .1 Section 31 14 13 – Soil Stripping and Stockpiling.  
.2 Section 31 23 10 – Removals, Excavating, Trenching and Backfilling.  
.3 Section 32 01 91 – Tree and Shrub Preservation.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)  
.1 ASTM D 698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m<sup>3</sup>).

1.4 EXISTING CONDITIONS

- .1 Contractor to arrange for full underground surface utility locates prior to commencement of construction.

1.5 PROTECTION

- .1 Protect and/or transplant existing fencing trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Project Manager / Consultant. If damaged, restore to original or better condition unless directed otherwise.  
.2 Maintain access roads to prevent accumulation of construction related debris on roads.

2 Products

2.1 MATERIALS

- .1 Select fill compatible with subgrade conditions in accordance with Section 312310 - Trenching and Backfilling of Underground Utilities.

3 Execution

3.1 STRIPPING OF TOPSOIL

- .1 Strip and stockpile topsoil in accordance with Section 311413 – Soil Stripping and Stockpiling.

3.2 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.  
.2 Rough grade to following depths below finish grades:  
.1 100 mm for grassed areas (sodded).  
.2 Varies for all other areas (refer to contract drawings for required depths).  
.3 Slope rough grade away from structures as indicated.  
.4 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.  
.5 Compact filled and disturbed areas to maximum dry density to ASTM D 698, as follows:  
.1 95% SPMDD under landscaped areas.  
.2 98 % SPMDD under paved and walk areas.

- .6 Do not disturb soil within branch spread of trees or shrubs to remain unless given direction by the Project Manager / Consultant.
  - .1 If direction is given for work within branch spread of trees then:
    - .1 work is to be done by hand
    - .2 measures are to be taken to ensure minimal impact on trees including:
      - .1 Any roots damaged are to be cut cleanly.
      - .2 Unearthed roots are to be covered with a moist burlap cover until such time that the roots can be reburied.
      - .3 The time that roots are exposed is to be kept to a minimum.

### 3.3 TESTING

- .1 Inspection and testing of soil compaction will be carried out by Contractor designated testing laboratory. Costs of tests will be paid under a Cash Allowance. Refer to Sections 01 21 00 – Allowances and 01 45 00 - Quality Control.
- .2 Submit testing procedure, frequency of tests, testing laboratory as designated by ULC or certified testing personnel to Project Manager / Consultant for approval.

### 3.4 SHORTAGE AND SURPLUS OF MATERIAL

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

**END OF SECTION**

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of geotextile layer separation.

1.2 RELATED REQUIREMENTS

- .1 Section 31 10 00: Site Clearing
- .2 Section 31 50 00: Excavation Support and Protection
- .3 Section 32 12 16: Asphalt Paving
- .4 Section 32 16 13: Curbs and Sidewalks
- .5 Section 32 91 19: Landscaping Grading
- .6 Section 32 92 23: Sodding
- .7 Section 32 93 43: Trees

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
- .1 ASTM D4355-07, Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
  - .2 ASTM D4873-02(2009), Standard Guide for Identification, Storage and Handling of Geosynthetic Rolls and Samples.
  - .3 ASTM D6241-04(2009), Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile Related Products Using a 50mm Probe.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Construction Conference: Arrange a site meeting attended by the Contractor, the Subcontractor, the Consultant, materials supplier(s), and other relevant personnel before commencement of work for this Section; as indicated in Section 01 31 19 Project Meetings.
- .1 Coordination: Coordinate components of the work of this Section with work performed by other Sections including; but not limited to, the following:
- .1 Install geotextile layer to separate different subsoil and granular subsurface, in locations indicated on the Drawings.
- .2 Scheduling:
- .1 Include requirements for coordinating work that requires unusual scheduling with work in other sections.

1.5 DEFINITIONS

- .1 **Filtration Opening Size (FOS)** means the opening size of a geotextile in microns corresponding to 95% by mass particle diameter passing through the geotextile in the hydrodynamic sieving test CAN/CGSB 148.1, Method No. 10.
- .2 **Geosynthetic** means a synthetic material used in geotechnical engineering applications. Geosynthetics may include such items as geotextiles, geomembranes, geocells, geogrids, geonets, and geocomposites.
- .3 **Geotextile** means a permeable synthetic textile material that is used in association with foundation, soil, rock, earth, or other geotechnical related material for one or more of the following functions: separation, filtration, drainage, or protection. They may be woven, non-woven, or knitted.



- .4 **Minimum Average Roll Value (MARV)** means the average value minus two standard deviations of a given property established by the manufacturer during production. The average roll value for a given property must meet or exceed this value.

## 1.6 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 Submittals.
- .2 Action Submittals: Provide the following submittals before starting work of this section:
- .1 Product Data: Submit manufacturers product data for each type of product specified.
  - .2 Shop Drawings: Submit shop drawings incorporating plans, elevations, sections and details for all work in this Section. The details shall illustrate and note all material thicknesses, of construction including joinery.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Delivery:
- .1 Geotextiles shall be protected against excessive UV exposure and contamination from dirt, dust, moisture, and any other deleterious materials, until they are installed.
  - .2 All geotextiles shall be wrapped in an opaque protective covering from the time of manufacture to the time of installation.
  - .3 Geotextiles and protective wrapping shall be free of tears and punctures upon delivery to the work.
- .2 Storage:
- .1 Geotextiles intended to be covered by soil, rock, earth, or other materials shall not be exposed to direct sunlight for more than 72 hours following the removal of the protective wrap.
  - .2 Geotextiles shall be protected from temperatures greater than 60 deg C.
- .3 Identification:
- .1 Each roll of geotextile or geotextile covered pipe or tubing shall be clearly marked according to ASTM D4873 with a permanently legible identification tag or label on the protective wrap or the inner core or affixed to the geotextile covered pipe or tubing.
  - .2 Product labels shall show the name of the manufacturer or supplier, product number, type, Class, roll number, and date of manufacture.

## 2 Products

### 2.1 MANUFACTURERS

- .1 Basis-of-Design products are named in this Section; additional manufacturers offering similar Products may be incorporated into the work provided they meet the performance requirements established by the named products provided they submit requests for a minimum of five (5) days in advance of Bid Closing.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- .1 Terrafix Geosynthetics Inc
  - .2 Nillex Civil Environmental Group

### 2.2 MATERIALS

- .1 Geotextile fibre or yarn, composed of at least 95% by mass of polypropylene, polyethylene, polyester, or other synthetic polymers, excluding polyamides.

- .2 Geotextiles shall contain stabilizers or inhibitors, if necessary, to make the filaments resistant to deterioration by excessive ultraviolet (UV) light and heat exposure.
- .3 Geotextiles shall be resistant to acid and alkali action and shall be unaffected by micro-organisms and insects.

## **2.3 NON-WOVEN GEOTEXTILES**

- .1 Non-woven geotextiles shall consist of a manufactured sheet, web, or batt of directionally or randomly oriented fibres, filaments, or other elements produced by bonding or interlocking the elements by mechanical, thermal, or chemical means.
- .2 Physical Properties:
  - .1 Class II
  - .2 Tensile Strength: 660 N
  - .3 Elongation at Break: >50%
  - .4 Tear Strength: 250 N
  - .5 Puncture Strength: 1375 N
  - .6 Permittivity: Minimum 0.05 perms

## **2.4 KNITTED SOCK GEOTEXTILES - DRAINAGE PIPING**

- .1 Knitted sock geotextiles shall be produced by interlooping one or more yarns, fibres, or filaments in a continuous tube. Knitted sock geotextiles are suitable only for wrapping of subdrain pipe.
  - .1 Physical Properties:
    - .1 Mullen Diaphragm Burst Strength: 600 kPa
    - .2 Permittivity: Minimum 2.75 perms
- .2 Drainage Piping:
  - .1 Perforated P.V.C. pipe conforming to CAN/CSA B1800-11, diameter indicated on the drawings. Diameters up to and including 150 mm (6") shall be DWV pipe, Schedule 40. Diameters greater than 150 mm (6") shall be DWV pipe, Series 100.
  - .2 Perforations shall be 13 mm (1/2") diameter holes spaced at 150 mm (6") on centre along the length of the pipe and alternating at 60 deg each side of the vertical centerline.
  - .3 Drainage system shall be complete with pipe couplings, 45 deg "wye" fittings, cleanouts, and necessary material for complete assembly of the drainage system.

## **2.5 SEAMS**

- .1 When sections of geotextile are joined by sewing, the seam strength shall be at least 90% of the minimum Grab tensile strength requirement for the class of geotextile specified in this Section.
- .2 Seams of the geotextile shall be sewn with thread meeting the material requirements for the geotextile or shall be bonded by thermal or chemical means.

## **3 Execution**

### **3.1 EXAMINATION**

- .1 Coordinate with Consultant and confirm installation of subsoil and granular subsurface prior to installation of geotextile layer separation materials indicated in this Section.

### **3.2 INSTALLATION**

- .1 Install sheet geotextiles and knitted sock geotextiles as per manufacturer's written instructions.
- .2 Overlap sheet geotextile a minimum of 100 mm (4") on all sides.

- .3 Connect pipe wrapped with sock geotextile with proper fittings and couplings to provided tightly-fitted system, and as follows:
  - .1 Cap ends of lines and install cleanouts as indicated.
  - .2 Cleanouts are to be accessible from the surface.
  - .3 Install one cleanout for every 22860 mm (75') of drainage piping where cleanouts are not indicated.
  - .4 Verify cleanout locations with Consultant on site; move as directed by Consultant.
  - .5 Place plugs in ends of uncompleted pipe at end of each day or when work stops.
- .4 Cover geotextile with backfill or soil, as indicated on the Drawings.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 Comply with requirements of Division 1.

**1.2 RELATED REQUIREMENTS**

- .1 Section 07 21 00 Thermal Insulation
- .2 Section 31 10 00: Site Clearing
- .3 Section 32 12 16: Asphalt Paving
- .4 Section 32 92 23: Sodding

**1.3 QUALITY CONTROL**

- .1 Owner may arrange and pay out of cash allowance included in Section 01 21 00 for independent inspection and testing agency to inspect and test work of this Section.
- .2 Testing agency may do the following as directed by the Consultant:
  - .1 Determine at what depth existing soil is capable of supporting fill, floor slabs and superimposed loads without deleterious settlement.
  - .2 Carry out grain size analysis on samples of each type of granular fill to ensure that proper material is being placed.
  - .3 Determine the quantity of water to be added to or removed from each type of fill to attain correct moisture content for compaction and maximum density.
  - .4 Determine the in-situ density and moisture content of compacted fills.

**1.4 EXISTING CONDITIONS**

- .1 Visit and examine the site and note all characteristics and features affecting the work of this Section. No allowance will be made for difficulties encountered or expense incurred resulting from conditions known or visible at the time of tendering.

**1.5 PROTECTION**

- .1 Protect excavations in accordance with applicable regulations. Provide and maintain in safe condition, lining, bracing and shoring required.
- .2 Prevent damage to existing structures, buried services and areas of site to remain undisturbed. Make good any damage caused.
- .3 Protect bottoms and sides of all excavations from exposure to wet weather, snow and frost, and from drying out, to prevent softening or weathering of any bearing surface.
- .4 Prevent unnecessary disturbance and protect soil from getting excessively wet. Schedule excavation and grading operations during dry periods. Take other protective steps such as designated traffic lanes, half load restriction on vehicles and temporary roads.

**1.6 JOB CONDITIONS**

- .1 If excavation reveals unexpected subsurface conditions, advise Consultant immediately.
- .2 Do not place fill material when temperature is at or below 0°C, nor while either fill material or subgrade is frozen.
- .3 Stockpile each type of fill material separately to prevent integration. Stockpile granular materials so as to prevent segregation.

2 Products

**2.1 FILL MATERIAL**

- .1 Fill type 1: clean, hard, durable aggregate free of shale, clay, organic matter or other deleterious substances: Granular 'A' OPSS Form 1010.
- .2 Fill type 2: clean, hard, durable aggregate free of shale, clay, organic matter or other deleterious substances: Granular 'B' OPSS Form 1010.
- .3 Fill type 3: clean sand, free of organic and deleterious matter.
- .4 Fill type 4: selected, clean, native soil excavated on this site, or imported clean fill, capable of being compacted to the required density, free of roots, debris, stones larger than 50 mm diameter, and free of any organic or deleterious matter.
- .5 Fill type 5: 19 mm clear crushed stone, no fines.
- .6 Moisture content of fill (native or imported) shall be within 2% of the optimum moisture content (ASTM D698).
- .7 Obtain all fill materials from sources approved by Consultant.

3 Execution

**3.1 EXCAVATION**

- .1 Carry out excavation to the extent, elevation and depth required for the construction of the building and for a sufficient distance beyond to permit proper construction, shoring, curing and inspection of work.
- .2 Do all excavation required for work of this project, unless it is clearly covered in other Sections.
- .3 Take precautions when excavating adjacent to buried services; use hand tools only in locating services.
- .4 Where piping is laid closer than 45 degree line from the underside of a footing or supporting structure, provide approved solid concrete underpinning.
- .5 After completion of excavation and prior to forms being erected, concrete placed, or piping installed, notify the Consultant for inspection of exposed surfaces. If any soft or spongy areas are located, notify Consultant at once. If the Consultant so directs, carry down the excavations to a greater depth until a suitable bearing is obtained.
- .6 Ensure that the bottoms of all excavations upon which any footings, walls or piers are to be built are accurately levelled and properly stepped, by cutting only, at all changes in elevation.
- .7 If the removal of earth causes displacement of adjacent earth, remove the earth so disturbed at no additional cost to the Owner.

**3.2 BACKFILLING AND COMPACTION**

- .1 Do not place backfilling until all bearing surfaces, subgrades and all work to be covered has been inspected and approved by the Consultant.
- .2 Proof-roll exposed subgrade below slabs on grade, prior to backfilling, with heavy static roller to ensure a minimum Standard Proctor Maximum Dry Density of 98% throughout. Subexcavate soft spots with suitable fill material and compact to 98% SPMDD.
- .3 Remove all debris, rubbish and temporary shoring before commencing backfilling.
- .4 Provide engineered fill below building as specified hereinafter.

- .5 Take care to avoid damage to or displacement of walls, piers, and other work. Wherever temporary unbalanced earth pressures are liable to develop in walls, provide and place the necessary shoring and bracing to counteract the imbalance, and leave these members in place until their removal is approved by the Consultant. Make good any damages caused due to inadequate bracing at no cost to the Owner.
- .6 Thoroughly compact all areas under and adjacent to building to be backfilled by mechanical tamping or rolling. Compaction shall be minimum 98% SPMDD unless otherwise indicated. Sub-excavate soft and excessively wet spots and backfill with suitable granular material.
- .7 Place fill material in layers not exceeding 200 mm uncompacted depth and compact each layer. Backfill to the levels required as indicated on the Drawings.
- .8 Unless otherwise indicated provide the following fill types:
  - .1 Below slab on grade base course: type 2.
  - .2 Slab on grade base course: 200 mm thick type 5.
  - .3 Below paved areas: type 2.
  - .4 Below landscaped areas: type 4.
- .9 Provide the following minimum compaction densities when tested in accordance with ASTM D698:
  - .1 Below slab on grade base course: 98%.
  - .2 Slab on grade base course: 98% SPMDD.
  - .3 Below paved areas: 98% SPMDD.
  - .4 Below landscaped areas: 95% SPMDD.
- .10 Remove and replace fill until compaction test reports by the independent inspection agency are satisfactory to the Consultant.

### 3.3 ENGINEERED FILL

- .1 Proof-roll existing subgrade and compact to minimum 98% Standard Proctor Maximum Dry Density in presence of independent inspection and testing agency.
- .2 Place engineered fill where required in accordance with requirements specified below. Extend engineered fill minimum 1 m beyond outside face of foundations.
- .3 Place engineered fill using type 2 fill in layers not exceeding 200 mm loose thickness. Compact each layer to 100% Standard Proctor Maximum Dry Density (SPMDD).
- .4 Confirm elevations of top of engineered fill layer upon completion of placement and compaction.
- .5 Remove and replace fill until compaction test reports by the testing agency are satisfactory to the Consultant.

### 3.4 GRADING

- .1 Do grading required for paved, sodded and landscaped areas.
- .2 Cut and fill as required. Make allowance for depth of surface finishes and base courses. Rough grade areas to within  $\pm 75$  mm of required subgrade.
- .3 Establish and maintain line and grade stakes for duration of grading operations.
- .4 Conform to grades and contours indicated on Drawings. Uniformly slope grade between elevations shown, unless otherwise noted. Smoothly slope top and toe of slopes and banks.
- .5 Proof-roll existing subgrade below paved areas with a heavy static roller to consolidate existing soil to minimum 98% SPMDD. Sub-excavate soft and excessively wet spots and backfill with suitable granular material compacted to 98% SPMDD.

- .6 Establish subgrade parallel to finish grades and shape in manner to permit drainage of water in the event of heavy rain.

### **3.5 COMPLETION**

- .1 Upon completion, remove all surplus fill and excavated materials from the site, and leave site clean and tidy.

**END OF SECTION**

1 General

**1.1 SUMMARY**

- .1 Related Sections:
  - .1 Section 01 33 00 - Submittal Procedures.
  - .2 Section 32 92 23 - Sodding.
  - .3 Section 31 32 21 – Rough Grading

**1.2 REFERENCES**

- .1 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .2 Fertilizers Act (R.S. 1985, c. F-10).
  - .3 Fertilizers Regulations (C.R.C., c. 666).
  - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .2 Health Canada - Pest Management Regulatory Agency (PMRA).
  - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

**1.3 DEFINITION**

- .1 Mycorrhiza : association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

**1.4 SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit monthly written reports on maintenance during warranty period, to Project Manager / Consultant identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

**1.5 QUALITY ASSURANCE**

- .1 Perform work in accordance with contract drawings

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Store and manage hazardous materials in accordance with manufacturer's directions and MSDS requirements.
- .2 Waste Management and Disposal:
  - .1 Dispose of excess materials and debris in accordance with industry accepted practices.

**1.7 SCHEDULING**

- .1 Obtain approval from Project Manager / Consultant of schedule indicating beginning of Work.



## 1.8 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Project Manager / Consultant to end of warranty period, perform following maintenance operations.
  - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
  - .2 Apply pesticides in accordance with National Standard for Pesticide Education, Training and Certification in Canada, Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease. Obtain product approval from Project Manager / Consultant prior to application.
  - .3 Apply fertilizer in early spring at rate of 0.025 kg of nitrogen/m<sup>2</sup>.
  - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through alternative disposal.

## 2 Products

### 2.1 MATERIALS

- .1 Fill:
  - .1 Type (A): clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
  - .2 Type (B): excavated pervious soil, free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc). Excavated material shall be approved by Project Manager / Consultant before use as fill.
- .2 Coarse washed stones: 35-75mm diameter clean round hard stone.
- .3 Drintile: 100mm diameter corrugated recycled plastic perforated tubing complete with snap couplings. Fill vents with 20 mm clear stone.
- .4 Peatmoss:
  - .1 Derived from partially decomposed species of Sphagnum Mosses.
  - .2 Elastic and homogeneous.
  - .3 Free of wood and deleterious material which could prohibit growth.
  - .4 Shredded minimum particle size: 5mm.
- .5 Fertilizer:
  - .1 To Canada Fertilizer Act and Fertilizers Regulations.
  - .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
- .6 Anti-desiccant: commercial, wax-like emulsion.
- .7 Filter Cloth:
  - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m<sup>2</sup> mass.
  - .2 Type 2: biodegradable burlap.
- .8 Wood posts: 38 x 89 x 2400mm length, untreated wood.
- .9 Welded wire fabric (WWF): 100 x 100mm, MW 15 x MW 15, to CSA G30.5.

## 3 Execution

### 3.1 IDENTIFICATION AND PROTECTION

- .1 Identify plants and limits of root systems to be preserved as approved by Project Manager / Consultant.
- .2 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Project Manager / Consultant.
- .3 Ensure no pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Project Manager / Consultant.

### 3.2 ROOT CURTAIN SYSTEM

- .1 Identify limits for required construction excavation as approved by Project Manager / Consultant.
- .2 Prior to construction excavation, hand dig trench minimum 500mm wide x 1500mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
- .4 Install wooden posts and welded wire fabric against construction edge of trench.
- .5 Securely attach Type 2 filter fabric on plant side of wire mesh.
- .6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
  - .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
  - .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m<sup>3</sup>.
- .7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150mm in depth. Compact each layer to 85% Standard Proctor Density.
- .8 Protect root curtain from damage during construction operations.
- .9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
- .10 Protect root curtain during backfill operations. Ensure root curtain is cut down to 300mm below finished grade and remove cut material.

### 3.3 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Project Manager / Consultant prior to excavation. Tunnel excavation to extend 2000mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Project Manager / Consultant.
- .4 Minimum acceptable depth to top of tunnel: 1000mm.
- .5 Backfill for tunnel and trench to 95% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .6 Complete tunneling and backfilling at tree within 2 weeks of beginning Work.

### 3.4 LOWERING GRADE AROUND EXISTING TREE

- .1 Begin Work in accordance with schedule approved by Project Manager / Consultant.
- .2 Cut slope not less than 500mm from tree trunk to new grade level.
- .3 Excavate to depths as indicated. Protect from damage root zone which is to remain.
- .4 When severing roots at excavation level, cut roots with sharp tools.

- .5 Cultivate excavated surface manually to 15mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
  - .1 60 % excavated soil cleaned of roots, plant matter, stones, debris.
  - .2 25 % coarse, clean sterile sand.
  - .3 15 % organic matter.
  - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m<sup>3</sup>.
- .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.
- .9 Install surface cover of sodding in accordance with Section 32 92 23 - Sodding.

### **3.5 PRUNING**

- .1 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through alternative disposal.

### **3.6 ANTI-DESICCANT**

- .1 Apply anti-desiccant to foliage where applicable and as directed by Project Manager / Consultant.

**END OF SECTION**

1 General

1.1 SCOPE

- .1 This section applies to the construction of base courses for all vehicular traffic areas and constructed pedestrian traffic areas.

1.2 REFERENCES

- .1 ASTM International
  - .1 ASTM D 698-12e12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
- .3 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS 314 (November 2013): Construction Specification for Untreated Granular Subbase, Base, Surface, Shoulder, and Stockpiling.
  - .2 OPSS 1001 (November 2013): Material Specification for Aggregates – General.
  - .3 OPSS.MUNI 1010 (November 2013): Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.

1.3 SOURCE QUALITY CONTROL

- .1 Inform Project Manager / Consultant of proposed source of aggregates and provide Project Manager / Consultant with samples and sampling reports from proposed source at least 2 weeks prior to commencing production.
- .2 If, in opinion of Project Manager / Consultant, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .3 Advise Project Manager / Consultant 2 weeks in advance of proposed change of material source.
- .4 Acceptance of material does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Handling
  - .1 Handle and transport aggregates to avoid segregation, contamination and degradation.
- .2 Stockpiling
  - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Project Manager / Consultant. Do not stockpile on completed pavement surfaces.
  - .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
  - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
  - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.
  - .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Project Manager / Consultant within 48hrs of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max 1.5 m for coarse aggregate and base course materials.
  - .2 Max 1.5 m for fine aggregate and sub-base materials.
  - .3 Max 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.
- .12 Stockpile minimum 50% of total aggregate required prior to beginning operation.

## 1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove excess material and debris from site and dispose of off-site in accordance with industry accepted practices.

## 2 Products

### 2.1 MATERIALS

- .1 Granular base: Granular A in accordance with OPSS.MUNI 1010.

## 3 Execution

### 3.1 SEQUENCE OF OPERATION

- .1 Place granular base after sub-base surface is inspected and approved by Project Manager / Consultant.
- .2 Placing
  - .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Place material to full width in uniform layers not exceeding 150mm compacted thickness. Project Manager / Consultant may authorize thicker lifts (layers) if specified compaction can be achieved.
  - .5 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .6 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment
  - .1 Compaction equipment to be capable of obtaining required material densities.
  - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Project Manager / Consultant before use.
  - .3 Equipped with device that records hours of actual work, not motor running hours.

- .4 Compacting
  - .1 Compact to density not less than 100% SPMDD in accordance with ASTM D698.
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density.
  - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Project Manager / Project Manager / Consultant.
  - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof rolling
  - .1 For proof rolling use standard roller of 45400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
  - .2 Obtain approval from Project Manager / Consultant to use non standard proof rolling equipment.
  - .3 Proof roll at level in granular base as indicated. If use of non standard proof rolling equipment is approved, Project Manager / Consultant to determine level of proof rolling.
  - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
  - .5 Where proof rolling reveals areas of defective sub-grade:
    - .1 Remove base and sub-grade material to depth and extent as directed by Project Manager / Consultant.
    - .2 Backfill excavated sub-grade with base material and compact in accordance with this Section.
    - .3 Replace base material and compact in accordance with this Section.
  - .6 Where proof rolling reveals defective base, remove defective materials to depth and extent as directed by Project Manager / Consultant and replace with new materials in accordance with this Section at no extra cost.

### 3.2 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 5 mm of established grade and cross section but not uniformly high or low.

### 3.3 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Project Manager / Consultant.

**END OF SECTION**

1 General

1.1 SUMMARY

- .1 Supply and installation of asphalt pavement structures and pavement line markings.
- .2 Subgrade preparation and placement of granular base.

1.2 RELATED REQUIREMENTS

- .1 Section 31 50 00: Excavation Support and Protection.
- .2 Section 32 16 13: Curbs and Sidewalks.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
  - .1 ASTM D242-09, Standard Specification for Mineral Filler for Bituminous Paving Mixtures
  - .2 ASTM D692/D692M-09, Standard Specification for Course Aggregate for Bituminous Paving Mixtures
  - .3 ASTM D946/D946-09a, Standard Specification for Penetration Graded Asphalt Cement for Use in Pavement Construction
  - .4 ASTM D979/D979M-12, Standard Practice for Sampling Bituminous Paving Mixtures
  - .5 ASTM D995-95b(2002), Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
  - .6 ASTM D1073-11, Standard Specification for Fine Aggregate for Bituminous Paving Mixtures
  - .7 ASTM D5581-07ae1, Standard Test Method for Resistance To Plastic Flow Of Bituminous Mixtures Using Marshall Apparatus (6 inch-Diameter Specimen)
  - .8 ASTM D2027/D2027M-10, Standard Specification for Cutback Asphalt (Medium-Curing Type)
  - .9 ASTM D3515-01, Standard Specification for Hot-Mixed, Hot -Laid Bituminous Paving Mixtures
- .2 Asphalt Institute:
  - .1 Asphalt Institute IS-91, Full-Depth Asphalt Pavements for Parking Lots, Service Stations and Driveways.
  - .2 Asphalt Institute MS-4, The Asphalt Handbook.
  - .3 Asphalt Institute SS-1, Model Construction Specifications for Asphalt Concrete.
- .3 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
  - .2 CAN/CGSB-16.1-M89, Cutback Asphalts for Road Purposes.
  - .3 CAN/CGSB-16.2-M89, Emulsified Asphalts, Anionic Type, for Road Purposes.
  - .4 CAN/CGSB-16.3-M90, Asphalt Cements for Road Purposes.
  - .5 CAN/CGSB 1.5-M-91, Low Flash Petroleum Spirits Thinner.
  - .6 CGSB-1.74-2001, Alkyd Traffic Paint.

1.4 QUALIFICATIONS

- .1 Asphalt concrete mixing plants shall conform to ASTM D995.

- .2 Provide the equipment, materials, and labour to complete the job. Variations in the size and amount of equipment will depend on the size of the area being paved.

## 1.5 DESIGN

- .1 Retain a professional engineer registered in the Province of the Work, to design and establish elevations of asphalt concrete paving.
- .2 Design water retention and site grading in accordance with Authorities having Jurisdiction.

## 1.6 BASIS OF PAYMENT

- .1 Payment will be on a stipulated price payment that includes for furnishing, hauling and placement of materials, for rolling, compaction and labour, and use of equipment, tools and incidentals necessary to complete the work of this section. Report immediately site conditions that differ significantly from those anticipated. Consultant will provide clarification or request a change to the work for an adjustment to the contract price.

## 1.7 SUBMITTALS

- .1 Provide required product information in accordance with Section 01 33 00 Submittal Procedures.
- .2 Submit asphalt concrete mix design and list of equipment and materials proposed for use to Consultant for review.
- .3 Submit a certificate of compliance indicating that the asphalt meets the requirements of the specifications, standards listed above and good local construction practices.
- .4 Submit proposed design for grading and pavement construction for Consultants review. Indicated direction of flow, site water retention area meeting City requirements, thickness and types of asphalt, line painting and pre-cast curb placement, stamped and signed by professional engineer.

## 1.8 TESTING

- .1 Materials shall be tested by accredited testing laboratory and included in Bid Price.
- .2 Sampling will follow recommended practice of ASTM D979.
- .3 Submit test certificates showing suitability of materials at least 4 weeks prior to commencing work.

## 1.9 WARRANTY

- .1 Provide a materials and workmanship warranty for an additional period of three (3) years taking effect after one year warranty required by Contract.
- .2 Warranty shall cover defects in material and workmanship affecting the appearance and long term performance of the completed installation.

## 2 Products

### 2.1 HOT-MIX, HOT-LAID ASPHALT

- .1 Design and prepare plant hot-mixed, hot-laid pavement mixtures utilizing asphalt cement and aggregate in accordance with ASTM D3515 and the following requirements.

### 2.2 BITUMINOUS MATERIALS

- .1 Asphalt Cement:
  - .1 Parking Areas: Penetration grade of 200 to 300 in accordance with to ASTM D946.
  - .2 Aggregates shall be coated with a minimum film thickness of 6.5 µm in accordance with Marshall Mix Design Criteria and requirements of ASTM D5581.
- .2 Tack Coat: Emulsified anionic asphalt, SS-1 or SS-1h mixed with water and meeting the requirements of ASTM D977.



- .3 Primer Coat: medium curing, medium viscosity cutback asphalt, MC-80 meeting the requirements of AASHTO M82 and ASTM D2027.

## 2.3 MINERAL AGGREGATE

- .1 Mineral aggregate for asphalt plant-mix shall consist of crushed stone, crushed gravel, sand, mineral filler, to ASTM D692 and ASTM D1073 and mineral filler. Mineral filler may be Portland cement, pozzolan, or commercially ground stone dust conforming to ASTM D242, and as follows:
- .1 Coarse aggregate shall be sound, angular crushed stone, crushed gravel, or crushed slag. Uncrushed coarse aggregate may be used in base course mixtures if the mixture meets all design criteria. The fine aggregate shall be well graded, moderately sharp to sharp sands.
- .2 Mineral aggregate and asphalt shall be combined in a mixing plant to meet the following nominal gradations for asphalt concrete:

Base and Surface Asphalt for new paving

<u>Sieve Size</u>	<u>% Passing by Weight</u>	
3/4"	100	
3/8"	60-80	
#4	40-65	
#8	30-50	
#30	15-30	100
#50	10-25	95-100
#100	5-20	
#200	3-8	70-100

Asphalt content as a percentage of weight by total mix shall conform to the requirements of Asphalt Institute MS-4.

## 2.4 ACCESSORIES

- .1 Line Paint:
- .1 To CGSB 1-GP-74M, alkyd traffic paint; colour, yellow, and as indicated on Drawings.
- .2 Thinner: To CAN/CGSB-1.5.
- .2 Cast-in-place Concrete Curbs:
- .1 Concrete ingredients, admixtures and reinforcing steel to CSA A23.4.
- .2 Anchors: Smooth 10mm (3/8") dia reinforcing bars, pointed at one end, minimum length to penetrate 457mm (18") through asphalt and subgrade.
- .3 Finish and colour of precast concrete, standard gray, as indicated in Section 32 16 13.
- .3 Adjustment Rims: as required to adjust elevation of manhole rims and valve chambers.

## 3 Execution

### 3.1 PREPARATION

- .1 Grades and elevations shall be established by the Contractor, and as follows:
- .1 The Contractor shall set grade stakes to the correct elevation.
- .2 Coordinate grades with existing features and adjoining properties to ensure proper drainage.

- .2 Remove all debris, vegetation, and other deleterious materials from the site, except for trees or shrubs designated for preservation.
- .3 Grade site in accordance with required profiles and remove excess material removed from site.
- .4 Compact subgrade at the lowest moisture content such that firm closing of hand can mould a handful of soil:
  - .1 Surface of subgrade after compaction shall be hard, uniform, smooth, and true to grade and cross-section. Confirm compaction by driving a heavily loaded truck over subgrade and verify that minimal deflection occurred.
  - .2 Roll subgrade to correct conditions where significant deflection occurs.
  - .3 Scarify subgrade to a depth of 150mm (6") and recompact where rolling does not correct the soft condition.
  - .4 Remove and replace subgrade with select materials where re-compaction does not correct soft condition.
- .5 Treat subgrade with a soil sterilant at the rate specified by the manufacturer to prevent the growth of weeds prior to placing base courses.
- .6 Apply cutback asphalt prime coat to prepared granular base courses at a minimum rate of 0.7 L/m<sup>2</sup> (0.15 gal/yd<sup>2</sup>).

### 3.2 PAVEMENT CONSTRUCTION

- .1 Heavy Traffic Construction: Lay plant hot-mixed, hot laid asphalt on prepared subgrade and base courses to a total thickness of 229mm (9"). Place material in a single thick lift during weather colder than 5 deg C (40 deg F).
  - .1 Asphalt base course shall be laid to a compacted thickness of 127mm (5").
  - .2 Asphalt surface course shall be laid to a compacted thickness of 75mm (3").
- .2 Light Traffic Construction: Lay plant hot-mixed, hot laid asphalt on prepared subgrade and base courses to a total thickness of 178mm (7"), unless otherwise indicated on Drawings. Place material in a single thick lift during weather colder than 5 deg C (40 deg F).
  - .1 Asphalt base course shall be laid to a compacted thickness of 50mm (2").
  - .2 Asphalt surface course shall be laid to a compacted thickness of 50mm (2").
- .3 Spreading Base and Surface Courses:
  - .1 For areas greater than 840 m<sup>2</sup> (1,000 yd<sup>2</sup>):
    - .1 Asphalt base and surface courses shall be spread and struck off with a paver.
    - .2 Any irregularities in the surface of the pavement course shall be corrected directly behind the paver.
    - .3 Excess material forming high spots shall be removed with a shovel or a lute.
    - .4 Indented areas shall be filled with hot mix and smoothed with a lute or the edge of a shovel being pulled over the surface.
    - .5 Casting of mix over such areas shall not be permitted.
    - .6 For areas less than 840 m<sup>2</sup> (1,000 yd<sup>2</sup>) and in areas where it is not practical to use a paver or spreader box:
      - .7 Spread asphalt base and finish surface courses by hand.
      - .8 Use rigidly supported wood or steel forms to ensure correct grade and cross-section
      - .9 Placing by hand shall be performed carefully to avoid segregation of the mix.

- .10 Broadcasting of the material will not be permitted.
- .11 Any lumps that do not break down readily shall be removed.
- .4 Roll and compact hot-mix material immediately without displacement; continue rolling until thoroughly compacted and all roller marks have disappeared.
- .5 In areas too small for the roller, a vibrating plate compactor or hand tamper shall be used to achieve thorough compaction.
- .6 The surface of the completed work shall be level to 6mm in 3048mm (1/4" in 10") when tested with a straightedge. Surface shall not contain irregularities that affect drainage, create puddles created than 2 ft<sup>2</sup>.

### **3.3 APPLICATION OF PAVEMENT LINE MARKINGS**

- .1 Clean pavement surface in accordance with paint manufacturers written instructions.
- .2 Paint lines straight and in uniform width, at locations indicated on drawings.
- .3 Apply paint using marking machine or line stencil, and as recommended by manufacturer, to minimum 0.18mm (0.007") dry film thickness.
- .4 Line Width: Roadways and Parking Areas: As indicated on Drawings.

### **3.4 CLEANING**

- .1 Remove spillage and over-spray of paint from pavement, sidewalks, building and other site features. Use methods and materials without damaging and leaving visible residue on substrates.

### **3.5 PROTECTION OF COMPLETED WORK**

- .1 Keep traffic off pavement markings for a time as recommended by paint manufacturer.

**END OF SECTION**

1 General

1.1 GENERAL REQUIREMENTS

- .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.

1.2 RELATED REQUIREMENTS

- .1 Section 03 35 00: Concrete Finishing  
.2 Section 31 50 00: Excavation Support and Protection  
.3 Section 32 12 16: Asphalt Paving

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM)  
.1 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete  
.2 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)  
.3 ASTM D1752-04a(2008): Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction  
.2 Canadian Standards Association (CSA)  
.1 CSA A23.1-09/23.2-09: Concrete Materials and Methods of Concrete Construction/Test methods and Standard Practices for Concrete  
.2 CSA G30.18-09: Carbon Steel Bars for Concrete Reinforcement  
.3 CAN/CSA B651-04(R2010): Accessible Design for the Built Environment

2 Products

2.1 MATERIALS

- .1 Granular Base:  
.1 Conforming to OPSS Form No. 1010, Class 'A' aggregate:

Sieve Designation	% Passing by Dry Weight
Imperial	
22 mm (7/8")	100
16 mm (5/8")	75 - 100
13 mm (1/2")	65 - 90
No. 4	35 - 55
No. 16	15 - 45
No. 50	5 - 22
No. 200	0 - 8

- .2 Forms:

- .1 Form Materials: Plywood, metal, metal framed plywood, or other acceptable panel type materials to provide full depth, continuous, straight, smooth exposed surfaces.
- .2 Use flexible or curved forms for curves with a radius of 30 m or less.
- .3 Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- .3 Steel Reinforcement:
  - .1 Plain Steel Welded Wire Reinforcement: Meeting the requirements of ASTM A185, fabricated from as-drawn steel wire into flat sheets.
  - .2 Deformed Steel Welded Wire Reinforcement: Meeting the requirements of ASTM A497, flat sheet.
  - .3 Reinforcing Bars: Deformed bars, meeting requirements of CSA G30.18, and Grade meeting requirements of Structural Engineer. Dowels and Tie-Bars: Smooth or deformed bars, meeting requirements of CSA G30.18, Grade meeting requirements of Structural Engineer, and as follows:
    - .1 Dowels:
      - .1 Plain round bars, clean, straight and free from flattened or burred ends.
      - .2 Dowels for contraction joints shall be in rigid assemblies of required dimension and spacing and held in the middle of the slab depth to proper horizontal and vertical alignment.
    - .2 Tie-Bars: Deformed steel bars.
  - .4 Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place, fabricated from steel wire, plastic, or precast concrete of greater compressive strength than concrete; equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
- .4 Concrete Materials:
  - .1 Cement Type: Normal Portland Cement in accordance with CSA A3000, Type GU.
  - .2 Concrete Admixtures: Certified by manufacturer to contain a maximum of 0.1% water-soluble chloride ions by mass of cementitious material and being compatible with other admixtures and cementitious materials; do not use admixtures containing calcium chloride:
    - .1 Corrosion Inhibiting Admixture:
      - .1 Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
      - .2 Acceptable materials: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
        - .1 FerroGard-901; Sika Corporation.
        - .2 DCI or DCI-S; Grace Construction Materials.
        - .3 Rheocrete 222+; BASF
- .5 Water: Meeting requirements of CSA A23.1/A23.2.
- .6 Concrete Aggregate: Meeting requirements of CSA A23.1/A23.2, containing no shale, and as follows:

- .1 Normal Density Fine Aggregate: Nominal maximum aggregate size in accordance with CSA A23.2-1A, uniformly graded to maintain Workability and control water bleed out, as indicated on Drawings.
- .2 Normal Density Coarse Aggregate: Aggregate selected from Group I or Group II Grading Classifications, to suit design mix, in accordance with CSA A23.2-13A, nominal maximum aggregate sizes and applications as indicated on Drawings.
- .7 Expansion and Isolation Joint Filler Strips: Meeting requirements of ASTM D1751, asphalt saturated cellulose fibre.
- .8 Curing Materials:
  - .1 Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 300 g/m<sup>2</sup> dry weight.
  - .2 Moisture Retaining Cover: ASTM C171, polyethylene film or white burlap polyethylene sheet.
  - .3 Water: Potable.
  - .4 Curing and Sealing Compound: Ultra-violet light resistant, non-yellowing acrylic polymer/water based type curing and sealing compound conforming to ASTM C309-93, Type 1, Class B, 'Sealtight VOCOMP-20' by W.R. Meadows of Canada Limited, or 'Florseal W.B.' by Sika Canada Inc., or approved equal.

### 3 Execution

#### 3.1 PREPARATION

- .1 Set out work from lines and levels shown on drawings.
- .2 Fine grade, shape and compact subgrade to minimum of 98% Standard Proctor Density.

#### 3.2 INSTALLATION

- .1 Concrete Curbs:
  - .1 Align concrete curbs with curves and tangents as shown on drawings. The minimum overall depth shall be 457 mm (18") with a curb face of 150 mm (6") as shown on drawings.
  - .2 Obtain approval of forms from Consultant before pouring concrete.
  - .3 Side forms shall be of nominal 50 mm (2") thick lumber, free of warp, and properly supported to maintain alignment and grade, except on curved sections where nominal 25 mm (1") lumber may be used. Treat all form lumber with a non-staining mineral oil prior to concrete placement. Construct form to prevent honeycombing.
  - .4 Curbs shall have expansion joints of asphalt plank at 4572 mm to 6096 mm (15' to 20') intervals. Place a reinforcing bar at top and base of curb, with concrete coverage of 50 mm (2") minimum.
- .2 Sidewalks:
  - .1 Place granular base immediately after the subgrade is approved by the Consultant, to 150 mm (6") compacted thickness.
  - .2 Fine grade, shape and compact each layer to a minimum of 98% Standard Proctor Density.
  - .3 Maintain true grade and cross section for each layer of material.
  - .4 Place asphalt planks at locations as indicated on drawings to form expansion joints at maximum of 4572 mm to 6096 mm (15' to 20') intervals with dummy joints at 1524 mm (5') O/C.

- .5 Place welded wire mesh 38 mm (1-1/2") from top surface of concrete. Lap mesh mats 150 mm (6") and tie securely.
- .3 Concrete:
  - .1 Pour concrete on prepared granular base to required levels and dimensions. Execute work in accordance with CAN/CSA-A23.1/A23.2.
  - .2 Do not deposit concrete on frozen ground. When deposited in forms concrete shall have a temperature between 10 deg.C and 30 deg.C and these limits shall be maintained for 72 hours.
  - .3 Fill forms with an excess of concrete and, after compacting strike to the required level in such a manner as to force the course aggregate below the mortar surface; finish top surface with a wood float to an even, smooth, dense surface.
  - .4 Do not strip forms for 24 hours after pouring concrete.
  - .5 After finishing and after stripping the forms, treat surfaces with approved curing compound.
  - .6 By means acceptable to the Consultant protect concrete from harmful effects of sunshine, drying winds and cold running of surface water for a minimum period of 5 days.
- .4 Curbs Finishes:
  - .1 Curbs Finish edges of dummy joints and expansion joints with 6 mm (1/4") radius edging tool.
  - .2 Sidewalks Concrete shall have a broom finish, employing a stiff broom, to produce an even, "non-slip" surface.
  - .3 Form intermediate dummy joints with a trowel cut. Edges of dummy joints and expansion joints shall be finished with a 6 mm (1/4") radius edging tool.
  - .4 Provide concrete curb cuts and sidewalk handicap access ramps as indicated in accordance with CAN/CSA-B651 and the authorities having jurisdiction.

**END OF SECTION**

1 General

**1.1 GENERAL REQUIREMENTS**

- .1 General Conditions and Division 01 apply to this Section.

**1.2 QUALITY ASSURANCE**

- .1 Qualifications:

- .1 Manufacturer and tradesmen executing the work of this Section shall have had a minimum 5 years continuous Canadian experience in successful manufacture and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
- .2 Erection of chain link fencing and gates shall be by workers especially trained and experienced in this type of work. Have a senior, qualified representative at the job site to direct the work of this Section at all times.

**1.3 SUBMITTALS**

- .1 Submit submittals in accordance with the General Conditions and Section 01 33 00.

- .2 Shop Drawings:

- .1 Submit fully dimensional shop drawings to Consultant showing construction, assembly, elevations, sections and interfacing with work of other Sections.
- .2 No work of this Section shall be fabricated until shop drawings and all other related submittals, documentation, certifications and samples as required by this Section, have been reviewed by Consultant.
- .3 Details shall indicate metal thicknesses, fasteners and welds, all anchorage assemblies and components and erection details.

- .3 Samples:

- .1 Submit to Consultant for approval, samples of materials and components to be used in the systems, prior to fabrication of work together with name of manufacturer and technical literature. Submit 12" x 12" samples of chain link fence fabric in colour as selected by the Consultant.

2 Products

**2.1 APPROVED MANUFACTURERS**

- .1 Subject to compliance with specifications, use products of one of the following:

- .1 McGowan Fence and Supply Ltd., or;
- .2 Lundy Fence, Division of IVACO Inc., or;
- .3 Peel Fence Systems Inc., or;
- .4 Approved equal.

**2.2 MATERIALS**

- .1 Steel Pipe: Conforming to CAN/CGSB-138.2-M80.
- .2 Fabric: No.9 gauge (0.148" nominal) ultra violet light resistant, P.V.C. coated, galvanized steel wire in 2" mesh, with both top and bottom selvages twisted and barbed, conforming to CAN/CGSB-138.1-M80.
- .3 End, Corner, and Pull Posts: Galvanized steel, minimum sizes and weights as follows:
- .1 Up to 6'-0" Fabric Height: 2.375" outside diameter pipe, 3.65 lbs/lin. ft.



- .2 Over 6'-0" Fabric Height: 2.875" outside diameter pipe, 5.79 lbs/lin. ft.
- .4 Line Posts: Galvanized steel, minimum sizes and weights as follows;
  - .1 Up to 6'-0" Fabric Height: 1.90" outside diameter pipe, 2.70 lbs/lin. ft.
  - .2 Over 6'-0" to 8'-0" Fabric Height: 2.375" outside diameter pipe, 3.65 lbs/lin. ft.
- .5 Gate Posts: Galvanized steel, for single gate or double leaf gate as follows;
  - .1 Up to 6'-0" Fabric Height: 2.875" outside pipe diameter, 5.79 lbs/lin. ft.
  - .2 Over 6'-0" Fabric Height: 4" outside diameter pipe, 9.11 lbs/lin. ft.
- .6 Top Rail and Intermediate Rails: Galvanized steel, manufacturer's longest lengths as follows:
  - .1 Typical: 1.66" outside diameter pipe, 2.27 lbs/lin. ft.
  - .2 Couplings: Expansion type, approximately 6" long.
  - .3 Attaching Devices: Means of attaching top rail securely to each gate, corner, pull, and end post.
- .7 Sleeves: Galvanized steel pipe with inside diameter not less than 1/2" greater than outside diameter of pipe. Provide steel plate closure welded to bottom of sleeves of width and length not less than 1" greater than outside diameter of sleeve as follows;
  - .1 Up to 6'-0" Fabric Height: Provide sleeve not less than 12" long.
  - .2 Over 6'-0" Fabric Height: Provide sleeve not less than 24" long.
- .8 Tension Wire: Minimum No.7 gauge galvanized steel, coated coil spring wire, located at bottom of fence fabric.
- .9 Wire Ties: Minimum No.11 gauge galvanized steel.
- .10 Post Brace Assembly: Manufacturer's standard adjustable brace at end posts and at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Use same materials as top rail for brace, and truss to line posts with 0.375" diameter rod and adjustable tightener.
- .11 Post Tops: Galvanized steel, weather tight closure cap for tubular posts, one cap for each post. Furnish cap with openings to permit passage of top rail.
- .12 Stretcher Bars: Galvanized steel, one piece lengths equal to full height of fabrics with minimum cross section of 3/16" x 3/4" inch. Provide one stretcher bar for each gate and end post, and two for each corner and pull post.
- .13 Stretcher Bar Bands: Manufacturer's standard.
- .14 Gate Hardware:
  - .1 Swinging Gate Hardware:
    - .1 Hinges: Offset type hinges to permit 180° gate opening. Provide 1-1/2 pair of hinges for each gate leaf over 6'-0" height.
    - .2 Latches: Forked or plunger bar type to permit operation from both sides of gate, with padlock eye.
- .15 Gate Cross-Bracing: 3/8" diameter galvanized steel adjustable length truss rods.

## 2.3 SETTING GROUT

- .1 Concrete: Minimum 20 MPa. Refer to Section 03 30 53.
- .2 Grout: Premixed, factory-packaged, non-staining, non-corrosive grout. Refer to Section 03 30 53. Provide type especially formulated for exterior application.

## 2.4 FINISHES

- .1 Galvanize as follows:
  - .1 Fabric: Not less than 1.2 oz zinc/sq ft.
  - .2 Framing: Not less than 1.8 oz zinc/sq ft.
- .2 P.V.C. Coating:
  - .1 Ultra violet light resistant, polyvinyl chloride (PVC) coating shall be applied by field bed method to preheated substrate, to 10 to 14 mils dry film thickness (DFT) on pipe and 7 to 10 mils dry film thickness (DFT) on fence fabric.
  - .2 Clean and pretreat surfaces as required to thermally bond the P.V.C. coating to surfaces.
  - .3 Colour shall be as selected later by Consultant from manufacturer's full available colour range.

## 2.5 FABRICATION

- .1 Fabricate swing gate perimeter frames of 1.90" outside diameter galvanized steel pipe. Provide horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories. Gates shall conform to CAN/CGSB-138.4-M82. Space frame members maximum 8'-0" apart.
- .2 Assemble gate frames rigidly by welding or with special fittings and rivets. Use same fabric as specified for fence. Install fabric with stretcher bars at vertical edges. Bars may also be used at top and bottom edges. Attach stretchers to frame at 12" O.C. Install diagonal cross-bracing on gates as required to ensure frame rigidity without sag or twist.
- .3 Attach hardware to provide security against removal or breakage.
- .4 Fabricate swing gates, double gates and sliding gates as indicated on drawings.

## 3 Execution

### 3.1 INSTALLATION

- .1 Install chain link fencing in strict accordance with CAN/CGSB-138.3-M80 and as specified herein.
- .2 Space line posts at 10'-0" O.C. maximum.
- .3 Methods for Setting Posts:
  - .1 Grade-Set Posts: Drill holes for post with auger or hand excavate. Excavate each post hole to minimum 12" diameter, or not less than 4 times the post diameter. Excavate to 4" below bottom of post. Set bottoms of posts 6" below "frost line". Hold, brace posts plumb, level while placing, consolidating and finishing concrete.
  - .2 Sleeve-Set Posts In Concrete: Anchor posts in concrete by means of pipe sleeves preset and anchored into concrete. Insert posts into sleeves and fill annular space between post and sleeve solid with grout. Mix and place grout in accordance with manufacturer's written instructions.
- .4 Intermediate Rails: Provide centre rails where indicated. Install in one piece between posts and flush with post on fabric side, using offset fittings where necessary.
- .5 Brace Assemblies: Install braces so posts are plumb with rod in tension.
- .6 Tension Wire: Install tension wires through post cap loops before stretching fabric and tie to each post cap with minimum No.6 gauge galvanized wire. Fasten fabric to tension wire using No.11 gauge galvanized steel hog rings at 24" O.C.
- .7 Fabric: Leave approximately 2" between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires. Install fabric on security side of fence, and anchor to framework so fabric remains in tension after pulling force is released.

- 
- .8 Stretcher Bars: To secure end, and pull posts, thread through or clamp to fabric 4" O.C. and secure to posts with metal bands spaced on 12" O.C.
  - .9 Tie Wires:
    - .1 Use U-shaped wire conforming with diameter of pipe to which attached, clasping pipe and fabric firmly with ends twisted two full turns. Bend wire ends to minimize hazards to persons or clothing.
    - .2 Tie fabric to line posts with wire ties spaced 12" O.C. Tie fabric to rails and braces with wire ties spaced 24" O.C. Manufacturer's standard procedure will be accepted if of equal strength and durability.
  - .10 Fasteners: Install nuts for tension bands and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
  - .11 Install swing gates, double gates and sliding gates plumb, level and secure for full openings, without interference. Set all ground set hardware in concrete for secure anchorage. Adjust and lubricate all gate hardware for smooth and efficient operation.

**END OF SECTION**

1 General

**1.1 SUMMARY**

- .1 Supply and install ornamental metal fencing, complete with swing gates, as indicated in this Section.

**1.2 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Manufacturer and tradespersons executing the work of this Section shall have had a minimum five (5) years continuous Canadian experience in successful manufacture and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
  - .2 Erection of ornamental metal fencing and gates shall be by workers especially trained and experienced in this type of work. Have a senior, qualified representative at the job site to direct the work of this Section at all times.

**1.3 DESIGN REQUIREMENTS**

- .1 Design and engineer ornamental metal fencing and gates to withstand minimum 170 Kph windload.

**1.4 SUBMITTALS**

- .1 Shop Drawings:
  - .1 Submit submittals in accordance with Section 01 33 00.
  - .2 Submit fully dimensional shop drawings to Consultant showing construction, assembly, elevations, sections and interfacing with other Work.
  - .3 No work of this Section shall be fabricated until shop drawings and all other related submittals, documentation, certifications and samples as required by this Section, have been reviewed by Consultant.
  - .4 Details shall indicate metal thicknesses, fasteners and welds, all anchorage assemblies and components and erection details.
  - .5 Shop drawings to be stamped by Professional Engineer specialized in work and licence in place of work.
- .2 Samples:
  - .1 Submit to Consultant for approval, samples of materials and components to be used in the systems, prior to fabrication of work together with name of manufacturer and technical literature.

2 Products

**2.1 APPROVED SYSTEMS AND MANUFACTURERS**

- .1 Climb resistant, Ornamental metal fencing and gates shall be heights as indicated on drawings, complete with posts, pyramid post caps, masonry attachment brackets and other brackets and stainless steel tamper-proof anchors:
  - .1 Manufactured by: Cochrane ClearVu fencing system, or approved equivalent by Omega Fencing Systems.

**2.2 MATERIALS**

- .1 Manufacturers and Products, where listed, are intended to set a level of expected quality and performance and are not intended to limit or restrict products from other manufacturers and/or suppliers capable of meeting the requirements of this specification.
- .2 Concrete mixes and materials: in accordance with Section 03 30 00 – Cast in Place Concrete
  - .1 Water, fine aggregates, normal density coarse aggregates: to CAN/CSA-A23.1.
  - .2 Compressive strength: 35 MPa minimum at 28 days.
  - .3 Provide certification that plant, equipment, and all materials to be used in concrete comply with requirements of CAN/CSA-A23.1.
- .3 Metal fence system:
  - .1 System: Cochrane ClearVu fencing system (or approved equivalent) 1.8m height (above ground): to CAN/CGSB – 138.1.
  - .2 2.7m long Cochrane taper post 85mm–85mm, posts sealed with UV stabilized polymer cap
  - .3 ClearVu mesh panels 3.297m wide x 1.8m high, galvanized wire with aperture size (centers) @ 76.2mm x 12.7mm.
  - .4 Panel Formation: Panel reinforced with 4 x 50mm deep 'V' formation horizontal recessed bands and 2 x 75mm 70° flanges along sides – must have internal fixings
  - .5 12 single bolt comb clamps
  - .6 12 'tech-bolts' mechanically galvanized.
- .4 Grounding rod: 16mm diameter copperwell rod, 3m long
- .5 Topping.

## 2.3 GATES

- .1 Supply of 1m wide ClearVu gate (or approved equivalent), galvanized wire with aperture size (centers) @ 76.2mm x 12.7mm.

## 2.4 FABRICATION

- .1 Fabricate components to be non-climbable.
- .2 Fit and assemble work in shop.
- .3 Workmanship shall be best grade of modern shop practice known to recognized manufacturers specializing in this work. Joints and intersecting members shall be accurately fitted, made in true planes with adequate fastening. Wherever possible fastenings shall be concealed.
- .4 Isolate where necessary to prevent electrolysis between metal to metal or metal to concrete contact. Apply 2 coats of bituminous paint.
- .5 Fabricate work square, plumb, straight, true and accurately fitted. Provide adequate reinforcing and anchorage.
- .6 Fabricate fence panels, swing gates and double gates with wire mesh securely welded to backside, so that horizontal wires are level and vertical wires are perpendicular to horizontal wires.
- .7 Fabricate swing gates and double gates as indicated on drawings.
- .8 Drilling shall be reamed and exposed edges left clean and smooth. Welds shall be ground smooth and flush with adjacent surfaces.
- .9 Include anchors and fastenings necessary to anchor work of this Section.

## 2.5 FINISHES

- .1 Fusion Bond Epoxy:

- .1 Post: hot dip galvanized, then marine fusion bond coated black.
- .2 Mesh: pre-galvanized, then marine fusion bond coated black.

3 Execution

**3.1 CONDITION OF SURFACES**

- .1 Inspect surfaces over which the work of this Section is dependent for any irregularities detrimental to the application and performance of the work. Notify Consultant in writing of all conditions which are at variance with those in the contract documents and/or detrimental to the proper and timely installation of the work of this Section. The decision regarding corrective measures shall be obtained from the Consultant prior to proceeding with the affected work.
- .2 Commencement of installation implies acceptance of surfaces and conditions.

**3.2 INSTALLATION**

- .1 Erect fence along lines as indicated on Contract drawings and in accordance with CAN/CGSB 138.3.
  - .1 Footing in Earth - Auger post holes to depths and dimensions indicated on Contract documents and in accordance with OPSD 972.130. Where a rock layer is encountered within the required depth to which the post is to be erected, a hole of a diameter slightly larger than the largest dimension of the post may be drilled into the rock and the post grouted in. Then the regular concrete footing shall be placed between the top of the rock and the top of the footing elevation as shown on the design documents. Posts shall be approximately centered in their footings. All concrete shall be placed promptly and consolidated by tamping or other approved methods.
  - .2 Footing on Secant piles - Auger post holes to depths and dimensions indicated on Contract drawings and in accordance with OPSD 972.130 on concrete secant piles. Drill a hole of a diameter slightly larger than the largest dimension of the post into the pile to the required depth and grout the post in.
- .2 Dispose of excavated material in accordance with authorities having jurisdiction.
- .3 Space taper posts maximum panel width apart, measured parallel to ground surface.
- .4 Corner posts shall be set at abrupt changes in vertical and horizontal alignment.
- .5 Install end posts at end of fence and at structures. Install gate posts on both sides of gate openings.
- .6 Place concrete in post holes then embed posts into concrete to depths indicated.
  - .1 Provide clearance between bottom of fence and ground surface of 30mm to 50mm.
  - .2 Brace to hold posts in plumb position and true to alignment and elevation until concrete has set. Posts shall be set plumb, and follow the indicated alignment. All posts shall be set to the depth indicated on the design documents. Concrete shall be thoroughly consolidated around each post, free of voids, and finished with a domed shaped surface, with the base of dome at grade elevation. Concrete shall be allowed to cure prior to installing any additional components to the posts.
- .7 Do not install fence mesh panels until concrete has cured a minimum of seven (7) days
- .8 Install brace between end and gate posts and nearest line post, at inclination as indicated in OPSD 972.130.
  - .1 Install braces on both sides of corner and straining posts in similar manner.
- .9 Install grounding rods and ground fence.

**3.3 INSTALLATION - GATES**

- .1 Install gates in locations as indicated on Contract drawings.
- .2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.
- .3 Determine position of centre gate rest for double gate. Cast gate rest in concrete as directed. Dome concrete above ground level to shed water.
- .4 Install gate stops as per drawings.
- .5 Swing Gates
  - .1 All connections and joints shall be welded to form rigid frames or assembled with corner fittings.
  - .2 Hinges shall not twist or turn under the action of the gate, shall be so arranged that a closed gate cannot be lifted off the hinges to obtain entry.

### 3.4 TOUCH-UP

- .1 Surface preparation
  - .1 Lightly sand the surface to remove all rust and loose material.
  - .2 Clean the surface with a solvent such as paint thinner to remove any remaining contaminants which might hinder proper paint adhesion.
- .2 Painting surface
  - .1 Apply a good grade exterior metal primer.
  - .2 Top coat with exterior grade enamel paint, colour to match existing.

### 3.5 CLEANING

- .1 Upon completion of the work of this Section, or when directed by Consultant, remove all protective coatings and coverings from ornamental metal fencing and gates. Clean and polish all exposed surfaces.

**END OF SECTION**

1 General

1.1 GENERAL

- .1 The work covered by this section includes the furnishing of all labor, materials, equipment, inspection and construction of a modular concrete Segmental Retaining Wall ("SRW") including drainage system and geosynthetic reinforcement. The work included in this section consists of, but is not limited, to the following:
  - .1 Excavation and foundation soil preparation.
  - .2 Furnish and placement of the Leveling Base.
  - .3 Furnish and placement of the Drainage system.
  - .4 Furnish and placement of Geotextile Filter.
  - .5 Furnish and placement of SRW units.
  - .6 Furnish and placement of Geosynthetic Reinforcement.
  - .7 Furnish, placement, and compaction of Backfill and Drainage Aggregates
  - .8 Furnish final grading.

1.2 REFERENCES

- .1 ASTM International, latest edition:
  - .1 Segmental Retaining Wall Units
    - .1 C140, Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
    - .2 C1372, Standard Specification for Dry-Cast Segmental Retaining Wall Units
  - .2 Geotextile Filter
    - .1 D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
    - .2 D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile
  - .3 Soils
    - .1 D422, Standard Test Method for Particle-Size Analysis of Soils
    - .2 D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
    - .3 D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
    - .4 D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
    - .5 G51, Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing
  - .4 Drainage Pipe
    - .1 D3034, Standard Specification for Polyvinyl Chloride (PVC) Plastic Pipe
    - .2 F667, Standard Specification for 3 through 24 inch Corrugated Polyethylene (PE) Pipe and Fittings

1.3 SUBMITTALS

- .1 Segmental Retaining Wall:
  - 1. Samples for verification: Three representative full-size samples of SRW. Thickness, color and finish that indicate the range of color variation and texture expected upon project completion.
  - 2. Accepted samples become the standard of acceptance for the product produced.
  - 3. Test results from an independent testing laboratory for compliance of concrete pavers with ASTM C1372.
  - 4. Manufacturer's catalog product data, installation instructions, and material safety data sheets for the safe handling of the specified materials and products.
- .2 Leveling Base
  - 1. Test results from an independent testing laboratory for sieve analysis per ASTM C136.



- .3 Backfill Aggregate: ¾" (19mm) clear stone
  - 1. Test results from an independent testing laboratory for sieve analysis per ASTM C136.
- .4 Drainage Aggregate Fill:
  - 1. Test results from an independent testing laboratory for sieve analysis per ASTM C136.
- .5 Geotextile Fabric
  - .1 Provide product data sheets.
  - .2 Provide three representative samples 6in by 6in.
- .6 Geogrid:
  - .1 Provide product data sheets.
  - .2 Provide three representative samples 8in by 12in.
- .7 Underdrainage Pipe:
  - .1 Provide product data sheets indicating conformance.
    - .a HDPE: ASTM F667
    - .b PVC: ASTM D3034
- .8 Paving Installation Contractor:
  - .1 Job references from a minimum of three projects similar in size and complexity. Provide Owner/Client/General Contractor names, postal address, phone, fax, and email address.
  - .2 Furnish sealed construction documents with detailed structural design calculations.

#### 1.4 QUALITY ASSURANCE

- .1 Utilize a Manufacturer having at least ten years of experience manufacturing concrete SRW on projects of similar nature or project size.
- .2 Source Limitations:
  - .1 Obtain SRW from one source location with the resources to provide products of consistent quality in appearance and physical properties.
  - .2 Obtain Drainage Aggregate and Backfill Aggregate from one source.
- .3 SRW Contractor Qualifications:
  - .1 Utilize an installer having successfully completed SRW installation similar in design, material, and extent indicated on this project.
  - .2 Utilize an installer that can ensure the SRW is constructed in accordance with the Construction Documents and be qualified in the construction of SRWs, knowledgeable of acceptable methods of construction, and have thoroughly reviewed and understood the Construction Documents.
- .4 Mockups:
  - .1 Install a 5 linear foot x 2 foot tall SRW.
  - .2 Use this area to determine installation tolerances. This area will serve as the standard by which the workmanship will be judged.
  - .3 Subject to acceptance by owner, mock-up may be retained as part of finished work.
  - .4 If mock-up is not retained, remove and dispose legally.

#### 1.5 DELIVERY, STORAGE & HANDLING

- .1 In accordance with Conditions of the Contract and Division 1 Product Requirement Section.
- .2 Deliver SRW in manufacturer's original, unopened and undamaged container packaging with identification labels intact.
  - .1 Coordinate delivery and SRW schedule to minimize interference with normal use of streets and sidewalks adjacent to paver installation.
  - .2 Deliver SRW to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift.
  - .3 Unload SRW at job site in such a manner that no damage occurs to the product or adjacent surfaces.

- .4 Store and handle all materials in accordance with manufacturer's recommendations and in a manner to prevent deterioration or damage due to moisture, temperature changes, contaminants, handling, or other causes.
- .5 Protect materials free from mud, dirt and other foreign materials.

## 2 Products

### 2.1 SEGMENTAL RETAINING WALL ("SRW") AND COPING

- .1 Basis-of-Design Product: SRW modular, solid, dry-cast concrete blocks based on:
  - .1 Unilock:
    - .a Pisa 2
  - .2 As manufactured by:
    - Unilock Toronto
    - Address
    - City, State and Zip
    - Contact: Insert your local Territory Manager
  - .3 The specified products establish minimum requirements that substitutions must meet to be considered acceptable.
    - .a To obtain acceptance of unspecified products, submit written requests at least 7 days before the Bid Date.
- .2 Product requirements:
  - .1 SRW: Pisa 2
    - .a Color: Natural Concrete Grey
- .3 Provide SRW meeting the requirements set forth in ASTM C1372.
- .4 Provide SRW meeting the physical properties listed below as tested using ASTM C140:
  - 1. Dimensional tolerance shall be +/- 3 mm (1/8 in.) for height, width, and length.
  - 2. The minimum 28-day compressive strength of 35 MPa (5000 psi).
  - 3. The maximum moisture absorption shall be 1.0 kN/cubic m (6.5 lbs/cubic ft).
- .5 Provide SRW utilizing an integral shear key connection with offset to create:
  - 1. Battered wall
  - 2. Near vertical wall
- .6 Accept only pigments in concrete pavers conforming to ASTM C 979.  
Note: ACI Report No. 212.3R provides guidance on the use of pigments.

### 2.2 LEVELING BASE

- .1 Provide non-frost susceptible, well-graded, compacted angular gravel-sand mixture (GW as per ASTM D2487) Leveling Base conforming to ASTM D 2940 and gradation requirements as presented in Table 1.

**TABLE 1  
BASE AGGREGATE  
GRADATION REQUIREMENTS**

ASTM D 2940	
Sieve Size	Percent Passing
2 in (50 mm)	100
1-1/2 in (37.5 mm)	95 to 100
3/4 in (19 mm)	70 to 92
3/8 in (9.5 mm)	50 to 70
No. 4 (4.75 mm)	35 to 55
No. 30 (600 µm)	12 to 25

No. 200 (75 µm)	0 to 8*
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- \* In order to prevent damage by frost heaving, it may be necessary to limit the percentages of material passing the No. 200 sieve to less than shown in the tables.

## 2.3 BACKFILL AGGREGATE

- .1 Provide Base Aggregate materials conforming to ASTM D 2940 and gradation requirements as presented in Table 2.

**TABLE 2  
BACKFILL AGGREGATE  
GRADATION REQUIREMENTS**

ASTM D 2940	
Sieve Size	Percent Passing
2 in (50 mm)	100
1-1/2 in (37.5 mm)	95 to 100
3/4 in (19 mm)	70 to 92
3/8 in (9.5 mm)	50 to 70
No. 4 (4.75 mm)	35 to 55
No. 30 (600 µm)	12 to 25
No. 200 (75 µm)	0 to 8*

- \* In order to prevent damage by frost heaving, it may be necessary to limit the percentages of material passing the No. 200 sieve to less than shown in the tables.

## 2.4 DRAINAGE AGGREGATE FILL

- .1 Provide Drainage Aggregate materials conforming to ASTM C 33 and gradation requirements of ASTM D 448 No. 8 as presented in Table 3.

**TABLE 3  
DRAINAGE AGGREGATE  
GRADATION REQUIREMENTS**

ASTM No. 8	
Sieve Size	Percent Passing
½ in (12.5 mm)	100
3/8 in (9.5 mm)	85 to 100
No. 4 (4.75 mm)	10 to 30
No. 8 (2.36 mm)	0 to 10
No. 16 (1.18 mm)	0 to 5

## 2.5 UNDERDRAINAGE PIPE

- .1 Provide a minimum 100 mm (4 inches) Underdrainage Pipe using:
- .1 Perforated corrugated high density polyethylene (HDPE) meeting ASTM F667.
  - .2 Perforated polyvinyl chloride (PVC) pipe meeting ASTM D3034.
- .2 Protect with Geotextile Filter to prevent the migration of soil particles into the Underdrainage Pipe.

## 2.6 GEOTEXTILE FILTER

- .1 Provide Geotextile material conforming to the following performance characteristics, measured per the test methods referenced:
  - .1 4 oz., nonwoven needle punched geotextile composed of 100% polypropylene staple fibers that are inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids.
  - .2 Grab Tensile Strength: ASTM D 4632: 115 lbs.
  - .3 Grab Tensile Elongation: ASTM D 4632: 50%
  - .4 Trapezoidal Tear: ASTM D4533: 50 lbs.
  - .5 Puncture: ASTM D4833: 65 lbs.
  - .6 Apparent Opening Size: ASTM D 4751: 0.212 mm, 70 U.S. Sieve
  - .7 Permittivity: ASTM D 4491: 2.0 sec -1
  - .8 Flow Rate: ASTM D 4491: 140 gal/min/s.f.

## 2.7 GEOSYNTHETIC REINFORCEMENT

- .1 Provide Geosynthetic Reinforcement as supplied by Unilock ([add location, address, City, State and Zip](#))  
Contact: [Insert name of local Territory Manager](#)
  - .1 Stratagrid 200

## 2.8 CONCRETE ADHESIVE

- .1 Provide a Concrete Adhesive manufactured by the following:
  - 1. LePage:
    - .1 Product Type: PL Premium Polyurethane construction adhesive
    - .2 LePage PL 9000 Heavy Duty construction adhesive
  - 2. Alliance:
    - .1 Product Type: Gator Glue XP Polyurethane construction adhesive
  - 3. Unilock Concrete Adhesive

## 3 Execution

### 3.1 EXAMINATION

- .1 Examine areas indicated to receive SRW for compliance with requirements for installation tolerances and other conditions affecting performance for the following items:
  - .1 Verify that subgrade preparation, compacted density and elevations conform to specified requirements.
  - .2 Verify all site services are located outside of SRW construction area unless otherwise noted.
  - .3 Verify the SRW structure or excavation limits are within property boundaries and do not cross into adjacent properties unless approved prior to construction.
  - .4 Verify the SRW drainage system delivers outflow to approved location.
  - .5 Verify the SRW and associated excavation remains outside of the loading influence of other adjacent structures and ensure stability of excavations and conformance with applicable regulations.
- .2 Geotechnical Inspection.
  - .1 Verify soil parameters and groundwater conditions are acceptable for SRW.
  - .2 Verify subgrade Bearing Capacity meets or exceeds values required for area to receive SRW.
  - .3 Identify groundwater conditions and/or other water source prior to SRW installation. Note additional water sources such as seepage from the cut embankment.

- .4 Ensure that surface water runoff and/or other sources of water are being controlled during construction and directed away from the SRW to a functioning drain.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.
  - .1 Beginning of bedding sand and paver installation signifies acceptance of base and edge restraints.

### 3.2 CONSTRUCTION TOLERANCES

- .1 Installation of SRW fascia shall be within all the following acceptable tolerances:
  - .1 Vertical Control: +/- 1.25 inches over a 10 ft distance
  - .2 Horizontal Control: Straight lines: +/- 1.25 inches over a 10 ft distance
  - .3 Rotation of the SRW face: Maximum 2.0 degrees from established SRW plan batter or +/-10.0% from total established horizontal setback
  - .4 Bulging: +/- 1.25 inch over a 10 ft distance

### 3.3 CONSTRUCTION

- .1 SITE PREPARATION
  - .1 Comply with all current Federal, Provincial/State, and local regulations for execution of the work, including local building codes and excavation regulations. Provide excavation support as required to maintain stability of the area during excavation and SRW construction and to protect existing structures, utilities, landscape features, property, or improvements.
  - .2 Prior to grading or excavation of the site, confirm the location of the SRW and all underground features, including utility locations within the area of construction. Ensure surrounding structures are protected from effects of SRW excavation.
  - .3 Coordinate installation of underground utilities with SRW installation.
  - .4 Control surface water drainage and prevent inundation of the SRW construction area during the construction process.
  - .5 Excavate the foundation soil to the required grades.
  - .6 Proof rolled and examined the foundation soils to ensure that it meets the minimum strength requirements to support the SRW. Repair if unacceptable foundation soil is encountered.
  - .7 Excavated the native soils to the lines and grades indicated in cut situations. Document and remove from the site.
  - .8 Prevent excavated soils being reused onsite from contamination or overly saturate the stockpiled fill material.
- .2 INSTALLING DRAINAGE SYSTEM
  - .1 Place the Geotextile Filter against the back of the first SRW Unit, over the prepared foundation soil extending towards the back of the excavation, up the excavation face and eventually over the top of the Drainage Fill to the back of the SRW Units near the top of the wall. Overlap Geotextile minimum of 300 mm (1 ft.) and shingle down the face of the excavation in order to prevent the migration of particles.
  - .2 Provide Drainage Pipe in accordance with the overall drainage plan for the site. Slope Drainage Pipe to ensure gravity flow of water from the Backfill Aggregate. Connect Drainage Pipe at a storm sewer catch basin or daylight along slope at an elevation lower than lowest point of pipe within Backfill Aggregate mass, every 15 m (50 feet) maximum.
  - .3 Provide additional Drainage Pipe if other sources of water are discovered during excavation or anticipated, other drainage measures/systems such as chimney or blanket drains may be required.
- .3 LEVELING BASE OR SPREAD FOOTING PLACEMENT
  - .1 Spread Leveling Base aggregate in areas indicated for SRW in accordance with horizontal and vertical alignments. .

- .2 Compact Leveling Base aggregate to a minimum thickness of 150 mm (6 inches) in maximum lifts not to exceed 100 mm (4 inches) to 98% Standard Proctor Density per ASTM D698.
- .4 INSTALLATION OF SEGMENTAL RETAINING WALL UNITS
  - .1 Place the SRW bottom row in the middle of the Leveling Base. Ensure the SRW Units are aligned properly, leveled from side to side and front to back, and in complete contact with the Leveling Base.
  - .2 Interconnect the SRW shear key creating the specified batter of the SRW face.
  - .3 Sweep the SRW top clean before placing additional courses to ensure that no dirt, concrete, or other foreign materials become lodged between successive lifts.
  - .4 Offset SRW units to create a running bond pattern with the edge of all units being approximately aligned with the middle of the unit in the course below it. Place cut SRW half units to ensure the vertical line between adjacent SRW units remains within the middle third of the SRW unit below.
  - .5 Provide Drainage and Backfill Aggregate once three courses above grade have been placed. Backfill with additional aggregates after a maximum of three courses of SRW units have been placed above the previous Backfill and Drainage Aggregate level.
  - .6 Verify no gaps are formed between successive lists affection performance and correct before proceeding with additional lists.
  - .7 Ensure SRW Units and Geosynthetic Reinforcement are not damaged during handling and placement.
  - .8 Prevent heavy equipment, for compaction, fill placement or other, within 1 meter (3 ft.) from back of the SRW Units.
- .5 DRAINAGE FILL
  - .1 Provide Drainage Fill between the back of wall and Backfill Aggregate.
  - .2 Place a minimum width of 300 mm (1 ft.) and separated from other soils using the specified Geotextile Filter.
  - .3 Place Drainage Fill behind the SRW facing in maximum lifts of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor.
- .6 BACKFILL AGGREGATE
  - .1 Provide Backfill Aggregate behind SRW and Drainage Fill with a maximum lift thickness of 150 mm (6 inches) and compacted to a minimum density of 95% Standard Proctor Maximum Dry Density (ASTM D698) at a moisture content from 2% below to 2% above optimum.
  - .2 Place Backfill Aggregate and compact level with the top of the SRW Units at the specified Geosynthetic Reinforcement elevations to ensure no voids exist under the Geosynthetic Reinforcement as it extends over the Backfill Aggregate.
  - .3 Ensure that the Geosynthetic Reinforcement lays flat and taut during placement of the Backfill Aggregate. Place the Backfill Aggregate on top of the Geosynthetic Reinforcement near the SRW and spreading away from the SRW.
  - .4 Slope the last lift of Backfill Aggregate away from the SRW facing to rapidly direct runoff away from the SRW at the end of each day's operation. Prevent surface runoff from adjacent areas to enter the SRW construction area.
- .7 GEOSYNTHETIC REINFORCEMENT
  - .1 Verify type and primary strength direction of the Geosynthetic Reinforcement.
  - .2 Sweep the top of the SRW Units to ensure the SRW Units are clean and free of debris.
  - .3 Cut Geosynthetic Reinforcement in sheets to the length shown in the Construction Documents.
  - .4 Place Geosynthetic Reinforcement sheets horizontally with the primary strength direction perpendicular to the SRW face and adjacent sheets without overlapping and without gaps between them.

- .5 Ensure each Geosynthetic Reinforcement layer corresponds with the correct elevations.
- .6 Place the Geosynthetic Reinforcement over the compacted Backfill Aggregate and the SRW Units with the outside edge extending over the shear key of the SRW Unit to within 25 mm (1 in.) of the front facing unit.
- .7 Carefully place subsequent SRW Units on top of the lower course to ensure that no pieces of concrete are chipped off and become lodged between courses. Ensure the Geosynthetic Reinforcement is in complete contact with the top and bottom surfaces of the successive SRW courses.
- .8 Pull Geosynthetic Reinforcement taut away from SRW Units during Backfill Aggregate placement. Provide Geosynthetic Reinforcement anchoring pins or staples to ensure that there are no wrinkles or slackness prior to Backfill Aggregate placement. Ensure Geosynthetic Reinforcement lays flat when pulled back perpendicular to the back of the SRW.
- .9 Prevent construction equipment from operating directly on top of the Geosynthetic Reinforcement until a minimum thickness of 150 mm (6 inches) of Reinforcement Fill has been placed.
- .10 Prevent heavy equipment from within 1 meter (3. Ft.) of the back of the SRW Units.
- .8 RETAINED FILL
  - .1 Provide compacted Retained Fill behind the Backfill Aggregate or Drainage Fill in maximum lift thickness of 150 mm (6 inches).
- .9 CONTINUING WALL CONSTRUCTION
  - .1 Repeat section 3.03.D through to 3.04.H until the grades indicated are achieved.
- .10 SECURE COPING
  - .1 Secure SRW Coping to SRW Units with two 10 mm (3/8 inch) beads of Concrete Adhesive positioned 50mm (2 inches) in front and behind the tongue of the last course of SRW Units.
- .11 FINISHING SRW
  - .1 Finish grading above SRW to direct surface runoff water away. Grade a swale above the SRW sloping away from back of the wall. Establish final grading immediately to ensure and protect the Backfill Aggregate from water infiltration.
  - .2 Prevent additional structures (fences, handrails, vehicular guardrails, buildings, pools/ponds, etc.) or changes to grading/loading (increased height, slopes, parking areas, changes in proximity to water flow, etc.), other than those shown in the Construction Documents, from being installed.
  - .3 Prevent landscaping activities within the Reinforcement Fill to ensure:
    - .a The Geosynthetic Reinforcement is not damaged by excavation for the root ball
    - .b The SRW is not subjected to any additional load from plants or trees.

### 3.4 REPAIRING, CLEANING AND SEALING

- .1 Remove and replace SRW Coping Units that are chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- .2 Cleaning: Remove excess dirt, debris, stains, grit, etc. from exposed SRW Units; wash and scrub clean.
  - .1 Clean SRW Units in accordance with the manufacturer's written recommendations.

### 3.5 PROTECTION

- .1 Protect completed work from damage due to subsequent construction activity on the site.

---

END OF SECTION



- 1 General**
- 1.1 Description**
  - .1 General Conditions, Supplementary Conditions and Division 01 apply to this Section.
- 1.2 Summary**
  - .1 Work includes supply and installation of armour stone retaining wall to lines and grades indicated on drawings. Work shall also include excavation, disposal of excavations, preparation of base, compaction, placing of units, cutting of units, rectification of grades and conditions adjacent to retaining wall and clean up.
- 1.3 Related Requirements**
  - .1 Section 31 23 33
  - .2 Section 31 32 19.23
- 1.4 Reference Standards**
  - .1 Geotextile Filter
    - .1 ASTM D 4751 - Standard Test Method for Apparent Opening Size
  - .2 Soils
    - .1 ASTM D 698 - Moisture Density Relationship for Soils, Standard Method
    - .2 ASTM D 422 - Gradation of Soils
    - .3 ASTM D 424 - Atterberg Limits of Soils
    - .4 ASTM D G51 - Soil pH
- 1.5 Submittals**
  - .1 Provide submittals in accordance with Section 01 33 00.
  - .2 Action Submittals:
    - .1 Samples: Submit samples of materials to Consultant for review and acceptance as follows:
      - .1 Armour stone 'Cap Rock' retaining wall units: Provide sample to indicate colour and face texture. Photos of rocks to be provided for approval prior to delivery.
      - .2 Accessories: Provide a sample of each type of accessory required for a complete installation. Accessories include but are not limited to the following:
        - .1 Filter Fabric: Provide 406mm x 406mm (16" x 16") filter cloth sample for review and acceptance.
        - .2 Drainage Piping: 305mm (12") in length.
    - .2 Data Sheets: Manufacturer's descriptive literature and recommended method of installation.
    - .3 Certificates: Manufacturer's certificates attesting that products meet specification requirements.
    - .4 Indicate horizontal and vertical dimensions as well as design grade elevations at the base and top of each wall, soil reinforcement and core fills, footing requirements and over burden restrictions.
- 1.6 Quality Assurance**
  - .1 Contractor executing work of this Section shall employ installers having a minimum of five (5) years continuous Canadian experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
  - .2 Mock-up:
    - .1 Prior to construction of any rock walls, contractor or subcontractor who is constructing the wall for the contractor shall show the engineer an example of similar rock walls that they had constructed previously.
    - .2 After acceptance of the previous work, contractor or subcontractor shall construct approximately 10 square metres of stone wall as shown on the drawings for approval by the engineer.
    - .3 If the construction is approved, the contractor or subcontractor shall construct the rest of the stone wall. If the construction is not approved, the contractor shall make any changes required by the owner and engineer to obtain approval and construct the remainder of the wall as approved.

**1.7 Storage, Delivery, Handling and Protection**

- .1 Protect materials during transportation, storage and installation to avoid physical damage.

**2 Products**

**2.1 Materials**

- .1 Armour stone – natural stone:
  - .1 All stone to be large armour stone blocks; dimensions as shown on Contract Drawings
  - .2 Stones to be “guillotined armour”, natural grey in colour, and have a natural split top and bottom surface, and weathered faces. Exposed drill markings are not acceptable.
  - .3 Rocks when submitted to ASTM C-131081 Abrasion Test shall not have a loss greater than 35%.
- .2 Rocks when submitted to ASTM- C88-76 soundness test shall have a loss not greater than 15%. Foundation Soil:
  - .1 The foundation soil shall be the native undisturbed on-site soils. The foundation soil shall be examined and approval by the Engineer prior to the placement of the base material.
- .3 Granular Base:
  - .1 Material used for granular base shall be according to OPSS 1010.
  - .2 Compaction density of base material should be no less than 100% Standard Maximum Dry Density according to ASTM D 698.
- .4 Drainage Pipe:
  - .1 The drainage pipe shall be perforated corrugated HDPE or PVC pipe, with a minimum diameter of 100 mm, protected by a geotextile filter ‘filter sock’ to prevent the migration of soil particles into the pipe.
- .5 Geotextile Filter: Terrafix 270R or Approved Equal.

**3 Execution**

**3.1 Inspection**

- .1 Check graded subgrade for conformity with elevations and cross-sections before placing stone units.
- .2 Check for unstable areas and areas requiring additional compaction.
- .3 Notify Consultant of unsatisfactory surfaces and conditions.
- .4 Do not begin installation of stone units until deficiencies have been corrected.

**3.2 Installation**

- .1 Preparation of Surfaces:
  - .1 The foundation soil shall be excavated or filled as required to the grades and dimensions shown on the Contract Drawings.
  - .2 If unacceptable foundation soil is encountered, the contractor shall excavate the material out to the satisfaction of the Engineer and replace with suitable material under the direction of the Engineer.
  - .3 Level the granular base to level of underside of base block to +/- 3 mm off approved final base grade elevations. Care should be taken to ensure the base material is level front to back and side to side. The leveling base material shall be crushed stone compacted to 100% Standard Proctor Density, or vibrated concrete along the grades and dimensions indicated on the Drawings or as directed by the Engineer. The minimum thickness of the leveling base shall be 300 mm.
  - .4 Place stones individually by crane or a backhoe. Sort, fit and tightly fit each rock to ensure stability. Individual stones must be in full contact with adjacent stones on both sides.
  - .5 Elevation of adjacent individual stones shall not vary more than 5 mm from one another when placed in works with a specified constant top elevation.
  - .6 Filter fabric overlaps shall be a minimum of 300 mm (1 ft.) in order to prevent the infiltration of soil into the granular drainage/backfill area.

- .7 Cut all units with a masonry saw for each stone adjacent to another stone. Ends units are to be left as a natural face.
- .8 Stones are to be carefully selected to meet the size and face texture requirements.
- .9 During installation all exposed "cut faces", steps and end units are to carefully monitored for sharp edges. All exposed and sharp edges are to be rock faced to the satisfaction of the Town and Consultant. In some cases it may be necessary to rock face before the stone is set into its final resting place.

### 3.3 Tolerances

- .1 The following tolerances are the maximum allowable deviation from the planned construction:
  - Vertical Control: +/- 25mm over a 3.05m distance; 50mm max.
  - Horizontal Control: +/- 25mm over a 3.05m distance; 50mm max.
  - Rotation: +/- 2 degrees from planned wall batter

### 3.4 Protection

- .1 Take extreme care during trenching operations, installation of drainage piping and backfilling not to damage or displace other utilities.

**END OF SECTION**

1 General

1.1 GENERAL

- .1 All Conditions of the contract apply to the work of this Section.

1.2 REFERENCE STANDARDS

- .1 All work shall meet the requirements of OPSS 206, 570 unless otherwise stated herein.

1.3 RELATED REQUIREMENTS

- .1 Section 31 10 00: Site Clearing  
.2 Section 32 92 23: Sodding

1.4 SCHEDULING OF WORK

- .1 Schedule finish grading to permit sodding under optimum conditions.  
.2 Commencement of final grading assumes final acceptance of rough grading work.

1.5 TESTING

- .1 Testing is required for all existing topsoil materials that is stockpiled on the site. Arrange for and be responsible for costs related to soil testing. Submit written reports to consultant for approval.  
.2 Test soil for N, P, K and minor element values, soluble salt content, organic matter and pH value using an approved independent inspection and testing agency.  
.3 Conform to recommendations from soil testing agency with respect to improvements required for topsoil.  
.4 Adjust fertilizer requirements and rates as well as additions of other additives to conform to soil testing recommendation, at no extra cost to the Contract.  
.5 Arrange for and be responsible for costs related to soil testing for confirmation of conformance to soil test report recommendations and as may otherwise be required by the Consultant.

2 Products

2.1 TOPSOIL

- .1 All topsoil used shall be existing site organic material.  
.2 Topsoil shall be friable, neither heavy clay nor of very light sandy nature consisting of 45% sand, 35% silt, 20% clay with a minimum 4% organic matter and pH value of 5.5 to 7. Free from subsoil, roots, vegetation, debris, toxic materials, stones over 25 mm diameter. Topsoil containing crabgrass, couchgrass or noxious weeds is not acceptable. The topsoil shall be tested for fertility and organic matter and the recommended adjustments shall be made.  
.3 Peatmoss: Derived from partially decomposed fibrous or cellular stems and leaves of species of Sphagnum Mosses. Elastic and homogeneous, brown in colour. Free of wood and deleterious material which could prohibit growth. Shredded particle minimum size: 6 mm.  
.4 Fertilizer: Complete commercial synthetic fertilizer with minimum 65% insoluble nitrogen. Applied to the topsoil at the manufacturer's recommended rate. Bonemeal: finely ground with a minimum analysis of 20% phosphoric acid.  
.5 Limestone: Ground agricultural limestone containing minimum 85% of total carbonates. Gradation requirements: percentage passing by weight, 90% passing 15 mm sieve, 50% passing 0.8 mm sieve.

3 Execution

**3.1 PREPARATION OF EXISTING GRADE**

- .1 Fine grade subgrade eliminating uneven areas and low spots, ensuring positive drainage.
- .2 Cultivate entire area which is to receive topsoil to depth of 100 mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted soil.
- .3 Remove surface debris, roots, vegetation branches and stones in excess of 25 mm diameter.

**3.2 SPREADING OF TOPSOIL/PLANTING SOIL**

- .1 Keep topsoil 25 mm below finished grade for sodded areas.
- .2 Ensure there is a minimum of 150 mm of topsoil in sodded or seeded areas.

**3.3 SOIL AMENDMENTS**

- .1 Apply soil amendments at rate as specified and as determined from soil sample test.
- .2 Mix soil amendments into full depth of topsoil prior to application of fertilizer.

**3.4 APPLICATION OF FERTILIZER**

- .1 Apply fertilizer at least one week after limestone application.
- .2 Spread fertilizer uniformly over entire area of topsoil at rate determined on basis of soil sample test.

**3.5 FINISH GRADING**

- .1 Fine grade and loosen topsoil. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Roll to consolidate topsoil for areas to be sodded and seeded leaving surface smooth, uniform, firm against deep foot printing, and with a fine loose texture to approval of the Consultant.

**END OF SECTION**

1 General

1.1 GENERAL

- .1 All conditions of the contract apply to the work of this Section.

1.2 SCOPE OF WORK

- .1 This Section of the contract includes the sodding work called for or implied by the drawings and specifications, together with all necessary incidentals whether referred to or not, as will be required to complete the work to the full intent and meaning of the drawings and specifications. The work includes but is not limited to the following:
- .1 Supply and install sodding.
  - .2 Maintain grassed areas.

1.3 RELATED REQUIREMENTS

- .1 Section 32 91 19 Landscaping Grading

1.4 DELIVERY AND STORAGE

- .1 Deliver, unload and store sod on pallets.
- .1 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted. Contractor shall provide Owner with one copy of delivery slips specifying type of sod delivered and time of lifting.
  - .2 Do not deliver small, irregular or broken pieces of sod.
  - .3 During dry weather protect sod from drying and water sod as necessary to ensure its vitality and prevent dropping of soil in handling. Dry sod will be rejected.

1.5 INSPECTION

- .1 Obtain approval of subgrade from the Consultant before commencing work.
- .2 Make all materials available for inspection, upon arrival on the site, or at source of supply when requested.
- .3 Supply name of sod supplier and field location of where sod was cut.
- .4 Give timely notice in writing, when materials are available for inspection.
- .5 Installation of sod prior to inspection by the Consultant is the Contractor's responsibility. The Consultant reserves the right to reject sod after it has been installed, if sod does not conform to the specifications and/or drawings.
- .6 Remove all rejected materials immediately from the site.
- .7 Give timely notice to the Consultant in writing, when all sodding work has been completed.

1.6 WARRANTY

- .1 Warrant all sodded areas for a period of three months after installation.
- .2 During the warranty period replace sod where necessary and make periodic inspections of all sodded areas. Notify the Consultant, in writing, of any corrective or preventative measures prior to treatment necessary to maintain grass in the specified condition. Replace all sod which has failed to establish into a healthy, vigorously growing condition, as a result of faulty materials, workmanship, and/or erosion.
- .3 If re-sodded areas exceed ten percent (10%) of the total sodded area, an additional one (1) month warranty will apply to the re-sodded areas.

2 Products

**2.1 MATERIALS**

- .1 Fertilizer shall be a standard 8-32-16 analysis in granular form. It shall be dry, free-flowing and free from lumps, and shall be in bags bearing the manufacturer's label clearly indicating mass and analysis. Requirements and rates shall be adjusted to conform to soil testing.
- .2 Number One Grade Turgrass Nursery Sod: Kentucky Bluegrass Sod. Comply with standards outlined in 'Canadian Standards for Nursery Stock', latest edition, published by Canadian Nursery Landscape Association.
- .3 Herbicide: Shall not be used on school site.

3 Execution

**3.1 FINE GRADING**

- .1 Fine grade and loosen topsoil prior to sodding. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable sod bed by means of discing and subsequent raking. Roll lightly and rake wherever topsoil is too loose.
- .2 Roll topsoil with 50 kg roller, minimum 900 mm wide, to compact and retain surface.
- .3 Keep topsoil 25 mm below finished grade.
- .4 Leave surface smooth, uniform, firm against deep foot printing, with a fine loose texture.

**3.2 APPLICATION OF FERTILIZER**

- .1 Apply fertilizer at least six days before sodding and prior to rolling.
- .2 Spread fertilizer with mechanical spreaders over entire area of topsoil at rate determined on basis of soil sample test and as directed.
- .3 Mix fertilizer thoroughly into upper 50 mm of topsoil.

**3.3 LAYING OF SOD**

- .1 Verify topsoil grade and depth before starting sodding.
- .2 Lay sod during growing season. Sodding during dry summer period, at freezing temperatures or over frozen soil is not acceptable.
- .3 Lay sod in rows, perpendicular to slope, smooth and even with adjoining areas, and with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
- .4 Provide close contact between sod and soil by means of light roller. Heavy rolling to correct irregularities in grade is not permitted.
- .5 Water immediately after sod laying to obtain moisture penetration through sod into top 100 mm of topsoil.
- .6 Provide adequate protection of sodded areas against erosion and mechanical damage. Remove protection after lawn areas have been accepted.
- .7 Upon completion of all sodding work, arrange for inspection by Consultant.

**3.4 LAYING OF SOD ON SLOPES GREATER THAN 3:1 (RUN/RISE)**

- .1 Lay sod sections at right angles to slopes and secure with wooden pegs. Place pegs 3 per m<sup>2</sup>, 100 mm below top edge to prevent shifting of sod and drive pegs flush with top of sod.
- .2 For drainage swales secure sod with six pegs around entire edge of each square metre of sod.

### 3.5 MAINTENANCE

- .1 Ensure maintenance equipment suitable.
- .2 Water grassed areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist for depth of 70 to 100 mm.
- .3 Contractor shall be responsible for all mowings during maintenance period.
- .4 Maintenance will extend until one month after installation.
- .5 Maintenance shall include all measures necessary to establish and maintain all sodded areas in a healthy, vigorous growing condition, free of thin, poor or burned-out patches.
- .6 Water sodded areas in sufficient quantities and at frequency required to maintain soil under sod continuously moist to depth of 75 mm to 100 mm.
- .7 Cut grass to 40 mm when it reaches height of 60 mm. Remove clippings which will smother grassed areas.
- .8 Fertilize sodded areas one month after sodding with 2:1:1 ratio fertilizer. Spread evenly at rate recommended by manufacturer and water in well.
- .9 Check sodded areas for disease and weeds and take immediate measure to eliminate diseases and control weed growth.
- .10 Re-sod areas which show deterioration or which are thin, bare or burned-out and repair all damages resulting from erosion and washouts or any other causes.
- .11 At time of final inspection, all sodded areas shall have a healthy, even, vigorously growing stand of grass, free of diseases, weeds, bare, thin or burned-out areas. Grass shall be cut to a maximum height of 60 mm at time of final inspection.

### 3.6 PROTECTION AFTER COMPLETION

- .1 Assume full responsibility for protection of all sodded areas until end of maintenance period.
- .2 Erect protective barriers and post signs where necessary and maintain same until acceptance. Remove after final inspection.
- .3 Remedy all damages, wash-outs and eroded areas resulting from weather, improper protection or other causes.
- .4 Report, in writing, to the Consultant all damages resulting from vandalism or any other causes beyond Contractor's control.

### 3.7 ACCEPTANCE

- .1 Sodded areas will be accepted at end of maintenance period provided that:
  - .1 Sodded areas are properly established.
  - .2 Sod is free of bare and dead spots and without weeds.
  - .3 No surface soil is visible when grass has been cut to height of 40 mm.

### END OF SECTION



1 General

1.1 SUMMARY

.1 Related Sections:

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 31 23 13 - Rough Grading.

1.2 REFERENCES

- .1 Agriculture and Agri-Food Canada (AAFC).
  - .1 Plant Hardiness Zones in Canada-2000.
- .2 Canadian Nursery Landscape Association (CNLA).
  - .1 Canadian Standards for Nursery Stock-2001.
- .3 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .2 Transportation of Dangerous Goods Act (TDGA), 1992, c.34.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for:
  - .1 Fertilizer.
  - .2 Mycorrhiza.
  - .3 Anti-desiccant.
  - .4 Guying assembly including clamps, collar, guying wire, anchors and wire tightener.
  - .5 Mulch.
- .3 Submit samples for:
  - .1 Mulch.
  - .2 Mycorrhiza.

1.5 STORAGE AND PROTECTION

- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Immediately store and protect plant material which will not be installed within 1 hour after arrival at site in storage location approved by Project Manager / Consultant.
- .3 Protect plant material from damage during transportation:
  - .1 When delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
  - .2 When delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.

- .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.
- .4 Protect stored plant material from frost, wind and sun and as follows:
  - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil, or mulch and watering to full depth of root zone.
  - .2 For pots and containers, maintain moisture level in containers. Heel-in fibre pots.
  - .3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.
- .5 Waste Management and Disposal:
  - .1 Remove excess material and debris from site and dispose of off-site in accordance with City accepted practices.

## 1.6 SCHEDULING

- .1 Obtain approval from Project Manager / Consultant of schedule 7 days in advance of shipment of plant material.
- .2 Schedule to include:
  - .1 Quantity and type of plant material.
  - .2 Shipping dates.
  - .3 Arrival dates on site.
  - .4 Planting Dates.

## 1.7 WARRANTY

- .1 For plant material as itemized on plant list the 12 months warranty period prescribed in subsection GC 32.1 of General Conditions "C" is extended to 24 months.
- .2 End-of-warranty inspection will be conducted by Project Manager / Consultant.
- .3 Project Manager / Consultant reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

## 2 Products

### 2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.
  - .1 Source of plant material: grown in Zone 5 in accordance with Plant Hardiness Zones in Canada.
  - .2 Plant material must be planted in zone indicated as appropriate for its species.
  - .3 Plant material in location appropriate for its species.
- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .3 Trees: with straight trunks, well and characteristically branched for species except where specified otherwise.
- .4 Trees larger than 200mm in caliper: half root pruned during each of two successive growing seasons, the latter at least one growing season prior to arrival on site.
- .5 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

- .6 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.

## **2.2 WATER**

- .1 Free of impurities that would inhibit plant growth.

## **2.3 STAKES**

- .1 T-bar, steel, 40 x 40 x 5 x 2440 mm.

## **2.4 WIRE TIGHTENER**

- .1 Type 1: galvanized steel, stamped plate type, rod, triangular shape.
- .2 Type 2: turnbuckle, galvanized steel, 9.5mm diameter with 270mm open length.

## **2.5 GUYING WIRE**

- .1 Type 1: steel, 3mm wire.
- .2 Type 2: 1.5mm diameter multi-wire steel cable.
- .3 Type 3: 3mm diameter multi-wire steel cable.

## **2.6 CLAMPS**

- .1 U-bolt: galvanized, 13mm diameter, c/w curved retaining bar and hex nuts.
- .2 Crimp type.

## **2.7 GUYING COLLAR**

- .1 Tube: plastic, 13mm diameter, nylon reinforced.

## **2.8 TRUNK PROTECTION**

- .1 Wire mesh: galvanized, electrically welded 1.4mm wire with 25 x 25mm mesh and fastener.
- .2 Plastic: perforated spiralled strip.
- .3 Burlap: clean, minimum 2.5 kg/m<sup>2</sup> mass and 150 mm wide, and twine fastener.
- .4 Tar impregnated crepe paper and twine fastener.

## **2.9 MULCH**

- .1 Bark chip: varying in size from 25 to 50mm in diameter, from bark of coniferous trees.
- .2 Wood chip: varying in size from 50mm to 75mm and 5 to 20mm thick, free of bark, small branches and leaves.
- .3 Shredded wood: varying in size from 25 to 125mm in length, from coniferous trees.

## **2.10 FERTILIZER**

- .1 Synthetic commercial type as recommended by soil test report.
- .2 Add mycorrhiza during planting operation. It is important that new root growth be in contact with mycorrhiza. Use as recommended by manufacturer.

## **2.11 ANTI-DESICCANT**

- .1 Wax-like emulsion.

## **2.12 FLAGGING TAPE**

- .1 Fluorescent, orange colour.

## **2.13 SOURCE QUALITY CONTROL**

- .1 Obtain approval from Project Manager / Consultant of plant material prior to planting.

- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

3 Execution

**3.1 PRE-PLANTING PREPARATION**

- .1 Ensure plant material acceptable to Project Manager / Consultant.
- .2 Remove damaged roots and branches from plant material.
- .3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

**3.2 EXCAVATION AND PREPARATION OF PLANTING BEDS**

- .1 Establishment of sub-grade for planting beds is specified in Section 31 23 13 - Rough Grading.
- .2 For individual planting holes:
  - .1 Stake out location and obtain approval from Project Manager / Consultant prior to excavating.
  - .2 Excavate to depth and width as indicated.
  - .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
  - .4 Scarify sides of planting hole.
  - .5 Remove water which enters excavations prior to planting. Notify Project Manager / Consultant if water source is ground water.

**3.3 PLANTING**

- .1 For bare root stock, place 50mm backfill soil in bottom of hole. Plant trees and shrubs with roots placed straight out in hole.
- .2 For jute burlapped rootball, cut away top one third of wrapping and wire basket without damaging root ball. Do not pull burlap or rope from under root ball.
- .3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.
- .4 Plant vertically in locations as indicated. Orient plant material to give best appearance in relation to structure, roads and walks.
- .5 For trees and shrubs:
  - .1 Backfill soil in 150 mm lifts. Tamp each lift to eliminate air pockets. When two thirds of depth of planting pit has been backfilled, fill remaining space with water. After water has penetrated into soil, backfill to finish grade.
  - .2 Form watering saucer as indicated.
- .6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.
- .7 Water plant material thoroughly.
- .8 After soil settlement has occurred, fill with soil to finish grade.
- .9 Dispose of burlap, wire and container material off site.

**3.4 TRUNK PROTECTION**

- .1 Install trunk protection on deciduous trees as indicated.
- .2 Install trunk protection prior to installation of tree supports when used.

**3.5 TREE SUPPORTS**

- .1 Install tree supports as indicated.
- .2 Use single stake tree support for deciduous trees less than 3 m and evergreens less than 2 m.
  - .1 Place stake on prevailing wind side and 150 mm from trunk.
  - .2 Drive stake minimum 150 mm into undisturbed soil beneath roots. Ensure stake is secure, vertical and un-split.
  - .3 Install 150 mm long guying collar 1500 mm above grade.
  - .4 Thread Type 1 guying wire through guying collar tube. Twist wire to form collar and secure firmly to stake. Cut off excess wire.
- .3 Use 3 guy wires and anchors for deciduous trees greater than 3 m and evergreens greater than 2 m.
  - .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
  - .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
  - .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
  - .4 Guying collars to be of sufficient length to encircle tree plus 50mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
  - .5 Install anchors at equal intervals about tree and away from trunk so that guy wire will form 45 degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
  - .6 Attach guy wire to anchors. Tension wire and secure by multi-wraps.
  - .7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.
  - .8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Project Manager / Consultant.
  - .9 Install flagging tape to guys as indicated.
- .4 After tree supports have been installed, remove broken branches with clean, sharp tools.

### **3.6 MULCHING**

- .1 Ensure soil settlement has been corrected prior to mulching.
- .2 Spread mulch as indicated.

### **3.7 MAINTENANCE DURING ESTABLISHMENT PERIOD**

- .1 Perform following maintenance operations from time of planting to acceptance by Project Manager / Consultant.
  - .1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.
    - .1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.
    - .2 Remove weeds monthly.
    - .3 Replace or re-spread damaged, missing or disturbed mulch.

- .4 For non-mulched areas, cultivate as required to keep top layer of soil friable.
- .5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Project manager / Consultant prior to application.
- .6 Remove dead or broken branches from plant material.
- .7 Keep trunk protection and guy wires in proper repair and adjustment.
- .8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

### 3.8 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Project Manager / Consultant to end of warranty period, perform following maintenance operations.
  - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
  - .2 Reform damaged watering saucers.
  - .3 Remove weeds monthly.
  - .4 Replace or re-spread damaged, missing or disturbed mulch.
  - .5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.
  - .6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Project Manager / Consultant prior to application.
  - .7 Apply fertilizer in early spring as indicated by soil test.
  - .8 Remove dead, broken or hazardous branches from plant material.
  - .9 Keep trunk protection and tree supports in proper repair and adjustment.
  - .10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.
  - .11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.
  - .12 Submit monthly written reports to Project Manager / Consultant identifying:
    - .1 Maintenance work carried out.
    - .2 Development and condition of plant material.
    - .3 Preventative or corrective measures required which are outside Contractor's responsibility.

**END OF SECTION**

1 General

1.1 GENERAL

- .1 All conditions of the Contract apply to the work of this Section.

1.2 SCOPE OF WORK

- .1 This Section of the Contract includes the supply and planting of trees, shrubs, ground covers and other landscaping and bedding materials indicated on drawings and specified herein. The work generally includes but is not limited to the following:
- .1 Supply and install trees and shrubs.

1.3 RELATED REQUIREMENTS

- .1 Section 32 91 19: Landscaping Grading
- .2 Section 32 92 23 Sodding

1.4 SOURCE QUALITY CONTROL

- .1 Obtain approval of plant material at source.
- .2 Notify Consultant of source of material at least 7 days in advance of shipment. No work under this Section is to proceed without approval. Substitutions for the specified plants will not be accepted unless approved in writing by the Consultant
- .3 Acceptance of plant material at its source does not prevent rejection on site prior to or after planting operations.

1.5 SHIPMENT AND PRE-PLANTING CARE

- .1 Co-ordinate shipping of plants and excavation of holes to ensure minimum time lapse between digging and planting.
- .2 Tie branches of trees and shrubs securely and protect plant material against abrasion, exposure and extreme temperature change during transit. Avoid binding of planting stock with rope or wire which would damage bark, break branches or destroy natural shape of plant. Give full support to root ball of large trees during lifting.
- .3 Cover plant foliage with tarpaulin and protect bare roots by means of dampened straw, peatmoss, saw dust or other acceptable material to prevent loss of moisture during transit and storage.
- .4 Remove broken and damaged roots with clean sharp pruning shears.
- .5 Keep roots moist and protected from sun and wind. Heel-in trees and shrubs, which cannot be planted immediately, in shaded areas and provide an ample amount of water.

1.6 WARRANTY

- .1 All trees, shrubs and groundcover planted during the allowable planting season of each calendar year shall be under warranty for a period of 24 months, commencing on the date of acceptance. All plant materials used as replacement for unacceptable plant material shall be of the same quality and requirements prescribed for original material. A plant shall be assumed to be acceptable when it is structurally sound, when it is well furnished with living foliage, when it has normal colour, when it shows adequate annual growth and formation of buds and when it is free from insects and disease. Plant material which has severely "died back" and has regrown from a bud or shoot shall be considered unacceptable.
- .2 Plants which have died during the period of warranty shall be replaced at no cost to the Owner as soon as possible consistent with the allowable planting season. The Contractor shall be required to complete replacement planting in one week. Dead plant material replaced under warranty shall be removed from the contract site at the Contractor's expense. The warranty or replacement plant material shall be extended for a period equal to the original warranty period.

- .3 Replacement of materials broken or damaged due to circumstances beyond the Contractor's control after planting shall not be an obligation under this warranty. Plant material which has died due to salt damage will have to be proven through tissue analysis at the expense of the Contractor. The Contract performance bond is a guarantee that the terms of warranty will be honoured to the date of acceptance of the contract.

## 2 Products

### 2.1 MATERIALS

- .1 Materials shall be of uniform quality, and be subject to inspection, quality interpretation and acceptance by the Consultant.

### 2.2 TOPSOIL

- .1 The Contractor shall ensure that on site topsoil shall be a fertile, friable, natural loam containing no less than 5% organic matter, shall be free of subsoil, clay lumps or weeds, stones and roots over 50mm in diameter and other extraneous material, and shall be capable of sustaining healthy plant growth. The Contractor shall not use topsoil that is in a frozen or muddy condition.

### 2.3 FERTILIZER

- .1 A controlled release water soluble fertilizer with an analysis of 20-6-4 shall be applied in the spring or fall following planting in accordance with the manufacturer's directions.
- .2 Fertilizer shall be delivered to the site in standard weatherproof containers, labeled to indicate their weight, analysis and manufacturer. Fertilizer shall be stored in such a manner that it is kept dry and its effectiveness is not impaired.

### 2.4 STAKES

- .1 Stakes for supporting trees shall be new steel T-bar stakes or an acceptable wooden substitute in accordance with the planting details. All staking materials shall be removed by the Contractor at the end of the warranty period.

### 2.5 TREE TIES

- .1 Tree Ties used for securing trees to stakes shall be of a material that will not damage the bark, is a minimum of 25mm wide and shall remain soft and pliable under all weather conditions.

### 2.6 ANTI-DESICCANT

- .1 Anti-desiccant emulsion shall be a product specifically manufactured to provide a flexible surface film to reduce transpiration yet not impede passage of carbon dioxide and oxygen.

### 2.7 MULCHING MATERIAL

- .1 For shrub/ perennial beds and tree saucers:
- .2 Mulching material shall be shredded bark not exceeding 80 mm in length. The Contractor shall supply a sample of the mulch to the Consultant for approval prior to its application.

### 2.8 PLASTIC GUARDS

- .1 All deciduous trees shall be protected by a corrugated PVC tree guard in accordance with the planting detail

### 2.9 PLANT MATERIAL

- .1 All plant material required for the performance of the work shall meet the specifications for size, height, spread, quality and nomenclature as set out in the Canadian Standard for Nursery Stock as published by the Canadian Nursery Landscape Association.
- .2 Collected material dug from native stands or established woodlots shall not be accepted unless prior approval has been granted by the Owner.



- .3 All trees and shrubs shall be nursery grown, true to type and structurally sound with straight trunks and leaders intact, and be well and characteristically branched for the species. Root balls shall not be cracked, broken or damaged. All plants shall be healthy, vigorous, and free of disease, insect infestation, rodent damage, sun scald, frost cracks and any other abrasions or scars to the bark. They shall be densely foliated when in leaf and have healthy, well developed root systems.
- .4 Plant materials grown in more moderate hardiness zones than those in this contract will not be accepted.

### 3 Execution

#### 3.1 GENERAL

- .1 The work shall be carried out by experienced, qualified personnel under the direction and supervision of foremen with at least 5 years of horticultural and planting experience. The Contractor must be a member of Landscape Ontario.

#### 3.2 ALLOWABLE PLANTING SEASON

- .1 Planting shall be performed during suitable periods with respect to weather conditions and locally accepted practice, as determined by the Consultant.

#### 3.3 DIGGING, TRANSPORTING AND STORAGE OF BALLED AND BURLAPPED STOCK

- .1 Rootballs, trunks, branches and leaves of all trees and shrubs shall be protected from sun and wind while in transit and until planted.
- .2 Balled and burlapped material shall not be stored on the site in excess of forty-eight hours (48h) without permission from the Consultant. If storage is necessary, the plant material shall be protected with soil or a similar material to prevent drying out and shall be kept moist until it is planted.
- .3 Balled and burlapped material shall not be stored on the site in excess of forty-eight hours (48 h) without permission from the Consultant. If storage is necessary, the plant material shall be protected with soil or a similar material to prevent drying out and shall be kept moist until it is planted.

#### 3.4 INSPECTION

- .1 All plant material upon arrival at the site shall be clearly identified by labels indicating species, size and supplier.
- .2 Plant material shall not be planted before acceptance and approval by the Consultant after delivery to the project site.
- .3 Rejected plants shall be removed from the site within twenty-four hours (24 h) of notification of same.

#### 3.5 LAYOUT AND STAKING

- .1 The Contractor shall be responsible for locating all underground utilities and services prior to digging.

#### 3.6 EXCAVATION OF PLANTING PITS

- .1 The planting pits shall be excavated to the depth of the rootball as shown on the Contract Drawings. The bottom of the planting pits shall be protected from freezing. Surplus excavated material shall be disposed of off the contract site. The bottom and sides of the planting pit shall be scarified so that water and roots can penetrate readily.

#### 3.7 PLANTING AND WATERING

- .1 The plant material shall be placed in pits in a vertical position at the same relation to grade as originally grown after settlement has taken place. The north side of the tree shall be marked in

the nursery and trees shall be planted to face the same direction or to provide the best appearance and relationship to adjacent objects and surroundings as directed by the Consultant. Plants shall be set plumb in the centre of the pits and at the same relation to grade as originally grown after settlement has taken place. Shrub beds shall be stripped of existing vegetation.

- .2 Burlap, ropes, wire, ties, etc., shall be cut and removed from at least the top of rootball.
- .3 Backfill shall be one part topsoil mixed thoroughly with two parts native soil.
- .4 The tree pit shall be backfilled with topsoil in layers of 150 mm depth, which are firmly tamped as applied. Soak the soil mixture thoroughly with water when the hole is half filled. Air pockets shall not be allowed to form when backfilling. The final backfill layers shall be applied to form a saucer-like surface over the entire planting pit area to retain water over the root area. If the pit is on a slope, the lower edge shall be built up to catch and hold water.
- .5 All plant material shall be thoroughly watered immediately after planting. The Contractor shall be responsible for the supply, delivery and application of the water and fertilizer.

### **3.8 STAKING**

- .1 All trees shall be staked immediately following planting in accordance with the planting detail.

### **3.9 MULCHING**

- .1 Immediately after planting and initial watering is completed, shredded bark mulch shall be applied to a minimum compressed depth of 100 mm in a uniform continuous blanket to:
- .2 The surface area of each individual tree pit and earth saucer kept back 50mm from trunks.

### **3.10 MAINTENANCE**

- .1 The Contractor shall advise the Consultant in advance when any maintenance operation is to be undertaken.
- .2 The Contractor shall provide maintenance immediately after each portion of planting is completed and continue throughout the period of warranty. Maintenance requirements shall include all procedures consistent with proper horticultural practices to ensure normal, vigorous and healthy growth of all material planted under this contract. This includes adequate watering, pruning, cultivation and weed control as required, disease and insect pest control, (conforming to local pesticide regulations), fertilizing, restaking and attention to tree ties, etc. All plant material shall be fertilized in the spring or fall after installation of plant material.
- .3 The Contractor shall restore the site to original conditions from damage arising out of the maintenance operations.
- .4 This work shall be performed to the satisfaction of the Landscape Architect and Owner and compensation shall be deemed to be included in the prices bid for various tender items.
- .5 All mulched areas shall be kept free of weeds and grass for the duration of the warranty period.

### **END OF SECTION**

1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A 48/A 48M-[00], Standard Specification for Gray Iron Castings.
  - .2 ASTM C 117-[04], Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .3 ASTM C 136-[05], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .4 ASTM C 139-[05], Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes.
  - .5 ASTM C 478M-[06], Standard Specification for Precast Reinforced Concrete Manhole Sections [Metric].
  - .6 ASTM D 698-[00a], Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-[88], Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-[M88], Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A23.1-[04]/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA-A3000-[03(R2005)], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-[03], Cementitious Materials for Use in Concrete.
    - .2 CSA-A3002-[03], Masonry and Mortar Cement.
  - .3 CAN/CSA-A165 Series-[04], CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
  - .4 CAN/CSA-G30.18-[M92(R2002)], Billet Steel Bars for Concrete Reinforcement.
  - .5 CAN/CSA-G164-[M92(R2003)], Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS 407-[November 2004], Construction Specification For Maintenance Hole, Catch Basin, Ditch Inlet And Valve Chamber Installation.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
  - .1 Submit manufacturer's test data and certification at least 2 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

### 1.3 QUALITY ASSURANCE

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Project Manager / Consultant to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building sub-trades.
  - .4 Review installation instructions and warranty requirements.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
- .2 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .3 Deliver, store and handle materials in accordance with manufacturer's written instructions.

## 2 Products

### 2.1 MATERIALS

- .1 Cast-in-place concrete:
  - .1 In accordance with Section 03 30 00 - Cast-in-Place Concrete.
  - .2 Precast manhole units: to ASTM C 478M, circular or oval.
    - .1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
- .2 Monolithic bases to be approved by Consultant and set on concrete slabs cast in place.
- .3 Precast catch basin sections: to ASTM C 139.
- .4 Joints: made watertight using rubber rings.
- .5 Mortar:
  - .1 Aggregate.
  - .2 Masonry Cement: to CAN/CSA-A3002.
- .6 Ladder rungs: to CAN/CSA-G30.18, No.25M billet steel deformed bars, hot dipped galvanized to CAN/CSA-G164.
  - .1 Rungs to be safety pattern (drop step type).
- .7 Adjusting rings: to ASTM C 478M.
- .8 Concrete Brick: to CAN3-A165 Series.

- .9 Drop manhole pipe: same as sewer pipe.
- .10 Galvanized iron sheet: approximately 2 mm thick.
- .11 Steel gratings, I-beams and fasteners: as indicated.
- .12 Frames, gratings, covers to dimensions as indicated and following requirements:
  - .1 Metal gratings and covers to bear evenly on frames.
    - .1 Frame with grating or cover to constitute one unit.
    - .2 Assemble and mark unit components before shipment.
  - .2 Gray iron castings: to ASTM A 48/A 48M, strength class 30B.
  - .3 Castings: coated with two applications of asphalt varnish sand blasted or cleaned and ground to eliminate surface imperfections.
  - .4 Manhole frames and covers: cover cast without perforations and complete with two 25 mm square lifting holes OPSS 407.
  - .5 Catch basin frames and covers: to OPSS 407.
  - .6 Size: 1200 mm clear diameter.
- .13 Granular bedding and backfill:
  - .1 Gravel / sand.
  - .2 Gradations to be within limits specified when tested to ASTM C 136 and ASTM C 117. Sieve sizes to CAN/CGSB-8.1.
  - .3 Concrete mixes and materials: in accordance with Section 03 30 00 - Cast-in-Place Concrete.

### 3 Execution

#### 3.1 MANUFACTURER'S INSTRUCTIONS

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

#### 3.2 EXCAVATION AND BACKFILL

- .1 Obtain approval of Project Manager / Consultant before installing manholes or catch basins.

#### 3.3 CONCRETE WORK

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete

#### 3.4 INSTALLATION

- .1 Construct units in accordance with details indicated, plumb and true to alignment and grade.
- .2 Complete units as pipe laying progresses.
  - .1 Maximum of three units behind point of pipe laying will be allowed.
- .3 Dewater excavation to approval of Project Manager / Consultant and remove soft and foreign material before placing concrete base.
- .4 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% maximum density to ASTM D 698.
- .5 Precast units:
  - .1 Set bottom section of precast unit in bed of cement mortar and bond to concrete slab or base.

- .2 Make each successive joint watertight with Project Manager / Consultant's approved rubber ring gaskets, bituminous compound, cement mortar, epoxy resin cement, or combination of these materials.
- .3 Clean surplus mortar and joint compounds from interior surface of unit as work progresses.
- .4 Plug lifting holes with precast concrete plugs set in cement mortar or mastic compound.
- .6 For sewers:
  - .1 Place stub outlets and bulkheads at elevations and in positions indicated.
  - .2 Bench to provide smooth U-shaped channel.
    - .1 Side height of channel to be diameter of sewer.
    - .2 Slope adjacent floor at 1 in 20.
    - .3 Curve channels smoothly.
    - .4 Slope invert to establish sewer grade.
- .7 Compact granular backfill to 95% maximum density to ASTM D 698.
- .8 Installing units in existing systems:
  - .1 Where new unit is installed in existing run of pipe, ensure full support of existing pipe during installation, and carefully remove that portion of existing pipe to dimensions required and install new unit as specified.
  - .2 Make joints watertight between new unit and existing pipe.
  - .3 Where deemed expedient to maintain service around existing pipes and when systems constructed under this project are ready for operation, complete installation with appropriate break-outs, removals, redirection of flows, blocking unused pipes or other necessary work.
- .9 Place frame and cover on top section to elevation as indicated.
  - .1 If adjustment required use concrete ring.
- .10 Clean units of debris and foreign materials.
  - .1 Remove fins and sharp projections.
  - .2 Prevent debris from entering system.

### 3.5 ADJUSTING TOPS OF EXISTING UNITS

- .1 Remove existing gratings, and frames and store for re-use at locations designated by Project Manager / Consultant.
- .2 Sectional units:
  - .1 Raise or lower straight walled sectional units by adding or removing precast sections as required.
  - .2 Raise or lower tapered units by removing cone section, adding, removing, or substituting riser sections to obtain required elevation, then replace cone section.
    - .1 When amount of raise is less than 600 mm use standard manhole brick, modoloc or grade rings.
- .3 Monolithic units:
  - .1 Raise monolithic units by roughening existing top to ensure proper bond and extend to required elevation with cast-in-place concrete.

- .2 Lower monolithic units with straight wall by removing concrete to elevation indicated for rebuilding.
- .4 Re-use existing gratings, and frames.
- .1 Re-set gratings and frames to required elevation on full bed of cement mortar, parge and trowel smooth.

### 3.6 FIELD QUALITY CONTROL

- .1 Leakage Test:
- .2 Install watertight plugs or seals on inlets and outlets of each new manhole and fill manhole with water.
- .3 Leakage not to exceed 0.3% per hour of volume of manhole
- .4 If permissible leakage is exceeded, correct defects.
- .5 Repeat until approved by Project Manager / Consultant.

### 3.7 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

1 General

1.1 SCOPE

- .1 This Section includes the construction of the storm sewer lead between new catch basins and the existing 305mm dia. storm sewer.

1.2 RELATED REQUIREMENTS

- .1 Section 31 23 10 – Removals, Excavating, Trenching and Backfilling.

1.3 REFERENCES

- .1 ASTM International
  - .1 ASTM D 698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-M89, Sieves, Testing, Woven Wire, Inch Series.
- .3 CSA International
  - .1 CAN/CSA-B1800-15, Thermoplastic Non-pressure Pipe Compendium - B1800 Series.
- .4 Ontario Provincial Standard Specifications (OPSS)
  - .1 OPSS.MUNI 1010 (November 2013) Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material.
  - .2 OPSS 409 (November 2013): Construction Specification for Closed-Circuit Television (CCTV) Inspection of Pipelines.
  - .3 OPSS 410 (November 2013): Construction Specification for Pipe Sewer Installation in Open Cut.
  - .4 OPSD 802.010: Flexible Pipe Embedment and Backfill, Earth Excavation.
  - .5 OPSD 802.013: Flexible Pipe Embedment and Backfill, Rock Excavation.
  - .6 OPSD 803.030: Frost Treatment – Pipe Culverts, Frost Penetration Line below Bedding Grade.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01330 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes, bedding material, and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Inform Project Manager / Consultant at least 3 weeks prior to beginning Work, of proposed source of bedding materials.
  - .2 Submit to Project Manager / Consultant testing results, at least 2 weeks prior to beginning Work, following samples of materials proposed for use: bedding material.
  - .3 Certification to be marked on pipe.
  - .4 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.
  - .5 Manufacturer's Instructions: submit to Project Manager / Consultant 1 electronic copy of manufacturer's installation instructions.



## 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 . Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect pipes from damage.
  - .3 Replace defective or damaged materials with new.

## 2 Products

### 2.1 PLASTIC PIPE

- .1 Type PSM Poly Vinyl Chloride (PVC): to CAN/CSA-B1800.
  - .1 Standard Dimensional Ratio (SDR): 35.
  - .2 Locked-in gasket and integral bell system.
  - .3 Nominal lengths: 4 m.

### 2.2 PIPE BEDDING AND SURROUND MATERIAL

- .1 Granular A in accordance with OPSS.MUNI 1010.

### 2.3 BACKFILL MATERIAL

- .1 Select fill compatible with subgrade conditions in accordance with Section 312310 - Trenching and Backfilling of Underground Utilities.

## 3 Execution

### 3.1 PREPARATION

- .1 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Project Manager / Consultant.

### 3.2 TRENCHING

- .1 Do trenching Work in accordance with Section 312310 - Excavating, Trenching and Backfilling and OPSD 802.010 / OPSD 802.013.
- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth to approval of Project Manager / Consultant prior to placing bedding material and pipe.

### 3.3 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth as indicated on OPSD 802.010 / OPSD 802.013.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
  - .1 Do not use blocks when bedding pipes.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 98% maximum density to ASTM D 698.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or catch basins with compacted bedding material.

### 3.4 INSTALLATION

- .1 Lay and join pipe in accordance with manufacturer's recommendations and to approval of Project Manager / Consultant.
- .2 Handle pipe using methods approved by Project Manager / Consultant.
  - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade with pipe inverts smooth and free of sags or high points.
  - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.
- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Water to flow through pipes during construction only as permitted by Project Manager / Consultant.
- .7 Whenever work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Install plastic pipe and fittings in accordance with CAN/CSA-B1800.
- .9 When any stoppage of Work occurs, restrain pipes as directed by Project Manager / Consultant, to prevent "creep" during down time.
- .10 Cut pipes as required for special inserts, fittings or closure pieces, as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .11 Make watertight connections to manholes and catch basins.
  - .1 Use shrinkage compensating grout when suitable gaskets are not available.
- .12 Use prefabricated saddles or approved field connections for connecting pipes to existing sewer pipes.
  - .1 Joint to be structurally sound and watertight.
- .13 Temporarily plug open upstream ends of pipes with removable watertight concrete, steel or plastic bulkheads.

### 3.5 PIPE SURROUND

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Project Manager / Consultant has inspected pipe joints, surround and cover pipes as indicated.
  - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated on OPSD 802.010 / 802.030.
  - .1 Do not dump material within 1 m of pipe.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 98% maximum density to ASTM D 698.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 98% maximum density to ASTM D 698.
- .7 When field test results are acceptable to Project Manager / Consultant, place surround material at pipe joints.

### 3.6 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill as specified in Section 312310 – Removals, Excavating, Trenching and Backfilling. In other areas, compact backfill as specified in Section 312310 – Removals, Excavating, Trenching and Backfilling.

### 3.7 FIELD TESTS AND INSPECTIONS

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 Deflection testing of flexible pipes shall be conducted in accordance with OPSS 410.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 Sewers shall be inspected using CCTV equipment. CCTV inspection of sewers shall be in accordance with OPSS 409.

### 3.8 CLEANING

- .1 Progress Cleaning:
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.–
- .3 Waste Management: separate waste materials for reuse and recycling.–
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

1 General

**1.1 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .2 CSA International
  - .1 CAN/CSA-B1800-15, Thermoplastic Non-pressure Pipe Compendium.
  - .2 CAN/CSA-G401-14, Corrugated Steel Pipe Products.
- .3 Ontario Provincial Standard Specifications
  - .1 OPSS 410, Construction Specification for Pipe Sewer Installation in Open Cut
  - .2 OPSS 405, Construction Specification for Pipe Subdrain
  - .3 OPSS 501, Construction specification for Compacting
- .4 ASTM International
  - .1 ASTM C4-04(2014), Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile.
  - .2 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>(600 kN-m/m<sup>3</sup>))

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes, pipe fittings, tiles, and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Certificates:
  - .1 Submit manufacturer's certification that drain pipe materials meet requirements of this Section.
  - .2 Certification to be marked on pipe.

**1.3 HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect pipes and tiles from damage.
  - .3 Replace defective or damaged materials with new.
  - .4 The Contractor shall replace any pipe or geotextile damaged by excessive exposure to sunlight or damaged by any other means.

2 Products

**2.1 MATERIALS**

- .1 Perforated plastic pipe and fittings: to Contract Drawings and to CAN/CSA-B182.8 or CAN/CSA-B182.6 or OPSS 1840.
  - .1 Nominal pipe sizes 100 to 300 mm.
  - .2 Subdrain pipe shall be wrapped with knitted sock geotextile.
- .2 Bedding gravel or crushed stone; granular material shall be according to OPSS 1010 and as specified in the contract documents
- .3 Clear stone shall be 19mm Type I or Type II, according to OPSS 1004.
- .4 Geotextile filter: approved non-woven class 1 geotextile.
- .5 Subdrain shall be connected to maintenance holes, catchbasins and ditch inlets by a 1m section of non-perforated pipe.

3 Execution

**3.1 EXAMINATION**

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

**3.2 TRENCHING**

- .1 Do excavating, trenching and backfilling in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**3.3 BEDDING**

- .1 Trenches shall be excavated a minimum of 50 mm below the pipe bottom. The 50 mm depth shall be filled with bedding consisting of granular material as indicated in the Contract Drawings. Bedding and backfill shall be the same material.

**3.4 INSTALLATION**

- .1 Refer to OPSS 405.

**3.5 CONNECTIONS TO MUNICIPAL FACILITIES**

- .1 Pipe connections to concrete maintenance holes, catch basins, and ditch inlets shall be to OPSS 410 and City of Ottawa Special Provision F-4100.
- .2 Subdrain connections to Rear Yard Catch Basins inlets shall include a 300 mm non-perforated corrugated steel pipe section which shall be welded to the corrugated steel pipe maintenance hole, catch basin, or ditch inlet.

**3.6 BACKFILLING**

- .1 Backfill shall be the same material as the bedding.
- .2 Any earth from cave-ins and all other unsuitable material shall be removed from the backfill. Cracked or crushed pipes shall be removed and replaced before any backfilling is commenced.
- .3 At the termination of a day's work, backfilling shall be complete over all subdrain pipes and outlet pipes placed.

- .4 The Contractor shall ensure that the subdrain pipe, outlet pipe, and outlet are not damaged or dislodged during the placement and compaction of the backfill. Compaction of backfill material shall be according to OPSS 501.

### **3.7 CLEANING**

- .1 Progress Cleaning: Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

**END OF SECTION**