High Park Visitor and Nature Centre

Parks, Forestry & Recreation
City of Toronto
Toronto, Ontario

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KONGATS ARCHITECTS

Project No: 2205
Issued for Tender February 25, 2025

SPECIFICATIONS
Volume 1

Architectural, Investigations and Reports

1.0 PROJECT TITLE

High Park Visitors Centre
City of Toronto

2.0 OWNER

City of Toronto
Street Address: 55 John Street, 14th Floor
City: Toronto, Ontario
Postal Code: M5V 3C6

Division: Parks, Forestry & Recreation, Capital Projects

Owner Representative: John Keen
Tel #: 416-395-7898
Email: John.Keen@toronto.ca

3.0 CONSULTANTS

3.1	Architectural:	Kongats Architects 23 Morrow Avenue Suite 2 Toronto, Ontario, M6R 2H9 Attention: Alar Kongats Tel:416-504-8998 Fax:416-504-6556 Email: akongats@kongatsarchitects.com
3.2	Structural, Mechanical, Electrical Civil	Mantecon Partners 15 Foundry Street Dundas, Ontario L9H 2V6 Tel: 905-648 0373

END OF SECTION

CONSULTANT'S SEAL

These seals govern all Documents and Sections of these Specifications,
except Section 00 30 00 - Existing Conditions and Section 02 61 33 - Hazardous Materials.

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PART ONE – GENERAL

1.1 SUMMARY OF WORK

.1 Without limiting the scope of work, the Contract includes all products, labour, equipment, materials and temporary facilities as required, or implied by the drawings and specifications to complete the Work, complete with all necessary incidentals.

1.2 RELATED SECTIONS

.1 Section 00 73 01 Supplementary Conditions.

.2 The requirements of this Section apply to all other Sections of the specifications.

1.3 SPECIFICATION FORMAT

.1 Specifications are not intended as a detailed description of installation methods but serve to indicate particular requirements to insure the performance of the completed work.

.2 Material shown or specified on Drawings or in Specifications, unless otherwise specified, shall conform to standards designated in Ontario Building Code. Similarly, unless otherwise specified, installation methods and standards of workmanship shall also conform to standards required by Ontario Building Code.

.3 Parts of specification are written in short form, therefore it is understood that where a component of Work is stated in heading followed by a material or operation, "shall be", "shall consist of" or similar words or phrases are implied which denote complete supply and installation of such material or operations for component of work designated by heading.

.4 Division One of the specifications shall be read into and form part of each Section of the Specifications.

.5 The Contract Documents are to be interpreted as a whole, although they are arranged in divisions and sections for convenience and clarity. The Contractor is responsible for all the work, regardless of the division of the work in the Contract Documents, and such division does not impose any obligation on the Consultant or upon the Owner as arbiters to establish limits or responsibility between the Contractor and the Subcontractors.

1.4 QUALITY OF WORK

.1 Work shall be of the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required work is such as to make it impractical to produce required results.

.2 Do not employ any unfit persons or anyone unskilled in their required duties.

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

.4 All contractor personnel are restricted to the job site and necessary access routes. No personnel shall visit other areas or buildings without specific authorization.

1.5 ALLOWANCES

.1 Refer to Section 01 21 01 Allowances.

1.6 SITE EXAMINATION

.1 Contractor warrants that:
  .1 the Contractor has visited and assessed the site prior to submitting a bid, including a review of any existing pertinent drawings and other documents and;

.2 that the Contractor and the subcontractors are familiar with all matters discussed at any bidder's site briefing, and;

.3 that the Contractor and the subcontractors are familiar with all visible, known or reasonably inferable site conditions.

.2 No claims for extra payment will be allowed for extra work made necessary or difficulties encountered due to conditions of the site which were visible upon or reasonably inferable from an examination of the site, and the Contract Documents prior to the closing of the bids. Execution of the form of Contract shall be deemed a waiver of all claims for extra payment due to any visible or reasonably inferable condition of the site existing prior to the closing of bids.

.3 The Contractor expressly agrees that conditions above existing suspended acoustic tile ceilings but below the level of plaster or gypsum board at the underside of structure shall be considered exposed conditions for the purposes of making findings under the provisions of this Contract, and that there shall be no claims for extra costs under CCDC 2 - 2020, GC 6.4 for extra work due to hidden conditions in these areas.

1.7 SAFETY

.1 Refer to CCDC 2 – 2020, GC 9.4.

.2 Contractor's current health and safety statement and policy shall be filed with the Owner prior to start of work, for the Owner's information only.

.3 The health and safety statement and policy shall include:

.1 Current Material Safety Data Sheets for the products to be used.
.2 Provisions for safety including the use of continuous snow fencing in lieu of barricades or caution tape.
.3 Signage to indicate DANGER ZONES, CLOSURES, DETOURS, ETC.
.4 Set-up locations and procedures.
.5 Material storage and handling.
.6 Fire protection.
.7 Debris handling, storage, disposal and clean-up.
.8 Personnel safety required by the regulations including roof barriers, travel restraint systems and fall arrest systems.
.9 Hazardous materials abatement.
.10 Other measures pertinent to the Work.

.4 Owner's receipt of such policy is not approval of completeness and accuracy of policy, nor confirmation of compliance with applicable legislation. The Owner shall in no way be held liable for contents or enforcement of the Contractor's health and safety statement and policy, or the Contractor's detailed health and safety procedures. Owner's comments, or lack thereof, shall not be construed as approval of the Contractor's health and safety practices.

.5 Observe and enforce construction safety measures required by Ontario Building Code, Canadian Construction Safety Code 1977, Occupational Health and Safety Act 1980 and all latest amendments including the Regulations for Construction Projects, Ontario Regulations 413/90 and all latest amendments, Workers' Compensation Board and municipal statutes and authorities.

.6 In the event of conflict between provisions of above authorities the most stringent provision applies.

.7 The General Contractor shall be designated the "Constructor", as defined by the Occupational Health and Safety Act. All Contractors on the Work site shall consider themselves as "employers" as defined by the Occupational Health and Safety Act.

.8 Do not permit any work in the existing building which may be hazardous or harmful to the occupants of the existing building. All such work must be scheduled for times the existing building will be unoccupied. Such work will include, but not be limited to, hoisting of materials and equipment over normally occupied spaces; the rise of toxic solvents or adhesives, the rise of carbon monoxide or carbon dioxide fumes generated by fuel-fired appliances or equipment, etc.

.9 Contractor is solely liable for construction safety and for compliance with applicable legislation.

.10 Provide a copy of the project registration filed with a Director under the Occupational Health and Safety Act (Ontario) called "Registration Forms of Construction and Employers of Workers".

.11 Where legislation requires a joint health and safety committee, provide minutes of the committee's meetings to the Owner for the Owner's information.

.12 Provide Owner and Consultant with a copy of Ministry of Labour inspection report and any orders arising within 24 hours of receiving report, for Owner's information.

.13 Correct all safety deficiencies immediately.

.14 Accidents
- .1 In addition to requirements of applicable legislation, in any emergency requiring the use of a resuscitator, the Owner shall be notified.
- .2 Make arrangements for emergency treatment of accidents.
- .3 Provide Owner and Consultant with a copy of WSIB injury report for all reportable accidents and injuries, for information purposes, within 24 hours of incident.

.15 The Contractor will be responsible for verifying through locates the location of any utilities or services that cross or enter the area of the Work.

.16 Indemnify and hold harmless the Owner of any and all liability of every nature and description that may be suffered through bodily injuries, involving deaths of any persons, by reasons of negligence of the contractor, his agents, employees, or his sub-contractors.

1.8 PROJECT COORDINATION

.1 Coordinate progress of the Work, progress schedules, submittals, use of site, temporary utilities, construction facilities, Owner's continuing use and occupancy of the building and site during the Work.

.2 Assume full responsibility for, and execute complete layout of work to locations, lines and elevations indicated including any existing utilities or services.

.3 Provide devices needed to lay out and construct work.

.4 Supply such devices as straight edges and templates required to facilitate Consultant's review of work.

.5 Each trade shall examine the work upon which the trade or specification Section depends. Have all defects and deficiencies corrected prior to proceeding with work. The application of work or any part of it shall be deemed acceptance by the Contractor of the work upon which subsequent work depends.

1.9 CUTTING AND PATCHING

.1 Refer to Section 01 54 01 Cutting and Patching.

1.10 PROJECT MEETINGS

.1 Preconstruction Meeting
- .1 Attend a preconstruction meeting before commencing work. Purpose of meeting is to review procedures.
- .2 Submit, at this meeting, proof that application has been made to the Ministry of Labour for "Notice of Project" where legislation requires this notification be made. Work may not proceed until the Ministry has been notified.
- .3 Record minutes. Include significant proceedings and decisions. Identify `action by' parties

and critical dates.

.4 Reproduce and distribute copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance, Consultant, and Owner.

.2 Progress Meetings

.1 Schedule and administer project progress meetings before work begins, throughout progress of work, and at call of Consultant.

.2 Distribute written notice of each meeting four days in advance of meeting date to Consultant, Owner, and major subtrades involved in the Work. Subtrades who have work in progress or imminent at the time of the meeting shall attend project meetings.

.3 Provide physical space and make arrangements for meetings.

.4 Record minutes. Include significant proceedings and decisions. Identify `action by' parties and critical dates.

.5 Reproduce and distribute copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance, Consultant, and Owner.

1.11 SCHEDULE

.1 Schedules Required

.1 Construction Progress Schedule. The Contractor shall cooperate and fully inform the Owner of their schedules and work to be done.

.2 Format

.1 Unless otherwise advised, prepare schedule in form of horizontal bar chart.

.2 Provide separate bar for each trade or operation.

.3 Provide horizontal time scale identifying first work day of each week.

.4 Format for listings: List of Contents of this specification.

.3 Submission

.1 Submit initial schedules within 10 days after award of Contract.

.2 Submit 2 copies to be retained by Consultant.

.3 Consultant will review schedule and return reviewed copy within 10 days after receipt.

.4 Resubmit finalized schedule within 10 days after return of reviewed copy.

.5 With each application for progress payment, submit an up-to-date schedule.

.4 Maintenance and Resubmission

.1 Monitor progress of work relative to approved schedule.

.2 Submit schedules at each progress (site) meeting indicating actual progress of the Work relative to approved schedule.

.3 Advise Consultant and Owner where progress of work varies from schedule, paying particular attention to variances that may result in delay of completion of Work, in whole or in part, or achievement of any milestone dates.

.4 Where progress of work varies from approved schedule, revise and resubmit schedule, showing means to recover from delays and achieve completion date(s).

.5 Revise and resubmit schedule to reflect extensions in Contract Time agreed to in Change Orders.

.6 Owner’s or Consultant’s acceptance of revised schedules showing completion dates later than contractually agreed shall not relieve Contractor of any responsibility for compensating Owner for costs incurred as a result of delayed completion of work, nor result in any liability by the Owner or the Consultant to the Contractor for additional costs due to the Contractor’s delay in completing the Work.

1.12 QUALITY CONTROL

.1 Refer to Section 01 45 01 Quality Control.

1.13 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

.1 Sanitary facilities, water supply, temporary heating, temporary power, and temporary telephone: refer to Section 01 51 01 Temporary Utilities.

.2 Construction facilities, site storage/loading, equipment/tool/materials storage: refer to Section 01 52 01 Temporary Facilities

.3 Temporary controls: refer to Section 01 5 01 Temporary Controls

.4 Project Cleanliness: refer to Section 01 74 01 Cleaning

.5 Assistance with Consultant's Site Review

.1 The Contractor shall render all necessary assistance to the Consultant and if required shall take and furnish him with levels, measurements, or anything else required by the Consultant to review the Work. The Contractor shall provide sufficient, safe and proper facilities at all times for the review of the Work by the Consultant.

1.14 MATERIAL AND EQUIPMENT

.1 Refer to Section 01 61 01 Material and Equipment.

1.15 ADDITIONAL DOCUMENTS REQUIRED

.1 The contractor shall maintain at the place of the Work one copy of each of the following:

.1 additional written instructions that change this work and supplement the Contract;
.2 one copy of each Site instruction, Change Directive, Change Order and Contemplated Change Order;
.3 Field Inspection and test reports by testing and inspection agencies;
.4 one copy of each of the Consultant's site visit reports;
.5 copy of approved work schedule;
.6 manufacturers' installation and application instructions;
.7 reviewed shop drawings and other submittals; and
.8 up-to-date progress schedule.

1.16 DAILY LOG

.1 Maintain a daily log recording following data:

.1 An address directory recording the names, address and telephone number of representative of all subcontractors, trades and suppliers doing work or supplying material for project.
.2 Record briefly various items of work being carried out on each day including the number of workers and amount of work completed.
.3 Record maximum and minimum daily weather temperatures both inside and outside of the building. In this regard the Contractor shall maintain a minimum/maximum thermometer both inside and outside the building for the duration of project.
.4 Record ordering dates and receiving dates of material F.O.B. job site to the site.
.5 Record accidents and first aid given.

.2 Daily log shall be open to review by the Consultant and by the Owner. Upon request, provide copy of log to Owner or Consultant.

1.17 EXISTING CONDITIONS ASSESSMENT

.1 Where the Contractor is required to remove and re-install existing assemblies, elements or materials to suit work of this Contract, survey same for damage existing prior to the start of work, other than that caused by the Contractor during other work operations.

.2 Submit written statement to Consultant outlining damage where damage exists.

.3 Commencement of work shall mean the Contractor accepts existing conditions as being without damage.

1.18 REPAIR, RESTORE & MAKE GOOD

.1 Repair, make good or restore shall mean the use of materials and technologies and methods to return damaged assemblies, elements or materials to the better of the condition in which they were prior to

the beginning of construction, or to the standard specified in other Sections for new work. In general, repaired areas shall be indistinguishable from adjacent areas.

.2 Repair, make good or restore damaged assemblies, elements or materials where assemblies, elements or materials are damaged by work of this Contract, or by operations of the Contractor during the work of the Contract. This shall include elements damaged by removal of abutting elements.

.3 Repair, make good or restore damaged utilities or services where utilities or services are damaged by work of this Contract, or by operations of the Contractor during the work of the Contract.

.4 Use repair materials which match the damaged substrates, or are recommended for repair of the damaged materials, which retain or return the damaged assemblies, elements or materials to their specified architectural, structural and fire-resistant/fire rated capabilities.

.5 Where no recommended repair material exists, provide the Consultant with options from which to select a preferred repair. Consultant's selection and decision shall be final.

.6 At penetration of fire-rated wall, ceiling or floor construction, completely seal voids with fire-rated and/or fire-resistant materials, to ensure the fire rating of the assembly being penetrated is maintained. Applied materials as outlined by manufacture for the construction element involved.

.7 Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to the nearest intersection. For assembly, refinish entire unit.

1.19 UNEXPECTED DISCOVERY OF ASBESTOS

.1 Where a friable material is discovered during construction, renovations and/or demolition and it is suspected to contain asbestos, stop all work that may disturb the material. Advise the Consultant and Owner of the discovery and await instructions.

1.20 DESIGNATED MATERIALS IN EXISTING PAINT

.1 Proceed on the basis that all existing paint contains lead, mercury or other designated substances.

.2 Take all necessary health and safety precautions.

1.21 COMPRESSED GAS OR EXPLOSIVE-ACTUATED FASTNER TOOLS

.1 Use of compressed gas or explosive-actuated fasteners and associated tools is prohibited in buildings occupied by the Owner.

.2 Use of compressed gas or explosive-actuated fasteners and associated tools is accepted in buildings unoccupied by the Owner, and where stray fasteners will not injure personnel.

.3 Use explosive-actuated and compressed gas fastener tools only under strictest safety conditions. Keep equipment locked in storage cabinet unless in active use by personnel. Equipment shall not be left unattended, or be accessible to anyone other than authorized users.

1.22 CLIMATIC CONDITIONS

.1 Where the climate may affect in any manner the ways and means for the performance of the work or the timing for the project, thoroughly examine the climatic data for the past 10 year period, and incorporate all information reasonably inferable from such data into the Contract Price, Construction Schedule and Contract Time.

1.23 HAZARDOUS MATERIALS

.1 Hazardous materials shall not be introduced for experimental or any other use prior to being evaluated by the Consultant.

.2 Make known any hazardous materials to be used and method of application before using. Be responsible for storage and proper safety requirements.

.3 Where a suspected hazardous material is discovered during construction, renovations and/or demolition stop all work that may disturb the suspected hazardous material. Advise the Consultant and the Owner of the discovery and await instructions.

1.24 DISCOVERED VALUABLES

.1 All articles of value, such as relics, antiquities, or items of historical or scientific interest which may be discovered during demolition, dismantling, or excavation of the Place of the Work are the property of the Owner and shall be immediately delivered into the custody of the Owner.

1.25 SMOKING RESTRICTIONS

.1 Smoking is forbidden within all buildings on the Owner's property and within 9.0 meters of any entrance or exit. Failure to comply will require offenders to leave the property and may result in loss of future business. Repeat offenders shall be removed from the site.

1.26 SECURITY AND KEYS

.1 Comply with Owner's policy and practices regarding site and building security. Do not reduce level of security afforded to building and site by work of this Contract.

.2 The Contractor is responsible for construction cylinders and producing construction keys.

.3 Ensure all gates and doors are locked and secured prior to leaving the site.

1.27 SUBCONTRACTORS

.1 The Owner reserves the right to reject a proposed subcontractor in accordance with the provisions of CCDC 2 - 2020.

.2 Subcontractors named in the Contractor's Bid Form shall be engaged for work of this Contract, and shall not be replaced by the Contractor except with the Owner's prior consent.

1.28 INSPECTIONS BY AUTHORITIES HAVING JURISDICTION

.1 The Contractor shall arrange all inspections required by Authority(s) Having Jurisdiction.

.2 Where the Owner feels it necessary, for any reason whatsoever, the Owner may also arrange for the Authority(s) Having Jurisdiction to attend at the work site.

1.29 PROTECTION OF FINISHED WORK

.1 The Contractor shall arrange for the protection of all finished work including all floors with protective coverings of heavy duty kraft paper or Masonite, special wall finishes with plastic sheets to prevent dust from settling on finished surfaces and finished metal surface with protect film.

PART 2- PRODUCTS Not Used.

PART 3-EXECUTION Not Used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 00 73 01 Supplementary Conditions

.2 Section 01 18 01 Utility and Building System Service Interruptions: provisions regarding system shutdown and re-activation.

.3 Section 01 18 01 Utility and Building System Service Interruptions for particular provisions regarding fire alarm and fire protection system shutdowns and re-activation.

.4 The requirements of this Section apply to all other Sections of the specifications

1.2 FIRE PROTECTION AND FIRE SAFETY

.1 Provide temporary fire protection throughout the period of construction.

.2 Particular attention shall be paid to the elimination of fire hazards.

.3 Take all necessary precautions to prevent fires, and to prevent damage to buildings, materials, personnel, equipment, furnishings and chattels.

.4 Provide fire extinguishers as required by the stricter of the Occupational Health and Safety Act and regulations made thereunder, and the Ontario Fire Code.

.5 Comply with the Owner's directives regarding fire safety.

.6 Hot Work Permits

.1 A Contractor’s Hot Work Permit must be submitted in writing to the Owner’s Construction Coordinator for any and all work involving open flame, cutting, grinding, soldering or welding in occupied facilities. For clarification, all existing buildings and tunnels are considered occupied facilities. Contractor’s Hot Work Permit to contain, at a minimum, the following information:

.1 Company performing hot work
.2 Location of hot work
.3 Nature of hot work
.4 Duration of hot work
.5 Name and contact information of person performing the work and of the person supervising hot work
.6 Protection method against false fire alarms and/or sprinkler activation
.7 Precautions being taken

.2 Submit permits a minimum of 48 hours in advance of commencing hot work.

.3 Do not perform hot work without the Owner’s written approval or sign-off on the Contractor’s proposed Hot Work Permit.

.4 The approved hot work permit must be clearly displayed on site at the location of the hot work.

.5 Follow all applicable legislation and standards including but not limited to Ontario Fire Code O. Reg. 38/97 and OHSA O. Reg 851 and CSA Standard W117.2-94 when performing hot work.

.7 Electric & Gas Welding & Cutting Operations

.1 Conduct all work involving electric and gas welding and cutting and grinding operations in accordance with the safety standards specified in the latest edition of CSA W117.

.8 Flammable Liquids

.1 Flammable liquids are to be kept to a minimum and shall be stored in approved safety containers. Obtain Owner's prior approval for storing flammable and combustible liquids in occupied buildings.

1.3 FALSE FIRE ALARM

.1 Reimburse the Owner, by means of a deduction from any amounts due the Contractor by the Owner, for all costs related to false alarms of the fire alarm system or the security alarm system attributable to acts or omissions of the Contractor. Costs shall include charges levied by local authorities, charges levied by the Owner's alarm monitoring service, labour and expense costs for Owner's staff to attend at site in response to a false alarm, Consultant's cost related to any work for a false alarm, all to a minimum of $1,000.00 per false alarm incident.

1.4 FIRE ALARM ACTIVATION

.1 A fire alarm system that has been activated by other than testing shall not be reset until the cause of the alarm has been investigated and until authorized by the Owner or the Fire Department.

1.5 FIRE PROTECTION EQUIPMNT IMPAIRMENT

.1 Take all precautions when fire protection equipment (nearby hydrants, sprinklers, chemical fire suppression systems, standpipes, fire extinguishers, related water service, etc.) is taken out of service, including but not limited to restricting all hot work operations and hazardous processes.

.2 Take measures to minimize the shut down or impairment of use of fire protection. Plan operations required to reduce system impairment time to the least amount possible.

.3 Advise Owner of complete or partial impairment of fire protection system, including time required, areas affected, etc., in accordance with Section 01 18 01 Utility and Building System Service Interruptions.

.4 Provide temporary protection such as extra extinguishers during all periods of fire protection equipment impairment.

.5 If fire protection system is restorable, either in whole or in part, assign personnel during the period of impairment to restore the system promptly in the event of a fire.

.6 During periods when fire protection service is interrupted, establish and maintain a fire watch, including but not limited to the following:
- .1 Patrol all corridors and high-risk areas affected.
- .2 Fire patrol shall have immediate access to a phone to call 911 if they see a fire.
- .3 Report all other problems encountered.
- .4 Remain on patrol until fire protection system is returned to full operation.

PART TWO – PRODUCTS Not Used.

PART THREE – EXECUTION Not Used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 01 General Requirements

.2 Section 01 21 01 Allowances

.3 Section 01 14 05 Fire Safety Requirements

.4 Section 01 51 01 Temporary Utilities

.5 The requirements of this Section apply to all other Sections of the specifications.

1.2 OWNER'S USE OF PREMISES

.1 Take all measures necessary and as directed by the Owner to minimize disruption of facilities and their use by the Owner. Facilities generally include buildings, roads, parking lots, tunnels, landscaped areas and all spaces normally occupied by the Owner and shall include any existing utilities and services.

.2 Take all measures necessary and as directed by the Owner to minimize disruption of adjacent facilities and areas of the Owner's property, and use by the Owner.

.3 Be advised that Owner's facilities and chattels include numerous scientific, research and other valuable efforts and goods, and the Owner's facilities contain irreplaceable contents. Unplanned loss of utilities may cause irreparable loss.

.4 Work carried out during Owner's standard operating hours shall not adversely affect the Owner's ongoing use and occupancy of the building, the site or adjacent buildings or facilities, otherwise work shall be carried out after regular working hours, on weekends and statutory holidays. Schedule work with the Owner to minimize disruption to Owner's operations. Contract Price includes all necessary overtime premium costs and cost to work statutory holidays, to ensure orderly progression of work and continuous operation of the Owner's facilities.

1.3 SYSTEM SHUTDOWN REQUIREMENTS: OWNER'S SYSTEMS

.1 Arrangements for shut down of Owner's utility and building systems (interruption of service) will be mutually arranged between the Owner and the Contractor. No shutdown to occur without the prior written consent of the Owner. Provide minimum 4 full working days advance notice of any required shutdown of an Owner's system, either in whole or in part.

.2 Where length of service shutdown will exceed 12 hours, provide minimum 7 full working days advance notice of shutdown.

.3 Schedule service shutdowns to occur outside Owner's regular operating hours, unless otherwise agreed.

.4 Provide detailed schedule of operations for shutdown.

.5 Obtain Owner's acceptance of proposed shutdown.

.6 Unless otherwise agreed or as required by Contract Time, schedule steam system shutdowns to occur during warm weather where construction extends into periods of normally warm (summer) weather.

.7 Unless otherwise agreed or as required by Contract Time, schedule chilled water system shutdowns

to occur during cool or cold weather where construction extends into periods of normally cool or cold weather.

.8 Unless otherwise agreed or as required by Contract Time, where construction extends into Owner's summer semester, schedule all other shutdowns to occur during this period.

.9 Take all measures to minimize period of shutdown/interruption of service.

.10 Systems that may require shutdown include, but are not limited to:
- .1 normal power, including power distribution, lighting, etc.;
- .2 essential (emergency) power;
- .3 heating, cooling or ventilating systems;
- .4 domestic water;
- .5 sanitary sewer or drains;
- .6 storm sewer or storm drains;
- .7 steam;
- .8 raw water;
- .9 natural gas;
- .10 fire alarm;
- .11 hose and standpipe system;
- .12 telephone, data or other telecommunications systems;
- .13 roads, parking lots and walkways;
- .14 areas of buildings.

.11 Subject to 1.3.12 below, the Contractor is responsible for providing qualified personnel to implement shutdown and re-activation of services. The Owner reserves the right to attend and monitor the shutdown and re-activation to assess effects on remainder of property and physical plant.

.12 The Owner reserves the right to shutdown and re-activate Owner's utilities and/or services under the Contractor's direction, where the utility and/or service affects buildings or parts thereof outside the Contractor's work area and in the Owner's opinion there is a significant concern of adverse impacts outside the work area arising from the shutdown and re-activation. Where Owner elects to implement shutdown and re-activation, Contractor shall have qualified personnel attend and direct the shutdown and re-activation process.

1.4 FIRE ALARM SHUT DOWN PROCEDURE

.1 Arrangements for shutdown (interruption of service) of fire alarm system will be mutually arranged between the Owner and the Contractor. No shutdown to occur without the prior consent of the Owner. Provide minimum 5 full working days advance notice of any required shutdown of Owner's system, either in whole or in part. Where length of service shutdown will exceed 12 hours, provide minimum 7 full working days advance notice of shutdown.

.2 Schedule service shutdowns to occur outside Owner's regular operating hours, unless otherwise agreed.

.3 Provide detailed schedule of operations for shutdown.

.4 Obtain Owner's acceptance of proposed shutdown.

.5 A Certified Fire Alarm Technician, per the Ontario Fire Code section 1, subsection 1, shall supervise additions and changes to the fire alarm system, including but not limited to changes in device location, and removal and re-installation of devices.

.6 Provide proof of staff certification upon request.

.7 Minimize periods of interruption of existing fire alarm system (shut down).

.8 Wherever possible, shut down only the devices or the zone needing work and schedule this down time in unoccupied hours to the greatest extent possible.

.9 Place signs at all de-activated pull stations indicating pull station is out of service. Remove signs immediately once pull stations are re-activated.

.10 During periods of audibility and visibility testing, place signs at all building entries indicating such testing is occurring and indicating hours of testing. Remove signs upon completion of testing.

.11 During dust creating operations, and when there are workers present to maintain a fire watch, smoke and heat detectors may be protected by protective devices such as protective cones, or plastic bags secured over the detector. Detectors shall be unbagged at end of each workday, and when workers are not present, or provide fire watch as specified for fire alarm shut down.

.12 Review the proposed period when the system will be disabled, in whole or in part, with Owner prior to any partial or complete system shut down, and obtain Owner's prior approval for shut down.

.13 The Owner will advise affected Owner's personnel normally resident in affected building of fire alarm system shut down. This will include instructions to call 911 if a fire is observed.

.14 Establish and maintain a fire patrol for all periods when the fire alarm is shut down, in whole or in part, and such fire watch shall include but is not limited to the following:
- .1 Patrol all halls and high-risk areas affected.
- .2 Fire patrol shall have immediate access to a telephone and call 911 if they see a fire.
- .3 Report all other problems encountered.
- .4 Remain on patrol until system is restored to service.
- .5 Where alarms (bells, etc.) are temporarily disabled, provide staff to monitor panel. Staff shall be knowledgeable with panel operation and be able and prepared to either immediately return panel to service, or be capable of raising fire alarm in the building through other means such as manual activation of bells, and through use of phones to alert Fire Dept. Such panel monitoring staff shall be equipped with two-way radios connected to other staff in the building who can advise the panel monitor to sound the alarm.

.15 Provide full details to Owner's fire alarm monitoring service as requested including contact name, company name, and length of time service is interrupted.

.16 An approved inspection firm shall verify all new and replaced fire alarm devices, in accordance with applicable regulations. Submit Certificate of Verification prior to applying for Substantial Performance, or Completion of Contract as defined in applicable lien legislation where no application is made for Substantial Performance.

1.5 SYSTEM SHUTDOWN REQUIRMENTS: MUNICIPAL UTILITY SYSTEM

.1 Provide Owner with minimum 5 full working days advance notice of any required shutdown of municipal utility, either in whole or in part.

.2 Where length of service shutdown will exceed 12 hours, provide not less than 7 full working days advance notice of shutdown.

.3 In general, schedule service shutdowns to occur outside Owner's regular operating hours.

.4 Provide detailed written schedule of operations for shutdown.

.5 Obtain Owner's written acceptance of proposed shutdown.

.6 Take all measures to minimize period of shutdown/interruption of service.

1.6 SAFETY

.1 Provide all necessary safety measures resulting from or required by shutdown of utility or service.

.2 Advise Owner of any safety precautions required of Owner during system shutdown. Such measures

may include, with Owner's prior consent, rescheduling uses, cancellation of uses, etc.

PART 2 – PRODUCTS **Not Used.**

PART 3 – EXECUTION **Not Used.**

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 01 General Requirements.

.2 Refer to particular specification sections and drawings for detailed requirements of submissions relayed to particular products and process.

.3 The requirements of this Section apply to all other Sections of the specifications.

1.2 ADMINISTRATIVE

.1 Submit list (schedule) of all submittals required, including mock-ups. List each submittal required, projected submission dates, date returned by architect/engineer, remarks, etc.

.2 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as not cause delay in the Work.

.3 Work affected by submittal shall not proceed until review is complete.

.4 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of the Work and Contract Documents.

.5 Verify field measurements and affected adjacent Work are co-ordinated.

1.3 REQUEST FOR INFORMATION OR CLARIFICATION

.1 Submit all requests for information or clarification relating to products or materials to Consultant before xxxm xx, 2024 to avoid delays in product/material delivery.

1.4 PROOF OF PURCHASE

.1 Submit proof of purchase for each material/product order.

.2 Acceptable proof of purchase: purchase order, or letter of confirmation from supplier.

.3 Proof of purchase to include a delivery date.

.4 Delay in shop drawing approval WILL NOT excuse delay in purchase orders.

.5 Provide letter of intent or purchase order prior to submission of shop drawings.

.6 Provide production confirmation within five (5) business days of shop drawing return.

1.5 SHOP DRAWINGS AND PRODUCT DATA

.1 Refer to also to CCDC 2 – 2020, GC 3.8.

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connection, explanatory notes and other information necessary for completion of Work.

.3 Adjustments made on shop drawings by Consultant are not intended to change Contract Price or Contract Time.

.4 Make changes in shop drawings as Consultant may require.

.5 Submit PDF of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request. Once the Consultant has completed their review submit final reviewed shop drawings incorporating Consultants comments in both PDF and AutoCAD Version formats.

.6 Submit PDF of product data sheets or brochures for requirements requested in specification Sections and as Consultant may reasonably request where shop drawings will not be prepared due to standardized manufacture of product.

.7 Shop drawings shall be prepared specifically for projects and shall be fully dimensioned. Use of standard drawings or brochures is acceptable only if accompanied by drawing showing product in assembled form and showing its relation to adjacent work, methods of anchorage, and other relevant information. Catalogue pages alone are not acceptable. All shop drawings must be to scale.

.8 Shop drawings including catalogue sheets, must identify features to be reviewed. Information, options and sizes not applicable to this project must be stricken out.

1.6 UTILITY LOCATES

.1 Submit, as a record, documented locations of all utilities and services at the Place of the Work.

1.7 SAMPLES

.1 Submit for review, samples in duplicate as requested in respective specification Sections.

.2 Deliver samples prepaid to Consultant's business address.

.3 Submit colour chips and finish samples in duplicate.

.4 Keep all approved samples at the Place of the Work. Maintain in good order and available to the Consultant and his representatives for the duration of the Work.

1.8 MOCK-UPS

.1 Refer to Section 01 45 01 Quality Control.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 01 General Requirements

.2 Allowances: Section 01 21 01 Allowances

.3 Section 01 61 01 Material and Equipment: Material and workmanship quality, reference standards.

.4 The requirements of this Section apply to all other Sections of the specifications.

1.2 CASH ALLOWANCE

.1 Include the cash allowance indicated in Section 01 21 01 Allowances to pay costs of miscellaneous testing and inspection as directed by the Consultant.

1.3 INSPECTION AND TESTING

.1 Contractor is solely liable for ensuring work conforms to the Documents. Examine all work for conformance with the Documents and have all defective and deficient work corrected before calling for inspections or reviews.

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

1.4 SITE REVIEW

.1 In accordance with CCDC 2 - 2020, GC 2.3.

.2 The Owner and the Consultant shall have access to the Work. If part of the Work is in preparation at locations other than the Place of the Work, access shall be given to such work whenever it is in progress.

.3 Do not conceal work that is designated for review, inspection or testing without permitting Consultant adequate time for reviews. Adequate time shall be defined, for the purposes of this Section, as 3 full business days advance notice of readiness for review, inspection or testing.

.4 The Consultant may order any part of the Work to be examined if the Work is suspected to be not in accordance with the Contract Documents. If, upon examination such work is found not in accordance with the Contract Documents, correct such work and pay the cost of examination and correction. If such Work is found in accordance with the Contract Documents, the Owner shall pay the cost of examination and replacement.

1.5 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies may be appointed by the Consultant, and either paid for by the Contractor from the cash allowance established for purpose of inspecting and/or testing designated portions of Work, or directly by the Owner, as determined by the Consultant.

.2 Except as described below, where the Contractor pays for inspection and testing, costs and payments for such testing and inspection shall be from the applicable cash allowances established in Section 01 21 01 Allowances and respective other Sections.

.3 Particular requirements for inspection and testing to be carried out by the designated testing

laboratories are specified in the various sections of the specifications.

.4 Provide equipment required for executing inspection and testing by appointed agencies.

.5 Coordinate inspections and testing with inspection and testing company. Uncover for examination any Work covered up prior to inspection or without approval of the Consultant. Make good such Work at no cost to the Owner.

.6 Employment of inspection/testing agencies shall not relax responsibility to perform Work in accordance with the Contract Documents.

.7 The following items are not included in cash allowances for testing and inspection and costs for same shall be included in the Contract Price:
- .1 Inspection and testing required by laws, rules, regulations or orders of public authorities.
- .2 Inspection and testing performed exclusively for Contractor's convenience.
- .3 Selected testing, adjustment and balancing of mechanical and electrical equipment and systems.
- .4 Mill tests and certificates of compliance.
- .5 Tests specified to be carried out by Contractor under the direction of the Consultant.
- .6 Costs of retesting work found to be defective or deficient, after such work has been remedied.

.8 Products and work may be inspected and tested during manufacture, fabrication, storage, shop testing, installation, construction and testing phases of the Contract, as directed by the Consultant. The Consultant will ascertain the quantity and quality of testing to be performed. Provide access, proper facilities and assistance irrespective of location of inspection and testing.

1.6 ACCESS TO WORK

.1 Allow inspection/testing agencies access to the Work, off site manufacturing and fabrication plants.

.2 Co-operate to provide reasonable facilities for such access.

.3 Contractor's Responsibilities
- .1 The Contractor shall:
  - .1 Provide equipment required for executing inspection and testing by appointed agencies. Facilitate inspections and tests.
  - .2 Co-ordinate with, and supply all materials for inspection and testing purposes as requested by the inspection and testing company.
  - .3 Make good work disturbed by inspection and testing.
  - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.

1.7 PROCEDURES

.1 Notify the appropriate agency and Consultant in advance of the requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.8 DEFECTIVE WORK

.1 Refer to CCDC 2 - 2020, GC 2.4.

.2 If defects are revealed during inspection and/or testing, the appointed agency will request additional

inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to the Owner. Pay costs for retesting and re-inspection.

1.9 REPORTS

.1 Submit 3 copies of inspection and test reports promptly to Consultant.

.2 Submit one copy of inspection and test reports promptly to the Owner.

.3 Submit one copy of inspection and test reports promptly to the local Building Department.

.4 Provide copies of inspection and test reports to Subcontractor of work being inspected/tested, and/or manufacturer/ fabricator of material being inspected/ tested.

1.10 TESTS AND MIX DESIGN

.1 Furnish test results and mix designs as may be requested.

.2 The cost of tests and mix designs beyond those called for in the Contract Documents or beyond those required by the law of the Place of Work shall be appraised by the Consultant and may be authorized as recoverable.

1.11 MOCK-UPS

.1 Construct in locations as specified in specific Section. Where location not specified, obtain direction from Consultant.

.2 Prepare mock-up for Consultant review with reasonable promptness and in an orderly sequence, so as not to cause any delay in the Work.

.3 Provide minimum 7 working days notice to Consultant of mock-up readiness for review.

.4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.5 Where mock-ups are not incorporated into the Work, retain mock-ups on site until all work addressed by the mock-up has been completed and accepted, then remove from site.

1.12 MILL TESTS

.1 Submit mill test certificates as may be requested.

1.13 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

.2 Refer to respective Sections for definitive requirements.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 52 01 - Temporary Facilities

.2 Section 01 57 01 - Temporary Controls

.3 The requirements of this Section apply to all other Sections of the specifications.

1.2 INSTALLATION, MAINTENANCE AND REMOVAL

.1 Provide temporary utilities in order to execute work expeditiously.

.2 Remove from site all such work after use.

.3 Maintain temporary utilities and plant in good operating order.

.4 Use utilities and execute work to prevent waste of utilities.

1.3 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.4 SANITARY FACILITIES

.1 General Contractor to supply and maintain temporary sanitary facilities as part of contract.

1.5 WATER SUPPLY

.1 The General Contractor will provide a continuous supply of potable water for construction use.

.2 Provide temporary connections to existing supply points, and pay all costs for installation, maintenance and removal.

1.6 TEMPORARY HEATING

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel (unless otherwise specified) for exterior work, or work exposed to exterior conditions, during construction period as required to:
- .1 Facilitate progress of work.
- .2 Protect work and products against dampness and cold.
- .3 Prevent moisture condensation on surfaces.
- .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
- .5 Provide adequate ventilation to meet health regulations for safe working environment.

.2 Construction heaters used inside building must be vented to outside or be flameless type. Solid fuel salamanders not permitted. Maintain fire watch during use of open flame heaters.

.3 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress, unless indicated otherwise, or as may be required by manufacturer’s instructions for materials being installed during heating period.

.4 On completion of work for which permanent heating system is used as construction heating, replace permanent filters, and leave equipment clean.

.5 With Owner's permission, temporary connection may be made to natural gas service for construction purposes. Provide meter, and compensate Owner for cost of fuel consumed at Owner's costs. Obtain all necessary permits and inspections. Owner shall be final authority to determine costs. Provide all other piping, fittings, connections, hoses, etc. as required for temporary connection.

.6 Be responsible for damage to work due to failure in providing adequate heat and protection during construction.

.7 Maintain strict supervision of operation of temporary heating equipment to:
- .1 Conform to applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

.8 The Contractor may use the building's existing heating system (prior to its demolition) as a source for temporary heat however **Note** this system cannot be used for temporary heating until all mould has been abated in accordance with Ministry of Labour requirements. It is the Contractor's sole responsibility to determine how temporary heating adequate for construction purposes will be achieved.

1.7 TEMPORARY VENTILATION

.1 Ventilate heated areas keep building free of exhaust or combustion gases.

.2 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.

.3 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.4 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.5 Ventilate storage spaces containing hazardous or volatile materials.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
- .1 Conform to applicable codes and standards.
- .2 Enforce safe practices.
- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.

.8 New and existing equipment and systems shall not be used for temporary ventilating.

1.8 TEMPORARY POWER AND LIGHT

.1 The General Contractor will pay for temporary power during construction for temporary lighting and operating of power tools to maximum available supply. Site verify available supply, including voltages, amperages and phases. Unless otherwise ascertained or verified, assume 110 volts, 15 amps, single phase available. Do not interrupt occupants' use of power when using power for construction purposes.

.2 Provide temporary connections to existing supply points, and pay all costs for installation, maintenance and removal. Make connections in accordance with Electrical Safety Code.

.3 Provide and maintain temporary lighting throughout project. Level of illumination on all floors and stairs shall not be less than 15 foot-candles (162 Lx).

1.9 TEMPORARY TELEPHONE AND DATA

.1 Provide and pay for temporary telephone and data services for own use and use of Consultant and Owner.

.2 Telephone service shall be separate from Owner's existing telephone service.

.3 Telephone service shall be complete with answering machine or voice mail messaging system. Provide telephone and facsimile machine in site office.

1.10 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of work required by governing codes, regulations and bylaws and by Owner's requirements.

.2 Open and burning rubbish are not permitted on site.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 51 01 - Temporary Utilities.

.2 Section 01 57 01 - Temporary Controls.

.3 Section 01 74 01 - Cleaning

.4 The requirements of this Section apply to all other Sections of the specifications.

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1.2 INSTALLATION AND REMOVAL

.1 Provide temporary construction facilities in order to execute work expeditiously.

.2 Maintain temporary facilities and plant in good operating order.

.3 Remove from site all such work after use.

1.3 SCAFFOLDING

.1 Provide and maintain scaffolding, ramps, ladders, platforms, temporary stairs and other temporary access devices as required to complete the Work.

1.4 HOISTING

.1 Provide, operate and maintain hoists and cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists and cranes shall be operated by qualified operator.

1.5 SITE STORAGE LOADING

.1 Confine work and operations of employees to limits indicated by Contract documents or where no limits shown on drawings, to immediate area of work. Do not unreasonably encumber premises with products.

.2 On-site storage of construction materials and equipment shall be kept to a minimum at all times. All materials being stored shall be protected by the Contractor from damage or loss and shall be repaired or replaced by the Contractor should damage or loss occur.

.3 Do not load or permit to load any part of work with a weight or force that will endanger the work, or any part of existing structures, components or elements.

.4 All materials and equipment shall be kept in a secure area, at contractor’s expense, or removed from the job site when work is not actually in progress.

1.6 CONSTRUCTION PARKING

.1 Contractor and sub-contractors are to pay parking costs outside of construction area.

1.7 SECURITY

.1 For unoccupied buildings, ensure that buildings are maintained locked at all times, except when doors are unlocked and continuously monitored by Contractor.

.2 Comply with Owner's security requirements.

.3 See also other Sections, in particular Section 01 57 01 Temporary Controls.

1.10 OFFICES

.1 Provide and maintain in clean condition during progress of work, adequately lighted, heated and ventilated temporary Contractor's office with space for filing and layout of Contract Documents and Contractor's normal site office staff. At Owner's discretion, portions of existing building may be used for these purposes. Where site offices use existing parking, pay parking fees required.

.2 Provide adequate required aid facilities.

.3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

1.11 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Materials may be stored in building subject to other requirements regarding overloading structure and Owner's ongoing use.

.2 Where materials cannot be stored in building, provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

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

1.12 WASTE DISPOSAL CONTAINERS AND SERVICES

.1 Provide for garbage chutes, on-site debris collection and disposal equipment, and services needed to dispose of all debris. Do not use Owner's waste containers for disposal of debris arising from work of this Contract. Provide and pay for dedicated waste disposal for work of this Contract.

1.13 CONSTRUCTION SIGN

.1 No signs or advertisements, other than warning signs, or signs required by law, are permitted on site, without Owner's consent.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 14 01 Special Project Requirements.

.2 Section 01 61 01 Material and Equipment.

.3 Individual Product Sections: cutting and patching incidental to work of the Section. Advance notification to other Sections required.

.4 The requirements of this Section apply to all other Sections of the specifications.

1.2 SUBMITTALS

.1 Approvals
- .1 Submit written request in advance of cutting or alteration which affects:
  - .1 Structural integrity of any element of Project.
  - .2 Integrity of weather-exposed or moisture-resistant elements.
  - .3 Efficiency, maintenance, or safety of any operational element.
  - .4 Visual qualities of sight-exposed elements.
  - .5 Work of Owner or separate contractor.

.2 Include in request:
- .1 Location and description of affected work.
- .2 Statement on necessity for cutting or alteration.
- .3 Description of proposed work, and products to be used.
- .4 Alternatives to cutting and patching.
- .5 Effect on work of Owner or separate contractor.
- .6 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.3 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 61 01.

1.4 PREPARATION

.1 Inspection
- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

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

.3 Provide protection from elements for areas that may be exposed by uncovering work; maintain excavations free of water.

1.5 SPECIAL PROCEDURES: CONCRETE CUTTING AND CORING

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

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

.3 Magnetic radio scanners not acceptable for telemetric scanning.

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

.5 Where x-rays employed:
- .1 Post on all exterior doors of any building in which radiography will occur a completed "Construction X-Ray Advisory" form. Where the radiography occurs on an outdoor site, or affects outdoor areas, or is otherwise not in an occupied building, place a completed "Construction X-Ray Advisory" form on all faces of the hoarding, in the most visible locations, and on the exterior doors of any affected buildings. Where the area that is off-limits to persons extends outside hoarding, place signs on approaches at least 10'/3m outside the point where warning barricades will be erected.
- .2 Sign postings shall occur on or before the day on which the work will occur. Immediately prior to x-ray image exposure verify signs are in place, replace any missing signs. Remove upon completion of x-ray work.
- .3 The radiographer supervising the x-ray work shall have a cell phone on his/her person during the work and it shall remain 'on' at all times during x-ray work.
- .4 Provide barriers and watch persons at each barrier during x-ray image exposures. Minimum acceptable barrier is pre-printed plastic tape. Continuous sawhorse barricades, hoarding, fencing (where equipped with signage required by regulations) also acceptable.
- .5 Post all required safety and warning notices in advance of scanning and remove same immediately upon completion of scanning.

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

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

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

.9 Execute cutting and coring to prevent damage (cutting in whole or in part) reinforcing steel in suspended concrete slabs without Consultant's prior authorization.

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

1.6 EXECUTION

.1 Perform cutting, fitting, and patching including excavation and fill, to complete the Work. Perform work to avoid damage to other work.

.2 Fit the several parts together, to integrate with other work.

.3 Uncover work to install ill-timed work.

.4 Remove and replace defective and non-conforming work.

.5 Remove samples of installed work for testing.

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

.7 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.

.8 Employ original installer to perform cutting and patching for new weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior acceptance of Consultant.

.10 Restore work with new products in accordance with requirements of Contract Documents.

.11 Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.12 At penetration of fire rated wall, ceiling, or floor construction, completely fire stop, seal voids and penetrations as specified elsewhere, full thickness of the construction element.

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

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 00 73 01 Supplementary Conditions.

.2 Section 01 11 01 General Requirements.

1.2 SITE

.1 Lay out Work as shown on Drawings.

.2 Layout to be completed by a Profession Land Surveyor registered in the Province of Ontario.

.3 Verify grades, lines, levels and dimensions indicated and report any errors or inconsistencies to Project Manager before commencing work. Confirm job dimensions at once to allow prompt checking of Shop and Other Drawings.

.4 Locate and fix locations of walls, partitions, shafts and all parts of the construction, as work proceeds.

1.3 BUILDING DIMENSIONS

.1 Prior to undertaking construction, the Contractor shall be responsible for determining from measurements taken at the Place of the Work the exactness of unconfirmed dimensions. If required, the Contractor shall obtain and pay for the services of a licensed Ontario Land Surveyor to ascertain and determine unconfirmed dimensions. Once established, the Contractor shall provide the Consultant with the results. Also, in consultation with the Consultant, the Contractor shall determine if adjacent dimensions are affected. If they are, the Consultant shall adjust same to comply with dimensions obtained at the Place of the Work. Such determinations shall not affect the Contract Price.

.2 Ensure necessary job dimensions are taken and trades are co-ordinated for accuracy and completeness of such dimensions and for coordination.

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

.4 Check and verify dimensions referring to Work and interfacing of services. Dimensions, when pertaining to the Work of other Trades, shall be verified with the Trade concerned. Ensure that Subcontractors from various Trades cooperate for the proper performance of the Work.

.5 Do not scale directly from drawings. If there is ambiguity or lack of information, immediately inform Project Manager. Any change through disregarding of this clause to be the responsibility of Subcontractor concerned.

.6 All dimensional changes resulting from the above shall be noted on the Contractor's as-built drawings.

.7 All details and measurements of any Work which is to fit or to conform to Work installed shall be taken at the Site.

.8 Where verified and determined dimensions from the Place of the Work are required in the preparation of Shop Drawings, the Contractor shall determine the exactness of the dimensions prior to the preparation of these drawings.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 51 01 - Temporary Utilities

.2 Section 01 52 01 - Temporary Facilities

.3 The requirements of this Section apply to all other Sections of the specifications.

1.2 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute work expeditiously.

.2 Maintain temporary controls and plant in good operating order.

.3 Remove from site all such work after use.

1.3 GUARDS AND HOARDING

.1 Comply with stricter of applicable legislation or the following.

.2 Erect guards and other barricades to protect all persons, public and private property from injury or damage.

.3 Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to building.

.4 Provide barriers around signs planters, trees and plants designated to remain. Protect from damage.

.5 Erect signs to prohibit entry of unauthorized personnel into work areas, particularly when building remains occupied by the Owner.

.6 Provide hoarding at all exterior work areas, including but not limited to outdoor storage areas, garbage bins, below all exterior work operations above grade, and at other hazardous exterior work areas, and as may be indicated. Unless otherwise indicated, or as otherwise agreed with the Owner and as may be required by legislation, acceptable exterior hoarding shall be minimum 6’ high, and be galvanized steel fence, or plywood on wood framing. Panels must be provided with T base suitable for pinning and shall be clipped together at top corners. Contractor remains solely responsible for site security and safety and shall supplement these requirements as necessary. Erect hoarding as required to protect all persons, and all public and private property from injury and damage. Ensure conformance with all requirements of authorities having jurisdiction.

.7 Provide hoarding at interior work areas as indicated or required. Unless otherwise indicated, or as otherwise agreed with the Owner and as may be required by legislation, acceptable interior hoarding shall be vinyl-clad gypsum board screwed to steel studs or other acceptable framing/supports.

.8 Where required, provide lockable gates/doors within hoarding for access. Ensure that requirements for exiting /egress from the area are maintained and provide panic hardware as required.

.9 Assume full responsibility for any damage or injury caused due to failure to comply with provisions of the Contract Documents.

.10 Interior Hoarding: Provide full height plywood hoarding assembly consisting of ¾” plywood Exterior side, on 92mm metal stud, 6mil poly dust protection, and ¾” plywood on interior side. Paint any side of hoarding exposed to existing tenant White.

1.4 GUARD RAILS, BARRICADES AND WARNING NOTICES

.1 Provide and maintain all required signage, construction barriers, dust screens etc. to adequately restrict and protect the public from the work site and the work being undertaken.

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

.3 Wherever the Contractor's work may expose persons to danger, provide all necessary protection to prevent injury and post notices advising of the hazard such as the public walkway outside the north boundary of the construction area.

1.5 SECURITY AND WEATHER ENCLOSURES

.1 In addition to the requirements of other Sections, provide weathertight closures to unfinished door and window openings, tops of shafts and other openings in floors, walls, and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work area for temporary heat. Weather enclosures shall be sufficient to maintain Owner's customary interior environment.

.3 Where the existing building envelope is opened, breached, or otherwise compromised by work of this Contract, possibly permitting entry of wind or precipitation into the building, or possibly adversely affecting usual interior temperatures and humidity, provide temporary weathertight and dust-tight enclosures and protection for exterior openings made until permanently enclosed.

1.6 DUST TIGHT SCREENS

.1 In addition to the requirements of other Sections, provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of Work.

.2 Use fans to maintain appropriate positive/negative pressure to limit migration of dust outside barriers.

.3 Maintain and relocate protection until such Work is complete. Remove upon completion of dust-generating work, and make clean areas affected.

1.7 ODOUR CONTROL

.1 Where work, such as painting, asphalting or roofing, will generate odours, take all necessary measures to limit migration of odours outside immediate work area and limit effect on Owner's operations.

1.8 NOISE CONTROL

.1 Take all efforts to limit adverse impact of noise generating operations on adjacent property owners.

1.9 ACCESS TO SITE

.1 Use existing driveways, roads, parking areas, and sidewalk crossings as may be required for access to the work.

.2 Maintain reasonable access at all times to all buildings, roads, walkways, service roads and adjacent parking areas.

.3 Protect existing driveways, roads, parking areas and sidewalk crossings from damage, and make good damage arising.

.4 Keep public roads clean of soiling. Clean as required.

1.10 PUBLIC TRAFFIC FLOW

.1 Provide and maintain notices, flag persons, traffic signals, barricades and flares, lights, or lanterns as required to perform the work and protect the public.

1.11 PROTECTION FOR OFF-SITE PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance work.

.2 Be responsible for damage incurred.

1.12 PROTECTION OF BUILDING FINISHES AND EQUIPMENT

.1 Provide protection for finished and partially finished building finishes, furniture and equipment during performance of work.

.2 Provide necessary screens, covers, and hoardings as required.

.3 Be responsible for damage incurred due to lack of or improper protection.

.4 Provide 6 mil polyethylene coverings to prevent soiling of complex surfaces and compartments. Tape polyethylene in place. Provide additional protection to prevent other damage where required. This includes but is not limited to using plywood or OSB sheets to prevent impact damage. Fastening shall not damage elements being protected.

1.13 GARBAGE CHUTES

.1 Debris shall not be allowed to free-fall from openings in the building's exterior walls. Provide garbage chutes in compliance with applicable legislation where debris from upper floors is dropped from the building. Existing windows may be removed and re-installed to suit this requirement, subject to maintaining weather and security protection.

1.14 LOCKOUT PROCEDURES

.1 All work to be done on systems or machinery, where the unexpected switching on or off, of the system or machinery could result in personal injury, shall be done in accordance with the Contractor's standard lockout procedure. The Contractor shall provide his/her own locks for the above procedure. At a minimum, lock out procedures shall consist of switches padlocked in off position, and tagged to advise of inadvertent operation.

.2 Where there is risk of injury to both the Owner's and the Contractor's personnel due to equipment re-activation, double lockout procedures shall be employed, with each of the Contractor and the Owner providing separately keyed locks and tags to the switches. Do not remove locks and tags until each party's responsible has:

.1 independently ascertained that no injury will be caused to personnel by re-activating the equipment;

.2 verified to the other party that no injury will be caused to personnel by re-activating the equipment.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 General requirements: Section 01 11 01 General Requirements.

.2 Cleaning: Section 01 74 01 Cleaning

.3 The requirements of this Section apply to all other Sections of the specifications.

1.2 FIRES

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

1.3 DISPOSAL OF WASTES

.1 Do not dispose of hazardous waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers. Dispose of hazardous waste or volatile materials in accordance with Article 1.23 of Section 01 11 01 General Requirements

1.4 POLLUTION CONTROL

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

.2 Prevent material from sandblasting, chipping, grinding and other similar operations from contaminating air beyond application area, by providing temporary enclosures.

.3 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for all operations relating to work of this contract.

1.5 INDOOR AIR QUALITY MANAGEMENT DURING CONSTRUCTION

.1 Site Protection
- .1 Site up geotextile dams to prevent run-off from excavated material on site into natural waterways and the City's storm water and sanitary sewers.

.2 Source Control
- .1 Prohibit the idling of motors and internal combustion engines on site during construction.
- .2 Use bottled gases for equipment rather than diesel.
- .3 Switch to electrical equipment rather than fossil fuel equipment wherever possible.
- .4 Ensure any exhaust is emitted directly to the exterior and well away from any intakes or door or window openings.
- .5 Use enclosed tankers rather than open kettles for roofing operations.

.3 Work Area Separation
- .1 Use dust curtains, continuous heavy duty sheet plastic seals to separate work areas containing any dust and dirt particulates from other cleaner areas.

.4 Housekeeping
- .1 Minimize dust with wetting agents or sweeping compounds.
- .2 Remove spills quickly when dealing with odorous or noxious materials.
- .3 Remove any accumulated water. Keep all work areas dry and dehumidify when and where necessary.
- .4 Vacuum with HEPA filtered vacuums to reduce airborne dust particles.

.5 Keep porous materials dry. Do not allow any insulation to become wet.
.6 Clean site daily.

.5 Scheduling
.1 If the building is occupied after substantial completion, on-going work areas are to be kept under negative pressure to prevent the migration of dust and dirt into the occupied spaces.
.2 Wherever possible, work, where off-gassing occurs is to be scheduled during off-hours.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

1.2 REFERENCE STANDARDS

.1 Within the text of each specifications section, reference may be made to reference standards. List of standards reference writing organizations is contained in Section 01 42 00 - References.

.2 Conform to these reference standards, in whole or in part as specifically required in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Consultant reserves right to have such products or systems tested to prove or disprove conformance.

.4 Cost for such testing will be borne by Consultant in event of conformance with Contract Documents or by Contractor in the event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

1.3 QUALITY

.1 The Contractor shall ensure all materials are delivered to the site in original containers and packages with labels and seals intact and that they are protected from the elements.

.2 The Contractor shall use all products in strict accordance with the manufacturers' directions unless specifically directed otherwise by the Consultant. Whenever reference to manufacturers' directions or instructions is included in the Specifications, the Contractor shall submit copies of such instructions or directions for review by the Consultant before commencing the relevant Work.

.3 When requesting approval for the use of substitutions, the Contractor shall clearly identify any effect(s) that the proposed substitution may have on the Contract Price and Contract Time.

.4 Products which are specified by their proprietary names, or by part or catalogue number, shall form the basis for the Contract and Specifications. No substitutions for these products may be used without the Consultant's prior written approval. Substitutions will be considered for approval ONLY under the following circumstances:

.1 when documentation is submitted to permit sufficient time for adequate review by the Consultant and
.2 it can be demonstrated to the Consultant's satisfaction that the substitution is equal to the specified product and
.3 the request for substitution is accompanied by a detailed list of properties of both the specified product and the proposed substitute for comparison.

.5 Products, materials, equipment and articles (referred to as products throughout Specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

.6 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.7 Should any dispute arise as to quality or fitness of products, decision rests strictly with Consultant based upon requirements of Contract Documents.

.8 Unless otherwise indicated in specifications, maintains uniformity of manufacture for any particular or like item throughout building.

.9 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action maybe authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 STORAGE HANDLING AND PROTECTION

.1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

.3 Store products subject to damage from weather in weatherproof enclosures.

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

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

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

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Consultant.

.9 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use touch-up materials to match original. Do not paint over nameplates.

1.6 TRANSPORTATION

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

.2 Transportation cost of products supplied by Owner will be paid for by Owner. Unload, handle and store such products.

1.7 MANUFACURERS' INSTRUCTIONS

.1 Unless otherwise indicated in specifications install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and reinstallation at no increase in Contract Price or Contract Time.

1.8 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Consultant reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.

1.9 COORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.10 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Consultant if there is interference. Install as directed by Consultant.

1.11 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable.

.2 Coordinate adjacent affected Work as required. Perform remedial work by specialists familiar with Materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.12 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Consultant of conflicting installation. Install as directed.

1.13 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metal and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

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

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

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

1.14 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No.304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15 PROTECTION OF WORK IN PROGRESS

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

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 11 01 General Requirements.

.2 Section 01 57 01 Temporary Controls.

.3 The requirements of this Section apply to all other Sections of the specifications.

1.2 GENERAL

.1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

.2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.

.3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.4 Prevent accumulation of wastes that may create hazardous conditions.

.5 In the event of any dispute regarding the removal of waste products, debris, tools, equipment, etc. the Owner may remove the waste product and debris and charge the cost to the Contractor, by means of deduction from monies owing the Contractor, to the extent that the Consultant shall determine to be just.

1.3 PROJECT CLEANLINESS AND PROGRESSIVE CLEANING

.1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other Contractors. Clean areas where work is being performed on a daily basis.

.2 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.3 Remove waste material and debris from the site and deposit in waste container at the end of each working day.

.4 Clean work area(s) upon completion of each day's work, and maintain areas free of dust and other contaminants during finishing operations. On a daily basis maintain project site and public properties free from debris and waste material.

.5 Provide for garbage chutes, on-site debris collection and disposal equipment, and services needed to dispose of all debris. Do not use Owner's waste containers for disposal of debris arising from work of this Contract. Provide and pay for dedicated waste disposal for work of this Contract.

.6 Remove waste materials and rubbish from site and dispose of at legal dumping areas. Pay all disposal costs.

.7 Clean interior areas prior to finish work, furniture move-in and final clean prior to occupancy, maintain areas free of dust and other contaminants during finishing operations.

.8 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer, and as compatible with Owner's cleaning systems for existing surfaces.

.9 Vacuum clean with commercial type vacuum interior building areas when ready to receive flooring

.10 and finish painting. Continue vacuum cleaning on an as-needed basis until work is complete.

.11 Schedule cleaning operations so that resulting dust and other contaminants will not fall on wet, newly painted surfaces.

.12 On a daily basis clean all areas dirtied by Work of this Contract to suit the Owner's continuing use and occupancy during construction.

.13 Where walks and roads are soiled by work of this Contract:

.1 At a minimum, weekly sweep and wash Owner’s roads and walks soiled by work of this Contract. Sweep and wash roads and walks more frequently where soiling may be tracked into adjacent buildings. Sweep and wash public roads and walks weekly, at a minimum, and more frequently as required by local municipality.

1.4 CLEANING

.1 Where work is sequenced or phased, and upon completion of work in each floor, or part of each floor area, clean rooms or spaces affected by work of this Contract.

1.5 FINAL CLEANING

.1 When the Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for the performance of the remaining Work.

.2 Remove waste products and debris other than that caused by the Owner, other contractors or their employees, and leave the Work clean and suitable for the occupancy by Owner.

.3 When the Work is complete, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.

.4 Remove waste materials and the site at regularly scheduled times or dispose of as directed by the Consultant. Do not burn waste materials on site.

.5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.6 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.7 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors and ceilings.

.8 Vacuum clean and dust building interiors, behind grilles, louvers and screens. Wet mop hard floors to remove all dust.

.9 Clean hard floor finishes, as recommended by the floor manufacturer.

.10 Inspect finishes, fitments and equipment and ensure specified workmanship and operation. Correct deficiencies.

.11 Broom clean and wash exterior walks and steps and similar surfaces; rake clean other surfaces of grounds.

.12 Remove dirt and other disfiguration from exterior surfaces.

.13 Clean and sweep roofs, gutters, downspouts, and drainage systems, areaways, sunken wells.

.14 Sweep and wash clean paved areas.

.15 Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION

1.1 Final Cleaning

.1 The Contractor is to engage a professional cleaning firm to perform final cleaning.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:

.1 Diversion of Materials.
.2 Canadian Governmental Responsibility for the Environment Resources Schedule C.

1.2 DEFINITIONS

.1 Recyclable: Ability of product or material to be recovered at end of its life cycle and remanufactured into new product for reuse by others,

.2 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred in to new products.

.3 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using unaltered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.4 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Salvaging reusable materials from remodelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
.2 Returning reusable items including pallets or unused products to vendors.
.3 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
.4 Separate Condition: Refers to waste sorted into individual types.
.5 Source Separation: Act of keeping different types of waste materials separate beginning from first time they become waste.

1.3 WASTE PROCESSING PLANTS

.1 Contact Ontario Ministry of Environment and Energy at 1(800)565-4923 to identify suitable waste processing sites.

1.4 STORAGE HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled and salvaged in locations as directed by General Contractor.

.2 Unless specified otherwise, materials for removal do not become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect surface drainage, mechanical and electrical from damage and blockage.

.6 Separate and store materials produced during dismantling of structures in designated areas.

.7 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On site source separation is recommended.
.2 Remove comingled materials to off-site processing facility for separation:
.3 Provide way bills for separated materials.

1.5 DISPOSAL OF WASTE

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil; or paint thinner into waterways, storm, or sanitary sewers.

1.6 SCHEDULING

.1 Coordinate Work with other activities at site to ensure timely and orderly progress of Work.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION

3.1 APPLICATION

.1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

.2 Suspected termite infested material to be stored in bags or enclosed dumpsters and delivered to a designated facility certified for proper waste management of termites.

3.2 CLEANING

.1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.

.2 Clean up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 Separate recyclable materials from general waste stream and stock pile in separate piles or containers, as reviewed by Consultant, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.
.2 Provide instructions on disposal practices.
.3 On site sale of reusable or recyclable materials is not permitted.

3.4 CANADIAN GOVERNMENT DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule C - Government Chief Responsibility for the Environment

Province	Address	General Inquiries	Fax
Ontario	Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON M4V IP5	(416) 323-4321 (800) 565-4923	(416) 323-4682
	Environment Canada Toronto	(416) 734-4494	

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Section 01 29 01 Changes, Payments and Certificates

.2 Section 01 74 01 Cleaning

.3 Section 01 54 03 Field Engineering

.5 The requirements of this Section apply to all other Sections of the specifications.

1.2 PROGRESSIVE CLEANING

.1 Refer to Section 01 74 01 Cleaning

1.3 REVIEW / TAKE-OVER PROCEDURES

.1 Review/Takeover Procedures

.1 In accordance with OAA/OGCA Document 100, latest edition, except where specified otherwise.
.2 In OAA/OGCA Document 100, where the term "Architect" is used, substitute the term "Consultant", and where the term "inspection" is used in relation to the Consultant's assessment of the Work, substitute the term "review".

.2 Arrange and pay for review by local authorities to obtain permission to occupy/occupancy permit (where applicable) prior to requesting Substantial Performance.

.3 Refer also to Section 01 29 01 Changes, Payments and Certificates for requirements related to applications for certificates and for applications for payment.

1.4 PROJECT CLOSE-OUT

.1 Final Cleaning

.1 Refer to CCDC 2 – 2020, GC 12.1.1 and Section 01 74 01 Cleaning.

.2 Systems Demonstration

.1 Prior to final review, demonstrate operation of each system to Owner. Ten (10) days prior to demonstration, provide an agenda for demonstration and a written description of operating procedure and maintenance, including schematics and diagrams for operation and maintenance of building services equipment and systems being demonstrated.

.2 Responsible personnel from Contractor, Subcontractors and equipment suppliers whose work is being demonstrated shall be present as required at these demonstrations.

.3 Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as basis for instruction.

.3 Operating and Maintenance Manuals

.1 Collect reviewed submittals and assemble documents executed by Subcontractors,

suppliers, and manufacturers including red-lined as-builts.

.2 Minimum two weeks prior to Substantial Performance of the Work, submit to Consultant, three (3) copies of operating and maintenance manuals. Where Substantial Performance of the Work is not certified, and the Contract proceeds directly to Completion of Contract as defined in applicable lien legislation, submission shall be minimum two (2) weeks prior to Completion of Contract.

.3 Bind contents in a three-ring, hard covered, black plastic jacketed binder, with labelling pocket on spine and with 'D' type rings. Size for 8-1/2" x 11" size paper, enclose title sheet labelled "Operating and Maintenance Data Manual", project name, date and list of contents. Organize contents into applicable sections of work to parallel project specification breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.

.4 Include following information as applicable, plus data specified elsewhere: operational information on equipment, cleaning and lubrication schedules, filters, overhaul and adjustment schedules and similar maintenance information; copy of building permit; copy of final inspection certificate by Electrical Safety Authority; copy of fire alarm verification certificate; copy of sprinkler test verification certificate; copy of certificates issued by other utilities; copies of field tests; copies of all inspection and testing reports; maintenance instructions for finished surface and materials; copy of hardware and paint schedules; description, operation and maintenance instructions for equipment and systems, including complete list of equipment and parts list; indicate nameplate information such as make, size, capacity, serial number; names, addresses and phone numbers of Contractor, Subcontractors and Suppliers, including local source of supplies and replacement parts; manufacturer’s product guarantees and warranties, executed in the name of the Owner, showing name and address of project and guaranty/warranty commencement date and duration of guaranty/warranty, and clear indication of what is being guaranteed and what remedial action will be taken under guaranty/warranty; additional material used in project listed under various sections showing name of manufacturer and source of supply.

.5 For Mechanical and Electrical include: description of system; controls including diagrams; maintenance and testing schedule; method of operation for each piece of equipment, and list of equipment with replacement parts, parts number, suppliers, addresses, etc. Refer also to Division 21, Division 22, Division 23, Division 25, Division 26, Division 27 and Division 28 as applicable for particular requirements relevant to respective Division.

.6 Neatly type lists and notes. Use clear drawings, diagrams or manufacturers' literature.

.7 Each set of manuals shall include complete set of reviewed shop drawings and product data sheets, indicating corrections and changes made during fabrication and installation.

.8 Each set of manuals shall include a copy of all of the above information on a CD in a searchable .pdf format acceptable to the Owner.

.4 Maintenance Materials and Spare Parts:

.1 Where supply of maintenance materials and spare parts are specified, deliver to Owner as follows:

.1 Use unbroken cartons, or if not supplied in cartons, they shall be strongly packaged. Supply maintenance materials and spare parts in quantities specified in individual specification sections.
.2 Provide only new materials as maintenance materials and spare parts, of the same manufacture, type and quality as incorporated into the Work.
.3 Store in locations directed, in a manner to prevent damage or deterioration.
.4 Clearly mark containers as to content.
.5 If applicable, give colour, room number, or area where material used.
.6 Obtain receipt from Owner upon delivery of materials.

.5 Project Record Documents

.1 After award of Contract, *the Contractor will print* three (3) sets of whiteprint (blueline or blackline) drawings and specifications (or project manual) for purpose of maintaining record drawings and specifications. Accurately and neatly record deviations from Contract Documents caused by site conditions and changes ordered by Consultant and the Owner.

.2 Record locations of: concealed components of mechanical and electrical services; depths of various elements of foundations in relation to first floor, accurate location, depth, size and type of outside underground utilities; location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features or structure; field changes of dimension and detail; changes made by Change Order, Change Directive or Site Instruction.

.3 At completion of project and prior to final review, neatly transfer notations to a second and third set of drawings and specifications and submit all sets to Consultant.

.4 Record changes using a different colour of felt tip pen markers for each major system.

.5 Mark up specifications to record actual construction, including manufacturer, trade name, and catalogue number of each item actually installed, particularly alternative, optional and substitute items.

.6 Identify drawings and specifications as "Project Record Copy". Maintain in new condition and make available for review on site by Consultant.

.7 Minimum 2 weeks prior to application for final payment, submit record documents to Consultant.

.8 Include with each manual, a hard copy of all red-lines as-built drawings and specifications for all disciplines.

.9 Provide copies of the survey for the foundations and the documentation related to existing utilities and site services as required by Section 01 54 03.

.6 Financial Close-Out

.1 Execute transition of Performance and Labour and Materials Payment Bond, if any, to warranty period requirements.

.2 Submit a final statement of accounting giving total adjusted Contract Price, previous payments, and monies remaining due.

.3 Consultant will issue a final change order reflecting approved adjustments to Contract Price not previously made.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION Not used.

END OF SECTION

PART ONE – GENERAL

1.1 RELATED SECTIONS

.1 Comply with Division One as applicable.

.2 Restrictions on noise, dust, interference, obstructions, access, hours of work: Section 01 14 01 Special Project Requirements

.3 Temporary facilities, public safety, weather and dust barriers or partitions: Section 01 11 01 General Requirements, Section 01 52 01 Temporary Facilities, Section 01 57 01 Temporary Controls.

.4 Hazardous material demolition and removals refer to:
- .1 Designated Substance Survey.
  - .1 Abatement to be completed by a licensed abatement subtrade in accordance to all Provincial Regulations.
- .2 Technical Specifications included with Designated Substance Survey

.5 The requirements of this Section apply to all other Sections of the specifications.

1.2 REFERENCES

.1 CSA S350-M1980, Code of Practice of Safety in Demolition of Structures.

1.3 EXISTING CONDITIONS

.1 Examine areas to be selectively demolished or dismantled, and confirm that their condition is substantially the same as the date on which bids closed, and as indicated in the Contract Documents. Advise the Consultant of any conditions that vary from this.

.2 Be familiar with structural system of the building, and the elements being demolished or dismantled.

.3 Inspect site and verify with Consultant items designated for removal and items to remain. Protect existing items designated to remain and materials designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Consultant and at no cost to Owner.

.4 Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in the course of demolition work stop work and notify the Consultant immediately. Do not proceed until written instructions have been received from the Consultant.

.5 Demolition of applied asbestos materials can be hazardous to health. Should material resembling asbestos be encountered in the course of demolition work, stop work and notify the Consultant immediately. Do not proceed until written instructions have been received from the Consultant.

1.4 EXTENT OF DEMOLITION

.1 Drawings showing extent of selective demolition are intended to be schematic and do not indicate full extent of all selective demolition work. Examine all Documents to determine complete scope of selective demolition, removals and re-instatement, repair and make good required to complete the Work.

1.5 PROTECTION

.1 Prevent movement, settlement or damage of existing structures, services, walks, paving, trees, landscaping, adjacent grades and parts of existing building to remain.

.2 Provide bracing, shoring and underpinning as required. Make good damage caused by demolition.

.3 Take precautions to support affected structures and, if safety of building being demolished appears to be endangered, cease operations and notify Consultant.

.4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.

.5 Provide bracing, shoring, or needling as required to support portions of existing structure or building to remain, where demolition or dismantling, cutting out, or partial removal of any elements, as specified in other Sections degrades the structural integrity of the structure to a point where it will not support all imposed loads. All bracing, shoring, and needling shall be designed to cause no damage to existing surfaces upon which the bracing, shoring or needling bears.

.6 Shoring, bracing, or needling of structural items shall be designed by a Professional Engineer registered in the Province of Ontario, and drawings shall bear the seal of this Engineer. Submit drawings of shoring, bracing, or needling to the Consultant prior to installing.

.7 Maintain temporary supports in place until permanent structure is able to fully support all imposed loads.

.8 Make good damage to existing elements to remain caused by demolition.

.9 Prevent debris from blocking surface drainage system, and obstructing mechanical and electrical systems which must remain in operation.

.10 Protect salvaged elements from damage. Provide protective coverings and storage.

PART 2 – PRODUCTS Not used.

PART 3 – EXECUTION

3.1 WORK

.1 Dispose of demolished materials off site except where noted otherwise and in accordance with authorities having jurisdiction and in accordance with Section 01 11 01 of the Specifications.

.2 Carefully dismantle items containing materials for salvage and stockpile salvaged materials on site at locations as indicated or as directed by Consultant.

.3 Temporarily re-route service lines entering building or on the building in accordance with authorities having jurisdiction, and to suit the Work of this Contract. Post warning signs on electrical lines and equipment that must remain energized during period of work.

.4 Do not disrupt active or energized utilities designated to remain undisturbed, without Consultant's consent.

3.2 SAFETY CODE

.1 Comply with all applicable legislation.

3.3 DISMANTLING AND DEMOLITION

.1 Do all work in a manner to prevent endangering safety of building or occupants.

.2 Selectively dismantle parts of the building as required to suit installation of new work and remedial work. Salvage and reinstall elements unless otherwise indicated. Make good disturbed surfaces.

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

.4 Do not disturb adjacent items designated to remain in place.

.5 At end of each day's work, leave work in safe condition so that no part is in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements at all times.

.6 Demolish to minimize dusting. Keep materials wetted as directed by Consultant.

.7 Do not throw or allow debris to fall uncontrolled from heights. Use chutes and other controls.

3.4 RESTORATION

.1 Upon completion of work, remove debris, trim surfaces and leave work site clean.

.2 Reinstate areas and existing works outside areas of demolition to conditions that existed prior to commencement of work.

END OF SECTION

1 GENERAL

1.1 SECTION INCLUDES

.1 All labour, materials, equipment and incidental services necessary to provide all finishing of slabs-on-grade and monolithic floor slabs.

.2 Surface treatment with concrete hardener, sealer and joint fillers / sealants.

1.2 RELATED SECTIONS

.1 Division 01 of this Specification.

.2 Section 03 30 00 - Cast-in-place Concrete.

.3 Section 07 92 00 - Joint Sealants.

1.3 REFERENCES

.1 CSA-A23.1-09/A23.2-09 - Concrete Materials and Methods of Concrete Construction / Methods of Test for Concrete.

.2 ACI 302.1R-04 - Guide for Concrete Floor and Slab Construction.

.3 ASTM E1155M-96(2008) - Determining FF Floor Flatness and FL Floor Levelness Numbers.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with concrete floor placement and concrete floor curing, and other work having a direct bearing on work of this section.

1.5 SUBMITTALS FOR REVIEW

.1 Section 01 33 00: Submittal Procedures.

.2 Product Data: Provide data on concrete hardener and sealer including:

- .1 Compatibilities and limitations.
- .2 Manufacturer’s installation instructions.
- .3 Material Safety Data Sheets (MSDS).
- .4 Data on maintenance renewal of applied coatings, as part of close-out submittals.

1.6 QUALITY ASSURANCE

.1 Perform Work in accordance with CSA-A23.1/A23.2.

.2 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience and approved by the manufacturer.

.3 Prior to starting concrete Work submit quality control procedures for Consultant’s approval for following items:

- .1 Hot weather concrete.
- .2 Cold weather concrete.
- .3 Curing.
- .4 Finishes.

1.7 DELIVERY, STORAGE, AND PROTECTION

.1 Section 01 61 00: Common Product Requirements.

.2 Deliver materials in manufacturer's packaging including application instructions.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Do not pour concrete during, or for 24 hours after rain/snow fall.

.2 Examine subgrade and ensure soil material is not frozen or saturated with water. Do not use frozen base materials. Do not install base on frozen subgrade.

.3 Temporary Heat: Ambient temperature of 10 degrees Celsius minimum or in accordance with product manufacturer's instructions, whichever is the greater temperature.

.4 Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

2 PRODUCTS

2.1 MATERIALS

.1 Substitutions: as approved by Consultant.

.2 Water: Potable.

.3 Hardener:

.1 Surflex TR Traprock Floor Hardener, by Euclid Chemical.

.2 MASTERPLATE Ff metallic-aggregate dry-shake surface, by BASF.

.4 Sealer:

.1 SLR-1:

.1 Two Coats - ZeraDur 102 UL, by ZeraUS. White, Colour and Finish to be confirmed by consultant.

.2 Top Coat - ZeraTuf 104 by ZeraUS.

.5 Perimeter Slab and Control Joint Sealant:

.1 POURTHANE NS, by W.R. Meadows Inc.

.6 Sawcut Joint Filler:

.1 REZI-WELD FLEX, by W.R. Meadows Inc.

.2 Loadflex, by Sika

,7 Polished ConcreteFloors (PCF):

,1 SCOFIELD Formula One, Liquid Densifier MP: liquid dye concentrated colour Black 0510, two coats. Finish Grade 1 light sand exposure with Class 1 low reflectivity.

3 EXECUTION

3.1 EXAMINATION

.1 Section 01 70 00 – Examination and Preparation: verify existing conditions before starting work.

.2 Verify that floor surfaces are acceptable to receive the work of this section.

.3 Do not begin installation until all unsatisfactory conditions are resolved. Beginning Work of this Section constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

.4 Ensure ambient temperature is within acceptable range as listed in manufacturer's written installation instructions.

.5 Do not apply material if rain is predicted within twenty-four (24) hours after application to exterior surfaces.

3.2 PREPARATION

.1 Clean substrate surfaces to manufacturer's written instructions.

.2 Perform application on minimum 0.85 m² (9 ft²) test section or 3.0m (10 ft) long test joint; obtain approval of test section from Consultant before proceeding with application.

3.3 FLOOR FINISHING

.1 Finish concrete floor surfaces to CSA-A23.1/A23.2.

.2 Steel trowel surfaces which are scheduled to be exposed.

.3 Laser screed where necessary to achieve higher flatness tolerances.

.4 Maintain design floor elevations at floor drains, or as indicated on drawings.

3.4 FLOOR SURFACE TREATMENT

.1 Apply hardener to manufacturer’s written instructions on floor surfaces, where indicated on drawings.

.1 Hardener Application Rate: 1 lb/ft^2 throughout.

.2 Apply sealer to manufacturer's written instructions on floor surfaces, where indicated on drawings.

.3 Apply joint fillers/sealants to manufacturer’s written instructions.

.4 Floor slab sawcut and construction joints must be filled full depth.

.5 Protect adjacent work from spillage and overspray. Remove overspray on adjacent surfaces immediately before dry.

.6 Do not dilute or mix materials with other sealers.

.7 Apply sealer after sawcut, control and perimeter joint sealants/fillers have been installed.

.8 Apply even costs allowing for and observing adequate penetration. Do not allow surface to dry between coats.

.9 Do not apply compound to surfaces that are restricted by product manufacturer.

.10 Clean substrate and equipment with potable water.

3.5 TOLERANCES

.1 Concrete slab and floor finish tolerance in accordance with CSA-A23.1, Table 21 (Slab and floor finish classifications):

.1 Exterior: Class A: F_F 20 / F_L 15.

.2 Interior: Class B: F_F 35 / F_L 30.

.2 Measure for floor flatness (F_F) and floor levelness (F_L) tolerances for floors to ASTM E1155M, within 48 hours after slab installation.

.3 Correct the slab surface if the actual F (F_F) or F (F_L) number for the floor installation measures less than required.

.4 Correct defects in the defined traffic floor by grinding or removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

END OF SECTION

1 GENERAL

.1 GENERAL REQUIREMENTS

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

.2 SCOPE OF WORK

.1 Work of this section includes but is not limited to:

.1 Selective repointing of existing masonry joints above and below grade.

.2 Selective resetting of loose brick units.

.3 Supply of matching brick units.

.4 Selective replacement of deteriorated or missing bricks.

.5 Selective resetting of loose stone units.

.6 Selective replacement of deteriorated or missing stone units.

.7 Selective reworking of interior masonry openings and infill.

.3 REPAIR INTENT

.1 The intent of this section is to repair the existing masonry and return it to a sound, durable condition.

.2 It is not intended that all missing or damaged faces or arises be made in the perfect-tooling way. The age and character of the Work should still show when the Work is complete.

.4 RELATED WORK

Section 04 05 12: Mortars

Section 04 22 00: Concrete Unit Masonry

Section 07 92 10: Joint Sealing

.5 REFERENCE STANDARDS

.1 Annotated Specifications For the Restoration of Historic Masonry (Ministry of Citizenship and Culture, Province of Ontario, Toronto, Canada, 1985).

.2 CAN3-A371.

.3 ASTM C 126, Ceramic Structural Clay Facing Tile, Facing Brick and Solid Masonry Units.

.4 CAN/CSA-A82.1, Burned Clay Brick (Solid Masonry Units Made From Clay or Shale).

.6 DEFINITIONS

.1 Deteriorated or Defective Joints: loose or missing mortar; excessively soft mortar; powder or crumbling mortar; cracks that weaken the bond between units; voids; badly stained pointing, face worn back more than 3 mm or previous pointing in hard cement and sand mortar.

.7 TEST REPORTS

.1 Routine testing of mortar mixes and application, for compliance with the specification will be carried out as specified in the Section – 04 05 12 Masonry Mortars.

.2 If test results show that performance criteria are not met, removal and repair of rejected Work shall be performed at no additional cost to the owner. All Work must be done to original specification.

.8 QUALIFICATIONS

.1 Execute all Work of this Section under the continuous supervision and direction of a competent mason.

.2 Provide for all Work to be done by qualified and experienced workers with a minimum of 5 years experience in the type of Work specified.

.9 **FIELD SAMPLES**

.1 Submit samples of repointing masonry showing pointing style for the Consultant's review before starting Work.

.2 The approved samples shall become the standard materials used on the job. Substitutions should not be made without written approval from the Consultant.

.3 Retain approved samples and protect as reference standard for acceptance of all related masonry repair Work.

.4 Submit clearly labeled sample of proposed replacement bricks and send to the Consultant for review.

.5 Obtain Consultant's approval of sample units of reclaimed brick.

.6 Provide sample wall area of brick cleaning minimum area of 10m2.

.10 **STORAGE AND PROTECTION**

.1 Store cementitious materials in accordance with Section – 04 05 12 Mortars.

.2 Keep materials dry and protect from weather and contamination. Stack masonry units on non-staining wood pallets (cypress, poplar, white or yellow pine without excessive resin). Do not use pressure treated wood.

.3 Remove from site materials that have deteriorated.

.4 All methods of enclosure and protection shall be subject to review by the Consultant.

.5 Allow new bricks to cure for at least two weeks after manufacture before being incorporated into the Work to allow for initial expansion of units.

.11 **ENVIRONMENTAL REQUIREMENTS**

.1 See Section 04 0512 – Mortars, for environmental requirements for mortar.

.2 Store materials, mix and lay mortar at a minimum of 5°C at all times.

.3 Provide heated enclosure for Work below 5°C and maintain minimum temperature for minimum of 3 days after mortar is laid.

.4 Ensure that repointed areas near to the edge of the enclosure are protected from local frosting by covering with insulated blankets.

.5 Provide shading and water-misted burlap protection for Work above 27°C.

.6 Provide protection to repointing for 21 days after installation in the wall.

.12 **EXISTING SITE CONDITIONS**

.1 Report to the Consultant in writing all areas of deteriorated masonry revealed during the Work and await instruction regarding repair or replacement of masonry units.

.13 **PRECONSTRUCITON CONFERENCE**

.1 A meeting is to be scheduled with the Consultant and the scope of the Work will be determined and agreed upon in writing.

.14 MOCK-UP

.1 Mock-up new masonry openings in one Level 2 suite where two single room are reconfigured into a suite .

2 PRODUCTS

.1 MANUFACTURERS

.1 See Section 04 05 12 – Mortars.

.2 MATERIALS

.1 Mortar materials: see Section 04 05 12 – Mortars.

.2 Water: to be clean, free of deleterious materials such as acid, alkali and organic material in accordance to CSA A179.

.3 New Brick:

.1 Use new brick below grade only, to match existing in colour, size, strength and porosity.

.2 Provide brick samples for Consultants review.

.3 The approved samples shall become the standard material used on the job. Substitutions should not m\be made without written approval from the Consultant.

.4 Reclaimed Brick:

.1 There is a small supply of brick units salvaged from selective on-site demolition.

.2 Use reclaimed face-bricks in the Work above grade.

.3 Reclaimed brick which closely matches the original in size, porosity and hardness, as assessed and approved by consultant.

.3 EQUIPMENT

.1 Hand Tools:

.1 All cutting out of joints to be done with hammer and chisels, unless otherwise specified.

.2 Tools must be sharp and properly sized for each joint type.

.2 Power Tools:

.1 Only hand-held mini-grinder type disk tools are allowed.

.2 Final cutting-out of the joints is to be made with sharp bolsters, to detach the upper and lower fragments remaining. Do not clean out joints with power equipment. All finish Work is to be done by hand.

.3 Maximum disk radius: 100 mm.

.3 Jointing Tools:

.1 Provide complement of slicks, brushes and keys to provide joint profiles scheduled.

.2 All masons to use identical jointing tools.

.4 Brushes:

.1 Fiber-bristle or plastic.

.2 Do not use a metal brush at any time.

.4 **SOURCE QUALITY CONTROL INSPECTION**

.1 Retain purchase orders, invoices, suppliers test certificates and documents to prove that materials used in contract meet requirements of specification.

.2 Produce above upon request of Consultant and allow free access to sources where materials were produced.

3 EXECUTION

.1 EXAMINATION

.1 Procedure of testing:

.1 Inspect joints visually for obvious signs of deteriorated masonry.

.2 Test for voids and weakness by using chisels or other approved means to sound and probe the masonry.

.3 Perform testing in co-operation with Consultant so that unsound joints can be marked and recorded.

.2 Study pointing styles and methods of reproducing them, and submit sample for approval before starting Work.

.3 Examine horizontal and vertical joints to determine which were struck first and whether they are same style, as well as other aspects of workmanship which establish authenticity of original work.

.4 Investigate possible structural problems and report before beginning masonry Work.

.2 PROTECTION

.1 Protect all landscaping adjacent to Work from affects of dust and residue.

.2 Review all methods of enclosure and protection with the Consultant.

.3 Provide and maintain protection for masonry repairs at all times when Work is suspended to prevent water from entering partially completed Work.

.4 Protect Work with non-staining plastic sheets, tarpaulin or burlap, secured to prevent lifting high winds.

.5 Protect exposed corners, sills, ledges, other projections, vulnerable decorative work and all openings such as doors and windows.

.6 Provide protection against the spread of dust, debris and water at or beyond the Work area and into the building, if required by suitably secured enclosures of sheeting and tarpaulins.

.7 Provide protection for workers from the effects of dust during cutting-out operations.

.3 PREPARATION

.1 Thoroughly dampen all bricks immediately before use. Do not dampen if air temperature is below 4°C.

.2 Prevent the entry of dust, debris, and water into the building by sealing all openings adjacent to the Work.

.3 Provide protection against the spread of dust, debris and water beyond the Work area by suitable enclosures of sheeting and tarpaulins.

.4 CUTTING OUT OF DETERIORATED JOINTS

.1 Cut-out all deteriorated joints to the full height of the joint and to a minimum depth of 20 mm.

.2 Remove all fittings such as nails, brackets, clips, plugs and anchors from wall areas as cutting-out proceeds. Drill out lead anchors and fill holes with mortar recessed 3 mm from brick face.

.3 Do not cut-out sound adjacent joints but leave in their present state.

.4 Cut-out fine joints (less than 3 mm high) not more than 10 mm in depth, to reduce the danger of chipping of masonry edges.

.5 Horizontal joints only may be partially cut out with power saws and grinding wheels under the direction of a skilled mason., Make one cut at center of the joint, no more than one-half its width and cut to the full depth required.

.6 Do final cutting-out of joints and cutting out of vertical joints hand tools only. Remove all joint material to depth specified, with hammers and chisels.

.7 Take care not to damage masonry adjacent to joints. The Contractor may be required to replace masonry units damaged by cutting-out operations.

.8 Clean debris from joints with brush and medium-pressure compressed air.

.5 **REPOINTING**

.1 Repointing of brick and stone work:

.1 Clean surfaces of joints using compressed air without damaging texture of exposed joints.

.2 Flush open joints and voids, clean with low pressure water and if not free draining blow clean with compressed air to remove dust.

.3 Immediately before repointing wet the surface well until absorption stops and the surface stays wet. Leave no standing water. Keep masonry damp while pointing is being performed.

.4 Build-up pointing in layers not exceeding ½” in depth. Allow back lifts to set 3 days before applying subsequent lifts.

.5 Once final layer of mortar has set up, lightly tool joint profile to match existing.

.6 Do not overwork face of the joint.

.7 Tool head joints first.

.8 Remove all excess mortar from face of masonry before it sets and neatly finish jointing as specified.

.6 **CUTTING OUT DEFECTIVE MASONRY**

.1 Remove defective units and cut-back to full depth, height and width of complete unit, including all mortar bedding.

.2 Cut-out all spalled, cracked, badly fissured, powdery or otherwise defective masonry units of the walling and replace with sound masonry units.

.3 Take down hollow-sounding, loose or otherwise unstable or unbonded masonry units to solid material and cut out void as above. Salvage any sound masonry units and reincorporate into Work.

.7 **RESETTING LOOSE MASONRY**

.1 Reset bricks on a solid and even bed of ,mortar, true and level and matching the existing bond pattern and coursing throughout (exactly as they were located previously in the wall).

.2 Fill cavities in back-up brickwork solidly.

.3 Match replacement brick to original material in size, colour and texture.

.4 Match jointing width to existing work. Squeeze joints tight and do not slush joints.

.5 Complete brick resetting before repointing generally. Rake back joints in around unit 1” and allow to set for at least 72 hours before repointing.

.8 **BRICK REPLACEMENT**

.1 Reset bricks on a solid and even bed of mortar, true and level and matching the existing bond pattern and coursing throughout (exactly as they were located previously in the wall).

.2 Match replacement brick or stone to original material in size, colour and texture.

.3 Fill cavities in back-up brickwork solidly.

.4 Match jointing width to existing work. Squeeze joints tight and do not slush joints.

.9 **CLEANING AII EXISTING MASONRY**

.1 Remove excess mortar, paint and dirt from all exposed interior existing clay masonry.

.2 Clean all masonry by hand with specified brushes.

.3 Use a Non Acidic Gel Cleaner: Manufactures Standard gel formulation, with pH between 6 and 9, that contains detergents and chelating agents and is specifically formulated for masonry surfaces.

.1 Price Research Ltd.; price Marble Cleaner Gel.
.2 ProSoCo; Sure Klean 942 Masonry Cleaner.

.10 **CLEANING NEW MASONRY WORK**

.1 Remove excess mortar immediately from adjacent surfaces.

.2 As Work proceeds clean all masonry with specified brushes.

.3 Wash down the completed sections of wall from top to bottom as the pointing has hardened. Allow three days for the initial hardening of the mortar.

.4 Clear site of debris, surplus material and equipment, leaving Work area in clean and safe condition.

.11 **PROTECTION OF INSTALLED WORK**

.1 Protect newly laid masonry from exposure to rain, full sunlight, excessive heat and/or drying winds until the surface is thumb-print hardened (3 days minimum).

.2 Protect newly laid masonry from freezing, at a minimum temperature of 4°C, for 21 days after installation.

.3 Provide for temporary enclosures and heating equipment to maintain specified temperatures to the full satisfaction of the Consultant.

.4 Provide and maintain protection for masonry walls at all times when Work is suspended to prevent water from entering partially repointed masonry.

.5 Protection shall consist of non-staining plastic sheets, tarpaulins or burlap, secured to prevent lifting in high winds.

.6 Provide protection boards to exposed corners, sills, ledges and other projections which may be damaged by repair Work activities. Maintain protection for the duration of operations

END OF SECTION

1 GENERAL

.1 GENERAL REQUIREMENTS

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

.2 RELATED WORK

.1 Related work specified elsewhere:

.2 Section 09 91 00: Painting

.3 Divisions 22, 23 and 26 for related items

.3 QUALIFICATIONS

Weld structural components: in steel, to conform to requirements of CSA Standard W59.1, and by fabricator fully certified by the Canadian Welding Bureau to conditions of CSA Standard W47.1 if applicable.

.4 SHOP DRAWINGS

Submit shop drawings for the work of this Section. Shop drawings shall bear the stamp and signature of the Engineer, registered in the Province of Ontario, responsible for the design of the work of this Section.

.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

Label, tag, or otherwise mark work supplied for installation by others to indicate its function, location in building, and shop drawing designation.

.6 PROTECTION

Maintain protection provided for work of this Section from time of installation until final finishes are applied or to final cleanup.

Protect prime painted and galvanized surfaces from damage.

Protect exposed surfaces of pre-finished metal work which does not receive site finishing with protective coatings or wrappings. Use materials recommended by finishers or manufacturers of metals to ensure that method is sufficiently protective, easily removed, and harmless to the finish

2 PRODUCTS

.1 MATERIALS PROPERTIES

.1 Generally:

.1 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.

.2 Metals shall be free from defects which impair strength of durability, or which are visible. Metals shall be new, of best quality, and free from rust or waves and buckles, clean, straight, and with sharply defined profiles.

.3 Refer to Section 01600 for general fastening requirements.

.2 Metals:

.1 Steel, Structural Shapes: Hot-rolled, to meet specified requirements of CAN3-G40.21-M87, Grade 300W.

.2 Steel, Plate and Bars: CAN3-G40.21-M81, Grade 44W.

.3 High Strength Bolts: ASTM Standard A325.

.4 Anchor Bolts: ASTM A446, Grade A, wipe coated as per CSSBI Technical Bulletin No. 3.

.3 Finishes:

.1 Prime Paint on Steel: Shall meet specified requirements of CGSB Standard 1-GP-40 for oil alkyd type structural steel primer, CGSB Standard 1-GP-132 for zinc chromate primer or shall conform to CISC/CPMA Specification 1-73a, as applicable, for specified finish treatments.

.2 Galvanizing: ASTM Specification A120 for pipe; CSA Standard G164 for irregular sections, 1.25 oz./sq.ft. zinc coating, unless indicated otherwise.

.4 Zinc Rich Paint: CGSB Standard 1-GP-181. Submit samples, on finished work as noted in this section and as requested by Consultant.

.5 Fastenings: Steel, cadmium plated screws, and bolts.

.6 Anchors: Where exposed to view, to match metal anchored. Where concealed from view; as for exposed anchors, except that galvanized steel may also be used if electrolytic action would not result.

.2 **FABRICATION**

.1 Generally:

.1 Fabricate work of this Section with machinery and tools specifically designed for the intended manufacturing processes and with skilled workers.

.2 Fit and assemble work in shop. When this is not possible, make a trial shop assembly.

.3 Provide anchors at 600 mm o.c. for miscellaneous metalwork items.

.2 Construction:

.1 Fabricate work with materials, component sizes, metal gauges, reinforcing, anchors, and fasteners of adequate strength to withstand intended use, and within allowable design factors imposed by jurisdictional authorities, and in accordance with CSA Standard S16.

.2 Ensure that work will remain free of warping, buckling, opening of joints and seams, distortion, and permanent deformation.

.3 Construct railings to withstand both required vertical and horizontal loadings.

.4 Construct items that are part of floor or roof constructions, to support the same live loads for which surrounding floors or roofs are designed unless indicated otherwise.

.3 Assembly:

.1 Accurately cut, machine, and fit joints, corners, copes, and mitres so that junctions between components fit together tightly and in true planes.

.2 Fasten work with concealed methods unless otherwise indicated on Drawings.

.3 Weld all connections where possible; bolt where not possible; and cut off bolts flush with nuts. Countersink bolt heads, and provide method to prevent loosening of nuts. Ream holes drilled for fastenings.

.4 Welded joints shall be tight, flush, and in true planes with base metals. Make welds continuous at joints where entry of water into building, or into voids of members or assemblies is possible.

.5 Grind welds smooth where exposed to view.

.6 Provide for differential movements within assemblies and at junctions of assemblies with surrounding work.

.4 Finish Work:

.1 Provide holes and connections for work installed under other Sections of this Specification.

.2 Cleanly and smoothly finish exposed edges of materials including holes.

.3 Cap open ends of sections exposed to view, such as pipes, channels, angles, and other similar work.

.4 Machine or grind floor plates, gratings, covers, or their bearings to provide level support.

.5 Prime Painting of Steel:

.1 Clean all loose mill scale, rust, dirt, weld flux, and spatter from work after fabrication. Grind smooth sharp projections. Prepare for prime painting by methods specified in CSA Standard S16 for priming and finishes specified.

.2 Unless otherwise specified, apply to steel a shop prime coat of paint. Work paint into corners and on to open areas smoothly. Deliver work to with primer undamaged. Give surfaces that are inaccessible to finish field painting two coats of primer.

.6 Prime paint interior steel fabrications and structural steel with red oxide primer, unless indicated otherwise.

.7 Galvanizing: Galvanize all exterior steel fabrications.

3 EXECUTION

.1 EXAMINATION

.1 Take site measurements to ensure that work is fabricated to fit surrounding construction, around obstructions and projections in place, or as shown on Drawings, and to suit service locations.

.2 INSTALLATION

.1 Install work plumb, true, square, straight, level, and accurately and tightly fitted together and to surrounding work. Install structural steel in accordance with CSA Standard S16.

.2 Work supplied by this Section shall include anchor bolts, bolts, washers and nuts, lag screws, expansion shields, toggles, straps, sleeves, brackets, clips, and other items necessary for secure installation as required by loading and jurisdictional authorities.

.3 Attach work to masonry with lead plugs and galvanized steel or other corrosion resistant fastenings to support load with a safety factor of three.

.4 Insulate between dissimilar metals; or between metal, and masonry or concrete with bituminous paint to prevent electrolysis.

.5 Work of this Section shall include caulking between components installed under this work where required to seal joints against passage of air or water, or both. Caulking between miscellaneous metal work and adjacent work of others is included in the work of Section 07 92 10.

.6 Grout metal posts, pickets, balusters, and the like, in metal sleeves cast into concrete, with quick setting anchor cement, or where noted, cast directly into concrete, both interior and exterior as detailed.

.3 **ADJUSTMENT AND CLEANING**

.1 After erection, touch up primed surfaces that are burned, scratched, or otherwise damaged with prime paint to match shop coat.

.2 Repair areas of bare metal and welds on galvanized surfaces with zinc rich paint.

.3 Remove damaged, dented, defaced, defectively finished or tool marked components and replace with new.

.4 Clean off dirt on surfaces resulting from installation work.

.4 **SCHEDULE OF MISCELLANEOUS ITEMS**

.1 Generally: List of items that follows is not intended to detail the work of this Section, but to generally outline the major works included. All miscellaneous metal fabrications noted in drawings and details or referred to in the Room Finish or Door Schedules is considered to be part of the work of this Section, whether indicated in this Schedule or not. Consult all Drawings and Specification Sections, including those for structural, mechanical, and electrical to establish the limits of work included in this Section.

END OF SECTION

1.0 GENERAL

Part 1 General

1.1 SUMMARY

.1 The Work of this Section includes the provision of all labour, materials, plant and equipment necessary for the completion of the work, including but not limited to:
- .1 Epoxy wood consolidate repairs;
- .2 Epoxy wood filler repairs;
- .3 Replacement of badly damaged or rotted portions.

.2 Locations:
- .1 Exterior heritage wood elements and existing windows and doors to remain.

1.2 RELATED REQUIREMENTS

.1 Section 07 92 13H - Heritage Joint Sealants.

.2 Section 09 91 00H - Heritage Painting.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI/HPVA HP-1-10, American National Standard for Hardwood and Decorative Plywood.
- .2 ANSI/BHMA A156.16 Auxiliary Hardware.
- .3 ANSI/ASME 18.6.1-1981(R2016) Wood Screws (Inch Series).
- .4 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .5 Architectural Woodwork Quality Standards.

.2 ASTM International
- .1 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .2 ASTM F1667-20, Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .3 CSA Group (CSA):
  - .1 CSA O121-17, Douglas Fir Plywood.
  - .2 CAN/CSA 0141-05 (2014), Softwood Lumber
  - .3 CAN/CSA-O80 SERIES-15, Wood preservation
  - .4 CSA O151-09 (R2014), Canadian Softwood Plywood.
  - .5 CSA O153-M13 (R2017), Poplar Plywood.

1.4 RESTORATION INTENT

.1 The intent of the restoration work is to make all wood elements sound, stable, and properly connected whilst conserving the maximum amount of existing wood and its existing character.

.2 As far as is possible, original woodwork is to be repaired instead of replaced.

.3 Refer to Section 09 91 00H - Heritage Painting, for scope of work related to filling of all areas of cracked, checked, delaminated or otherwise open or damaged wood grain.
- .1 Remove loose, cracked and/or unbonded paint, sand smooth, ready for repainting.

.4 Ensure that the trades people understand these conditions and the approach required for the work.

1.5 QUALITY ASSURANCE

.1 Heritage carpenter to have experience in historic woodwork repair and conservation work on projects of similar size and complexity to Work of this Contract for a period of at least the immediate past 5 years.

.2 Provide for all work to be done by qualified and experienced tradesmen with a minimum of 5 years' experience in the type of work specified.

.3 Execute all work of this Section under the continuous supervision and direction of a competent heritage carpenter.

1.6 PRECONSTRUCTION MEETING

.1 Following contract award and prior to commencement of any work on or off site, Contractor to organize, attend and chair a Start-Up Meeting with the Architect /Heritage Consultant. Contractor to prepare and distribute minutes.

.2 The purpose of the meeting is to review the requirements of the project, review installation and substrate conditions, coordinate with other construction subtrades and review manufacturer's written instructions and warranty requirements, and establish a schedule of work including delivery of Submittals.

.3 At the meeting, Contractor to provide a Project Schedule that identifies critical milestones and sequencing for the work of this Section.

1.7 SUBMITTALS

.1 Submit in accordance with Section 01 33 01 – Submittals.
- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for all products and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Samples:
- .1 Provide samples of repair materials for review by Architect /Heritage Consultant.
- .2 Provide samples of replacement sections for wood windows and carved wooden elements showing profiles and details that match existing.
- .3 Work Schedule:
  - .1 Provide a detailed Work Schedule demonstrating compliance with the stated timelines and completion dates.
  - .2 Perform woodwork restoration after the completion of adjacent brick work repair and reconstruction.

1.8 MOCK-UPS

.1 Construct mock-ups in accordance with Division 1 requirements.

.2 Provide the following mock-ups before starting the work of this Section. Confirm mock up location(s) with the Architect / Heritage Consultant before commencing:
- .1 Full-scale 0.6 m long typical replacement sections;
- .2 Full-scale of typical plastic repair epoxy consolidation and filler application for small, medium and large size;

.3 Review completed mock-ups with Architect / Heritage Consultant. Do not proceed with work of any type until reviewed in writing by Architect / Heritage Consultant.

.4 Repeat mock-up until results obtained meets project requirements.

.5 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment, material preparation and finish application.

.6 The reviewed mock-ups shall become the reference standard of all related work, and are to be retained for the duration of the work and accessible for workers performing related work.

.7 Material or Process Substitutions deviating from reviewed mock-ups shall not be made without written approval from the Architect / Heritage Consultant, and may require a new mock-up at the expense of the contractor.

.8 Reviewed mock-ups may remain and be considered part of completed work.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Division 1 requirements.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Store materials in dry location, indoors, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.4 Store and protect materials from nicks, scratches, and blemishes.

.5 Replace defective or damaged materials with new.

1.10 SITE CONDITIONS

.1 Ambient conditions: as per manufacturer's recommendations.

.2 Existing conditions: Report to the Architect / Heritage Consultant in writing any substantial areas of deterioration not previously identified and revealed during the course of work. Await instructions before proceeding.

1.11 EXTENDED WARRANTY

.1 Refer to Division 01 for basic warranty requirements.

.2 The warranties included in this section are above and beyond the requirements of the basic warranty.

.3 Contractor to advise Architect / Heritage Consultant prior to bid close if the extended warranties specified herein cannot be provided.

.4 Extended warranties begin at the end date of the basic warranty.

.5 Provide the following extended warranties against all defects not due to ordinary wear and tear or improper usage:
- .1 Workmanship: 2 years

.6 Warranties are to be issued by the warrantor to the benefit of the Owner.

.7 Submit extended warranties in accordance with the requirements of Division 1, including as a minimum the following information:
- .1 Description of extended warranty coverage (being full replacement, including any affected adjacent work);
- .2 Date extended warranty starts;
- .3 Date extended warranty expires;
- .4 Contact name, address, phone number and email address. The Contractor is responsible for notifying the Owner of any changes to contact information during the warranty period.

.8 Remedy and make good any and all defects that develop during the extended warranty period, including damage to other work as a result of the defects, without expense to the Owner.

Part 2 Products

2.1 MATERIALS

.1 Lumber general:
- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board, to National Lumber Grades Authority standards.
- .2 Use shed stock with maximum moisture content of 8-12% for interior work, and 13-19% for exterior work at time of fabrication.

.2 Lumber for general rough carpentry and blocking: unless specified otherwise, softwood, S4S, in accordance with following standards:
- .1 Furring of door and window frames at interior:
  - .1 SPF, Construction grade
  - .2 Softwood lumber to CAN/CSA-O141.

.3 Lumber for finish carpentry:
- .1 White Pine, No. 1 and No. 2 Grade, flat cut
- .2 Douglas Fir, No. 1 and No. 2 Grade, flat cut

.4 Softwood and hardwood lumber: Sound lumber to specified AWS grade requirements, kiln-dried to moisture content recommended for location of the Work. The standards that follow are all for plywood. Which is not the subject of this clause.
- .1 Douglas fir plywood (DFP): to CSA O121, standard construction;
- .2 Canadian softwood plywood (CSP): to CSA O151, standard construction;
- .3 Hardwood plywood: to ANSI/HPVA HP-1;
- .4 Poplar plywood (PP): to CSA O153, standard construction;

.5 Wood preservative:
- .1 To meet CAN/CSA-O80 SERIES-15 - Wood preservation
- .2 Clear zinc naphthenate solution (copper naphthenate solution not accepted for toxicity reasons)

.6 Wood Consolidant:
- .1 Two-part epoxy-based consolidant, Acceptable products:
  - .1 “PC-Petrifier Water Based Wood Hardener” by PC-Products; for non-structural repairs
  - .2 “PC-Rot Terminator Solvent Based Wood Hardener” by PC Products; for structural repairs
  - .3 “105 Epoxy Resin/ 207 Special Clear Hardener” by West System;
  - .4 “Flexible Epoxy Consolidant” by ConServ Epoxy;
  - .5 Or accepted alternative.
    - .1 Non-epoxy-based consolidants will not be accepted.

.7 Wood filler:
- .1 Two-part epoxy-based filler, low-modulus to achieve a sandable patch repair, such as:
  - .1 “PC-Woody Epoxy Wood Filler” by PC-Products;
  - .2 “105 Epoxy Resin/ 207 Special Clear Hardener” with “407 Low Density Fairing Filler” by West System;
  - .3 “Flexible Epoxy Patch” by ConServ Epoxy;
  - .4 Or accepted alternative.
  - .5 Non-epoxy-based fillers will not be accepted.

.8 Nails:
- .1 To meet ASTM F1667Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .2 Hot-dipped galvanized, spiral-shank nails for exterior work and treated lumber.
- .3 Review with Heritage Architect before using nailing guns.

.9 Bolts, nuts, washers, lags and screws:
- .1 Medium carbon steel, hot-dip galvanized coating, size and type to suit application, unless noted otherwise.

.10 Structural Adhesive: LePage PL 400, or equivalent.

.11 Sealant: In accordance with Section 07 92 13H - Heritage Joint Sealants.

2.2 FABRICATION

.1 Coordinate locations of existing concealed supports and blocking on site.

.2 Fabricate Work in manner to allow expansion and contraction of the materials without visible open joints. Conceal joints and connections wherever possible.

.3 Set nails and countersink screws, apply wood filler to indentations, sand smooth and leave ready to receive finish to match adjacent existing work.

.4 Finish work free of blemishes, bruises, mineral marks, knots, shakes and other defects.

.5 Select wood for uniformity of colour, grain and texture, where clear finished.

.6 Fabricate replacement parts to match existing in length, section and profile.

.7 Fabricate replacement mouldings with sharp true profiles, to match existing exactly.

.8 Use as far as possible the original methods of attachment.

2.3 TOLERANCES

.1 Maximum fabrication tolerances:
- .1 Width and depth of component: To match existing exactly
- .2 Length of component: 1.6 mm (1/16”) different from existing.

.2 Maximum installation tolerances:
- .1 Alignment at joints.
- .2 Flush with existing.

Part 3 Execution

3.1 EXAMINATION

.1 Take all relevant site measurements of existing construction to which the Work of this Section must conform.

.2 Verification of site conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation.
- .1 Visually inspect substrate.
- .2 Starting work will indicate acceptance of site conditions.
- .3 Inform Consultant of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Carefully dismantle and retain all woodwork specified for salvage, repair and/or replacement.

.2 Report any other deterioration, damaged or missing components uncovered in the course of the work and report to Consultant. Await Consultant’s instructions before proceeding with any additional work.

.3 Remove by scraping all loose, peeling and non-bonded paint. Sand all surfaces prior to repainting.

3.3 INSTALLATION

.1 General:
- .1 Install new work and replacement pieces to align with existing and as far as possible plumb, square, level and straight, fastened securely to backing to support itself and anticipated superimposed loads.
- .2 Reinstall salvaged woodwork plumb, square, level, straight and true where the parts and existing conditions permit. Do not overcorrect distortions of time which are part of the patina of age of the work. It is acceptable to lightly alter joints of salvaged parts, such as mitres, to make parts fit, unless the contract documents expressly do not permit this.
- .3 Join work with square ends and only over solid backing. Use material in lengths as long as possible.

.2 Cutting and Fitting:

- .1 Scribe and cut as required to fit tightly and with flat, smooth surfaces, to abutting walls, and surfaces. Fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .2 Form joints to conceal shrinkage.
- .3 Lightly ease all exposed corners to a smooth uniform radius. Match the degree of easing to existing fabric adjacent.

.3 Fastening:
- .1 Position items of new finished carpentry work accurately, and level, plum and true where existing conditions permit. Fasten or anchor securely.
- .2 Fasten new work with nails generally but use screws or special fasteners at critical joints where strain, usage and excessive shrinkage are anticipated. Select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Fasten existing, salvaged wood elements by providing lead holes form nailing or screwing to avoid splitting the wood.
.4 Blind nail wherever possible.
.5 Set finishing nails below surface to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
.6 Replace items of new finish carpentry which have been damaged during installation, including hammer and other bruises.

.4 Standing and running trim:
.1 Butt and cope internal joints to make snug, tight, joint. Cut right angle joints of casing, base and other elements with mitred joints.
.2 Fit backs of elements snugly to wall surfaces to eliminate cracks at junction with walls.
.3 Make joints, where necessary using a scarf type joint.
.4 Install new door and window trim in single lengths without splicing.

.5 Finishing:
.1 Fill all nail holes and surface damage with specified wood filler.
.2 Fine sand wood after installation to leave surfaces smooth, level, in true planes and free of machine or tool marks.
.3 Finish as directed – refer to Section 09 91 00H - Heritage Painting.

3.4 WOOD CONSOLIDATION APPLICATION

.1 Install according to manufacturer's printed instructions.

.2 Provide clean, dry surface, removing all dry rot, dirt, sawdust and/or loose paint or varnish. Remove existing paint and/or varnish to increase acceptance of consolidant by wood – refer to Section 09 03 91 Heritage Wood Preparation & Painting.

.3 If the wood surface is very soft, remove paint sufficiently to allow consolidant to penetrate and complete paint removal by mechanical means after consolidant has cured.

.4 For vertical surfaces, drill small holes (3 mm ø) in wood on downwards angle at 20mm o.c. to hold consolidant.

.5 Apply mixture by pouring and brushing onto the wood surface until damaged area is fully saturated. The applicator bottle can be used to inject into drilled holes or larger openings in the wood. Consolidant will readily follow grain of wood. Apply wood consolidant while absorption continues.

.6 Reapply prior to cure if required.

.7 After curing is complete, infill missing pieces with epoxy wood filler.

3.5 WOOD FILLER APPLICATION

.1 Install according to manufacturer's printed instructions.

.2 Provide clean, dry surface, removing all dry rot, dirt, sawdust and/or loose paint or varnish.

.3 Where rotted wood is present, remove or encapsulate with epoxy consolidant before applying epoxy wood filler. Refer to instructions regarding Wood Consolidation Application.

.4 Ensure all areas to be filled are a minimum of 3mm deep on vertical surfaces and 5mm deep on horizontal surfaces, to avoid feathered edges and to ensure a longer lasting repair.

.5 Only use epoxy fillers where the wood element is still sound and has integrity. Do not cast large replacement portions of a wood element using epoxy fillers if the element is compromised or if areas are rotten or missing. Obtain direction from Architect / Heritage Consultant before proceeding.

.6 Use filler in conjunction with wood Dutchmen to fill larger holes.

.7 Using separate knives to remove equal amount needed, mix equal parts of 'A' (off white colour) and 'B' (light brown colour) on flat surface until uniform tan colour is achieved. Mixing for a longer period of time will assure better performance.

.8 For best results, allow 15-20 minutes of standing time after application before roughly shaping and moulding.

.9 Form mould profiles to match existing wood profiles and/or as indicated on the Drawings.

.10 Let filler cure for full period specified in manufacturer's published instructions. Fully cured epoxy can be worked and tooled similar to real wood.

.11 Sanding can generally take place within 1-2 days. Premature sanding will gum up sand paper. Always sand in direction of wood grain.

.12 Do not fill and obscure exposed grain or small imperfections in the surface in sound wood that form part of the patina of age.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 01 - Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 01 - Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 74 03 - Waste Management and Disposal.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide rough carpentry work, including but not limited to, the following:
- .1 Miscellaneous furring and blocking,
- .2 Wood nailers, curbs and sheathing for roofing,
- .3 Electrical mounting boards, and
- .4 Rough blocking in walls for support of wall-mounted items.

1.3 RELATED SECTIONS

.1 Architectural Woodwork Section 06 47 00

1.4 REFERENCES

.1 CSA-B111-1974 (R1998); Wire Nails, Spikes and Staples.

.2 CAN/CSA-G164-M92 (R1998); Hot Dip Galvanizing of Irregularly Shaped Articles.

.3 CSA-O80 Series-97; CSA Standards for Wood Preservation.

.4 CSA-O86-01; Engineering Design in Wood (Working Stress Design).

.5 CSA-O112 Series-M1977 (R2001); CSA Standards for Wood Adhesives.

.6 CSA-O121-M1978 (R1998); Douglas Fir Plywood.

.7 CAN/CSA-O141-91 (R1999); Softwood Lumber.

.8 CSA-O151-M1978 (R1998); Canadian Softwood Plywood.

.9 CAN/ULC-S102; Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

10 National Lumber Grades Authority (NLGA) Special Products Standard for Finger joined Structural Lumber SPS-1991.

.11 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber-1991.

1.5 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with applicable CSA standards.

2 PRODUCTS

2.1 LUMBER MATERIAL

.1 Framing Lumber: SPF softwood, NLGA No. 2 Grade or better, S4S, kiln-dried with moisture content 19% or less in accordance with CAN/CSA-O141. Includes joists, studs, and strapping, sizes as shown on drawings.

.2 Machine stress-rated lumber is acceptable for all purposes.

.3 Glued end-jointed (finger-jointed) lumber products certified under NLGA Special Products Standard 1-81 are acceptable except for material for "A" appearance framing to be left unfinished or to be finished with transparent or translucent type coating.

.4 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing, and sleepers:
- .1 S2S is acceptable.
- .2 Board sizes: "Standard" or better grade.
- .3 Dimension sizes: "Standard" light framing or better grade.

.5 Pressure Preservative Treated Lumber: SPF softwood, NLGA No. 2 Grade or better, S4S, kiln-dried with moisture content 19% or less in accordance with CAN/CSA-O141; pressure preservative treated with Copper Azole (CBA-A or CA-B), or Alkaline Copper Quaternary (ACQ) to CSA-O80 Series.

2.2 PANEL MATERIALS

.1 Construction Sheathing (CS): to CAN/CSA-O325.0, thickness as indicated.

.2 Canadian Softwood Plywood (CSP): to CSA-O151, standard construction, thickness as indicated.

.3 Pressure Preservative Treated Plywood: Canadian softwood plywood (CSP) to CSA-O151, standard construction; pressure preservative treated with Copper Azole (CBA-A or CA-B), or Alkaline Copper Quaternary (ACQ) to CSA-O80.9 and kiln-dried to a moisture content of 15% or less. Thickness as indicated.

.4 Fire Retardant Treated Plywood: Douglas Fir Plywood (DFP) to CSA-O121, standard construction; fire retardant treated to CSA-O80.27, kiln-dried to a moisture content of 15% or less, Flame Spread Rating of less than 25 to CAN/ULC-S102. Product must be UL or ULC labeled. Thickness as indicated.

2.3 ACCESSORIES

.1 Sealants: in accordance with Section 07 92 10.

.2 General Purpose Adhesive: to CSA-O112 Series.

.3 Nails, Spikes and Staples: to CSA-B111.

.4 Proprietary Fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.

.5 Nailing Discs: flat caps, minimum 25mm diameter, minimum 0.4mm thick, sheet metal/plastic, formed to prevent dishing. Bell or cup shapes not acceptable.

.6 Finishes
- .1 Hot-dip galvanized connectors and fasteners to CAN/CSA-G164 minimum 610g/m2 coating for:
  - .1 Interior highly humid areas
  - .2 Fire-retardant treated wood

.7 Surface-applied wood preservative: to CAN/CSA-O80 Series; Copper Azole (CBA-A or CA-B) or Alkaline Copper Quaternary (ACQ).

3 EXECUTION

3.1 PREPARATION

.1 Treat cut surfaces of pressure preservative treated material exposed by cutting, trimming, or boring with wood preservative before installation.

.2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.

3.2 INSTALLATION

.1 Install members true to line, levels and elevations, square and plumb.

.2 Construct continuous members from pieces of longest practical length.

.3 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.4 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding, electrical equipment mounting boards, and other work as required.

.5 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.

.6 Align and plumb faces of furring and blocking to tolerance of 1:600.

.7 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.8 Install wood nailers, curbs, and other wood roof supports as required and secure using galvanized steel fasteners.

.9 Install sleepers and curbs with top set level as indicated.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

END OF SECTION

PART 1– GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section and all related sections.

.2 The work of this section and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 WORK INCLUDED

.1 Section includes:

.1 Wall sheathing.
.2 Parapet sheathing.
.3 Floor sheathing.
.4 Floor underlayment.
.5 Roof sheathing.

.2 Provide all labour and materials to complete the Work indicated in the Contract Documents and specified in this Section.

1.3 RELATED WORK SPECIFIED ELSEWHERE

.1 Section 06 10 10 “Rough Carpentry” for dimension lumber framing.

1.4 REFERENCE STANDARDS, CODES, AND ACTS

.1 Conform to the requirements of the local building code identified on the structural Drawings as amended by all subsequent regulations issued to the date of this Specification and applicable acts of authorities having jurisdiction.

.2 All references to the standards and publications noted in this Specification shall be to the edition referenced in the local building code identified on the structural Drawings, or to the edition referenced in the latest published editions or revisions of all standards published by the Canadian Standards Association issued to the date of this Specification, whichever is the later edition or revision.

.3 All references to the standards and publications noted in this Specification which are not referenced by the local building code or by the standards published by the Canadian Standards Association shall be to the latest edition and revision published to the date of this Specification.

.4 Standards referenced by the publications noted in this Specification apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

.5 Where there are differences between the Contract Documents and the standards, codes, or acts, the most stringent provisions govern.

.6 References:
.1 APA AFG-01 Adhesives for Field-Gluing Plywood to Wood Framing.

.2 ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.3 ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84mm) to 0.112 in (2.84mm) in Thickness.

.4 ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.5 ASTM D2898 Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing.

.6 ASTM D3201/D3201M Standard Test Method for Hygroscopic Properties of Fire-Retardant Wood and Wood-Based Products.

.7 ASTM D3498 Standard Specification for Adhesives for Field Gluing Plywood to Lumber Framing for Floor Systems.

.8 ASTM D5516 Standard Test Method for Evaluating the Flexural Properties of Fire-Retardant Treated Softwood Plywood Exposed to Elevated Temperatures.

.9 ASTM D6305 Standard Practice for Calculating Bending Strength Design Adjustment Factors for Fire-Retardant-Treated Plywood Roof Sheathing.

.10 ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

.11 ASTM F1667 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.12 CANPLY (Canadian Plywood Association) Grading and Certification.

.13 CAN/ULC S101 Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.14 CSA O80 Series-15 Wood Preservation.

.15 CSA O86 Engineering Design in Wood.

.16 CSA O121 Douglas Fir Plywood.

.17 CSA O325 Construction Sheathing.

.18 ULC Fire Resistance Directory.

1.5 PERFORMANCE REQUIREMENTS

.1 Fire-Resistance Ratings: As tested in accordance with CAN/ULC S101; testing by a qualified agency.

.1 Identify products with appropriate markings of applicable testing agency.

.2 Indicate design designations from ULC's "Fire Resistance Directory" or from the listings of another qualified testing agency.

1.6 SUBMITTALS FOR REVIEW

.1 Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

.1 Include data for wood-preservative treatment from chemical treatment manufacturer an certification by treating plant that treated sheathing complies with requirements. Indicate type of preservative used and net amount of preservative retained.

.2 Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated sheathing complies with requirements. Include physical properties of treated materials.

.3 For fire-retardant treatments, include physical properties of treated sheathing both before and after exposure to elevated temperatures based on testing by a qualified independent testing ageny according to ASTM D5516.

.4 For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

.2 Provide letter outlining steps to be taken during construction to ensure adequate weather protection of wood structures.

1.7 SUBMITTALS FOR INFORMATION

.1 Evaluation Reports: For the following, from CCMC or ICC-ES:
.1 Wood-preservative-treated sheathing.
.2 Fire-retardant-treated sheathing.

.2 Qualification Data: For installer and testing agency.

1.8 QUALITY ASSURANCE

.1 Installer Qualifications: Company specializing in performing the Work of this Section with minimum three years of experience.

.2 Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.9 DELIVERY, STORAGE, AND PROTECTION

.1 Protect panels from weather during transit to Project site.

.2 Stack panels flat with spacers beneath and between each bundle to provide air circulation.

.3 Protect panels from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 – PRODUCTS

2.1 SHEATHING

.1 Wall and Parapet Sheathing: Plywood or Oriented Strand Board (OSB), exterior grade.

.1 Plywood: CSA O121.
.2 OSB: CSA O325.
.3 Nominal Thickness: Not less than 12.5mm.

.2 Underside of Floor Joists Sheathing: Plywood, exterior grade.

.1 Plywood: CSA O121.
.2 OSB: CSA O325.
.3 Nominal Thickness: Not less than 12.5mm.
.4 Edges: Tongue and groove.

.3 Floor Underlayment: Plywood underlayment in nominal thicknesses indicated or, if not indicated, not less than 7.5mm over smooth subfloors and not less than 9.5mm over board or uneven subfloors.

.1 Underlayment for Ceramic Tile: CSA O121, Exterior, Select Tight Face, not less than 15.5mm nominal thickness.

.4 Roof Sheathing: Plywood or Oriented Strand Board (OSB), exterior grade.

.1 Plywood: CSA O121.
.2 OSB: CSA O325.
.3 Nominal Thickness: Not less than 19.0mm.
.4 Edges: Provide H-clips between each panel.

.5 Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED SHEATHING

.1 Preservative Treatment by Pressure Process: CSA O80; Use Category UC2 for interior construction not in contact with ground, Use Category UC3.2 for exterior construction not in contact with ground, and Use Category UC4.1 for items in contact with ground. Preservative chemicals must be acceptable to authorities having jurisdiction and contain no arsenic or chromium.

.2 Mark treated materials with treatment quality mark of an inspection agency acceptable to authorities having jurisdiction.

.3 Treat items only as indicated on the Drawings. Any fasteners in contact with treated wood must be hot-dip galvanized or stainless steel.

2.3 FIRE-RETARDANT-TREATED SHEATHING

.1 Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

.2 Fire-Retardant-Treated Sheathing by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 3.2 meters beyond the centerline of the burners at any time during the test.

.1 Use treatment that does not promote corrosion of metal fasteners.

.2 Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated sheathing by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

.3 Interior Type A: Treated materials shall have a moisture content of 28% or less when tested according to ASTM D3201 at 92% relative humidity. Use where exterior type is not indicated.

.4 Design Value Adjustment Factors: Treated sheathing shall be tested according to ASTM D5516, and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 76°C shall be not less than span ratings specified.

.3 Kiln-dry material after treatment to maximum moisture content of 15%. Do not use material that is warped or does not comply with requirements for untreated material.

.4 Identify fire-retardant-treated sheathing with appropriate classification marking of qualified testing agency.

.5 Treat items only as indicated on the Drawings.

2.4 FASTENERS

.1 Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Where sheathing is exposed to weather (during or after construction), in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153 or of Type 304 stainless steel.

.2 Nails, Brads, and Staples: ASTM F1667.

.3 Power-Driven Fasteners: Fasteners with a CCMC or ICC-ES evaluation report acceptable to authorities having jurisdiction.

.4 Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

.5 Screws for Fastening Sheathing to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

2.5 MISCELLANEOUS MATERIALS

.1 Adhesives for Field Gluing Panels to Wood Framing: ASTM D3498 or APA AFG-01, approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

.2 Proprietary Products:

.1 Proprietary products shown on the Drawings have been selected and specified based on the manufacturer's representation.
.2 The Consultant shall not become guarantor of the product.
.3 Install proprietary products in strict conformance with the manufacturer's recommendations.
.4 Contractor is responsible for proper workmanship during installation.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Examine supporting construction in areas to receive sheathing, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

.2 Cut panels at penetrations, edges, and other obstructions of work. Fit tightly against abutting construction unless noted otherwise.

.3 Securely attach sheathing to substrate by anchoring and fastening as indicated, complying with the following:

.1 Fastening requirements in Part 9 of the National Building Code of Canada.
.2 CCMC or ICC-ES evaluation report for fastener.

.4 Use common steel wire nails unless noted otherwise.
.1 Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials.
.2 Make tight connections.
.3 Install fasteners without splitting wood.
.4 Drive nails snug but do not countersink nail heads unless noted otherwise.

.5 Substitution of common nails with power-driven nails of the same length and diameter is acceptable. Substitution of power-driven nails of smaller diameter is permitted only with the Consultant's approval.

.1 Set nail gun pressure so that nail heads do not crush plywood surface.
.2 Nail head penetration shall not exceed 2mm.

.6 For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

.1 Comply with approved fastener patterns where applicable. Before fastening, mark fastener locations, using a template made of sheet metal, plastic, or cardboard.
.2 Use finishing nails unless noted otherwise. Countersink nail heads and fill holes with wood filler.

.7 Secure floor and roof sheathing with longer edge perpendicular to framing members and with end joints staggered and sheet ends over bearing. For sheathing over solid wood panels, locate sheathing joints away from gaps between panels.

.8 Fully engage tongue and groove edges where applicable. Where sheathing is not tongue and groove, use sheathing clips between sheets.

.9 Secure wall sheathing to wall studs, with ends over firm bearing and staggered. Long dimension of sheathing may be parallel or perpendicular to wall studs.

.10 Coordinate wall, parapet, and roof sheathing installation with flashing and joint sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

.11 Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the work day when rain is forecast.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide all Finish Carpentry including the following:
.1 Supply and installation of all siding and running wood trim.
.2 Installation of all wood doors and windows.
.3 Supply and Installation of all wood door frames.
.4 Installation of all hollow metal doors and frames.
.5 Installation of all finish hardware.
.6 Installation of architectural woodwork.

1.3 RELATED SECTIONS

.1 Rough Carpentry Section 06 10 10
.2 Metal Doors & Frames Section 08 11 14
.3 Flush Wood Doors Section 08 14 10
.4 Finish Hardware Section 08 71 10
.5 Painting and Finishing Section 09 91 00

1.4 REFERENCES

.1 CSA-B111-1974 (R1998); Wire Nails, Spikes and Staples.
.2 CAN/CSA-G164-M92 (R1998); Hot Dip Galvanizing of Irregularly Shaped Articles.
.3 CSA-O115-M1982 (R2001); Hardwood and Decorative Plywood.
.4 CSA-O112 Series-M1977 (R2001); CSA Standards for Wood Adhesives.
.5 CSA-O121-M1978 (R1998); Douglas Fir Plywood.
.6 CAN/CSA-O141-91 (R1999); Softwood Lumber.
.7 CSA-O151-M1978 (R1998); Canadian Softwood Plywood.
.8 CAN4-S104-M80 (R1985); Fire Tests of Door Assemblies.
.9 CAN/ULC-S706-02; Standard For Wood Fibre Thermal Insulation For Buildings.
.10 CAN4-S105-M85 (R1992); Fire Door Frames.
.11 CAN/CGSB-11.3-M87; Hardboard.
.12 ANSI A208.1-1999; Particleboard, Mat-formed Wood.
.13 ANSI A208.2-2002; Medium Density Fiberboard.
.14 AWMAC / AWI Quality Standards for Architectural Woodwork 2003.
.15 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber-1991.
.16 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress January 1986.

1.5 SAMPLES

.1 Submit samples of each type and profile of all standing and running trim, in accordance with Section 01 33 01.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 01.

.2 Indicate details of construction, profiles, jointing, fastening and other related details.
.3 Indicate all materials, thicknesses, finishes and hardware.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Protect materials against dampness during and after delivery.

.2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

1.9 GUARANTEE

.1 Guarantee finish carpentry work for a period of two years from the Date of Substantial Performance against warpage, opening of joints, shrinkage and similar defects.

2 PRODUCTS

2.1 LUMBER MATERIALS

.1 Softwood Framing Lumber: SPF softwood, NLGA No. 2 Grade or better, S4S, kiln-dried with moisture content 19% or less in accordance with CAN/CSA-O141.

.2 Solid Finish Softwood Boards Wall Panels: Douglas Fir, charred tongue and groove 19mm x 170m boards, fire treated to achieve a ULC flame spread rating of 25 or less and stained black, supplied by South Parry Lumber, Parry Sound, Ontario under the product name Kindl.

2.2 PANEL MATERIALS

.1 Douglas Fir Plywood **(DFP)**: to CSA-O121, G2S, standard construction, thickness as indicated. Exterior and interior grades to be fire treated with a ULC flame spread rating of 25 or less, ASTM test Method E-84.

.2 Canadian Softwood Plywood **(CSP)**: to CSA-O151, G2S, standard construction, thickness as indicated.

.3 Particleboard: interior mat-formed wood, to ANSI-A208.1, Grade M-2, minimum density 641 kg/m_3, thickness as indicated.

.4 Hardboard: to ANSI A135.4, Class 1 (tempered), thickness as indicated.

.5 Medium density fibreboard **(MDF)**: to ANSI-A208.2, Grade 130, density 769 kg/m_3, thickness as indicated.

2.3 ACCESSORIES

.1 Nails and staples: to CSA-B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain steel finish elsewhere.

.2 Wood screws: to CSA-B35.4, electroplated steel, type and size to suit application.

.3 Splines: wood or metal.

2.4 ADHESIVES

.1 Contact Adhesive: conforming to CAN/CGSB-71.20.

.2 Hot Melt Adhesive: of approved manufacturer.

.3 Resorcinol Adhesive: conforming to CSA-O112.6-M1977 or O112.7-M1977.

.4 Sealer: approved water-resistant sealer or glue.

3 EXECUTION

3.1 INSTALLATION

.1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of

Canada (AWMAC), except where specified otherwise.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects. Form joints to conceal shrinkage.

.3 Perform door and frame installation in accordance with National Fire Codes, Volume 4, produced by National Fire Protection Association (NFPA) 80.

3.2 CONSTRUCTION

.1 Fastening
- .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug with wood plug to match material being secured.
- .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and Running Trim
- .1 Butt and cope internal joints of baseboards, mitre external corners. Mitre all corner joints of casing. Butt and cope all baseboard and trim where intersecting with door casing.
- .2 Fit backs of baseboards and casing snugly to wall surfaces.
- .3 Make necessary joints in baseboard using a 45° scarf joint.
- .4 Install door and window trim in single lengths without splicing.

.3 Interior Frames
- .1 Set and secure frames with plumb sides, and level heads and sills.

3.3 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 10.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows:
.1 Hinge side: 1.0 mm.
.2 Latchside and head: 1.5 mm.
.3 Finished floor top of carpet and thresholds: 13 mm (6 mm at rated doors).

.3 Adjust operable parts for correct function.

3.4 FRAME INSTALLATION

.1 Set frames plumb, square, level and at correct elevation.

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Touch up galvanized finishes damaged during installation with zinc-rich primer.

3.5 INSTALLATION OF FINISH HARDWARE

.1 Neatly mortise and fit finishing hardware. Cut mortises straight and sharp without ragged edges and sized accurately to accommodate hardware. Where mortising and application of finishing hardware has not been done in a first class manner, replace such work.

.2 Adjust all hardware for correct function.

3.6 SCHEDULE

.1 Finish hardware installation.

.2 Select Clear White Pine new feature wall in Lecture Hall 104.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide all mill fabricated architectural woodwork and associated hardware, including the following:
.1 Shop fabrication.
.2 Delivery to the site.
.3 Installation on site including fit and trim.

1.3 RELATED SECTIONS

.1 Finish Carpentry Section 06 40 00
.2 Gypsum Board Systems Section 09 21 16
.3 Solid Surface Countertops 12 36 61
.4 Mechanical Division 22
.5 Electrical Division 26

1.4 REFERENCE STANDARDS

.1 ANSI-A135.4-1987; Hardboard.
.2 ANSI A208.1-1999; Particleboard, Mat-formed Wood.
.3 ANSI A208.2-2002; Medium Density Fiberboard.
.4 ANSI/BHMA-A156.9-2003; Cabinet Hardware.
.5 AWMAC / AWI Quality Standards for Architectural Woodwork 2003.
.6 National Lumber Grades Authority (NLGA) Standard Grading Rules for Canadian Lumber-1991.
.7 National Hardwood Lumber Association (NHLA) Rules for the Measurement and Inspection of Hardwood and Cypress January 1986.
.8 CAN3-A172-M79, High Pressure, Paper Base, Decorative Laminates.
.9 CSA O112.6/O112.7-M1977, Resorcinol Resin Adhesive.
.10 CAN/CGSB-71.19-M88 Adhesive, Contact, Sprayable.
.11 CAN/CGSB-71.20-M88 Adhesive, Contact, Brushable.
.12 CSA-B111-1974 (R1998); Wire Nails, Spikes and Staples.
.13 CAN/CSA-G164-M92 (R1998); Hot Dip Galvanizing of Irregularly Shaped Articles.
.14 CSA-O115-M1982 (R2001); Hardwood and Decorative Plywood.
.15 CSA-O112 Series-M1977 (R2001); CSA Standards for Wood Adhesives.
.16 CSA-O121-M1978 (R1998); Douglas Fir Plywood.
.17 CAN/CSA-O141-91 (R1999); Softwood Lumber.
.18 CSA-O151-M1978 (R1998); Canadian Softwood Plywood.
.19 ANSI/NEMA , LD 3-2005, High Pressure Decorative Laminate.

1.5 QUALITY ASSURANCE

.1 Fabricator
.1 Work of this section shall be performed by subcontractors having a minimum of 3 years documented experience in shop fabrication of architectural woodwork (millwork). Submit proof of experience to Consultant. Fabricators shall have sufficient equipment and personnel to complete the architectural woodwork (millwork) portion of this contract.

.2 Installation
.1 Work shall be performed in strict accordance with reviewed shop drawings, and in accordance with all warranty requirements.

.3 Pre-installation Meeting
- .1 Convene a pre-installation meeting for the work specified in this section. Attendees must include, as a minimum, representatives of the following:
- .2 Contractor (Site Superintendent & Project Manager),
- .3 Installation Subcontractor (Site Foreman & Project Manager),
- .4 Product Manufacturer and/or Distributor (Technical Representatives),
- .5 Related Subcontractors, and
- .6 Consultant.

1.6 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 01.

.2 Clearly indicate all materials, details of construction, profiles, jointing, fastening, installation schedule, colours and other related details.

.3 Details and sections must be minimum 1:10 scale.

1.7 MOCK-UP

.1 Shop-prepare one typical base cabinet unit, complete with all hardware and applied finishes and install on site at designated location for Consultant's review.

.2 If approved by the Consultant, the accepted unit will establish the base minimum for acceptable work.

.3 If rejected, remove mock-up unit and replace with unit acceptable to Consultant.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Protect finished surfaces against damage with heavy kraft paper over doors and countertops during and after delivery.

.2 If required, store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

.3 Do not deliver or install millwork until necessitated by coordination with work of other trades, or until area is sufficiently climate controlled so as not to expose millwork to damage from excessive changes in temperature or humidity.

1.9 SUSTAINABILITY REQUIREMENTS

.1 Recycled Content
- .1 Materials:
  - .1 Provide Product with minimum post-consumer recycled content plus ½ of the postindustrial recycled content equal to 7.5% of total value of materials.

.2 FSC Certified Wood
- .1 Materials:
  - .1 Provide Product that is made from wood based materials that are certified in accordance with Forrest Stewardship Council's principles.

.3 Low Emitting Adhesives and Sealants
- .1 Materials:
- .2 Comply with the requirements of Section 01 11 01 supplemented as follows:
- .3 Provide adhesives and sealants with VOC 01 11 01 content limits lower than stated in the state of California's South Coast Air Quality Management District (SCAQMD) rule #1168, current edition.

.4 Low Emitting Paints and Coatings
- .1 Materials:
  - .1 Comply with the requirements of Section 01 11 01 supplemented as follows:

.2 Provide paints with VOC and chemical component limits lower than stated in Green Seal's Standard GS-11, current edition.

.3 Provide anti-corrosive coatings with VOC and chemical component limits lower than stated in Green Seal's Standard GC-03, current edition.

.5 Low Emitting Wood and Laminate Adhesives

.1 Materials:

.1 Comply with the requirements of Section 01 11 01 supplemented as follows:

.2 Do not use composite wood and laminate adhesives containing added ureaformaldehyde.

1.10 SEQUENCING AND SCHEDULING

.1 Do not commence millwork installation until resilient flooring and carpet work has been completed in area to receive millwork.

1.11 GUARANTEE

.1 The millwork fabricator shall guarantee cabinetwork against warpage, opening of joints, shrinkage, and similar defects for a period of two (2) years from the Date of Substantial Completion.

1.12 EXTENDED WARRANTY

.1 The millwork fabricator shall supply from the manufacturers of the plastic laminate and the melamine panels standard written warranties against delamination or surface degradation under normal usage for a period of two (2) years from the Date of Substantial Completion.

2 PRODUCTS

2.1 SOURCE QUALITY CONTROL

.1 Millwork fabricator will supply to the Consultant, shipping labels and/or bills of lading for panel materials used in the work of this Section, for verification purposes.

2.2 MATERIALS

.1 Mat-Formed High density Wood Particleboard: to ANSI-A208.1, Grade M-2, minimum density 641 kg/m3.

.2 Medium Density Fibreboard: to ANSI-A208.2, Grade 130, density 769 kg/m3, thickness as indicated.

.3 Low VOC Plywood.

.4 Stainless Steel: 1.519mm thick, Type 304 stainless steel sheet with AISI No. 4 (satin) finish.

.5 High Pressure Laminated Plastic:

.1 Plastic Laminate (PLAM 1) : Tafisa, Meadows Cove L567, Origen, as supplied by Tafisa, contact www.tafisa.ca. Colour and Finish to be confirmed with Consultant.

.2 Flatwork: high-pressure laminate to CAN3-A172, Grade GP, 1.15mm thick; based on printed patterns range, with matte finish.

.3 Post-Forming Work: high-pressure laminate to CAN3-A172, Grade PF, 0.76mm thick; based on printed patterns range, with matte finish.

.4 Backing Sheet: high-pressure laminate supplied by same manufacturer as facing sheet: Grade BK, not less than 0.5mm thick and same thickness and colour as face laminate.

.5 Cabinet Liner: (PLAM 1) supplied by same manufacturer as facing sheet, ISO Grade CLS; Tafisa, Meadows Cove L567, Origen, as supplied by Tafisa, contact www.tafisa.ca. Colour and Finish to be confirmed with Consultant.

.6 Acceptable manufacturers are:
- .1 Tafisa
- .2 Wilsonart
- .3 Formica
- .4 Arborite
- .5 Nevamar
- .6 Pionite

.6 Edge Treatment (Unless noted otherwise on drawings)

.1 PVC Edging: Woodtape® 3mm thick solid polyvinyl chloride with a measured degree of hardness of 95 Shore D.

.2 Adhesive: Ethylene Vinylacetape Thermalset adhesive with a temperature resistance of not less than 100°C; a processing range of 190 to 200°C. Contact cement or other adhesive not acceptable.

.3 Application: Edging material shall be applied using only equipment designed for the application of thick PVC in accordance with the manufacturer's specifications. All edges are to be machined to a 3mm radius.

.4 Colour: colours to match face veneer as selected by Consultant from manufacturer’s standard range of colour.

.7 Vinyl Covered wire steel shelving as shown on drawings

.1 System includes shelving with end caps, adjustable wall pilasters, shelf brackets and coat rod, acceptable supplier ClosetMaid or approved equal. Colour: white.

2.3 COLOURS

.1 The Consultant will select colours from the ranges specified in the preceding paragraphs.

2.4 ADHESIVES

.1 Contact Adhesive: to CAN/CGSB-71.19 and CAN/CGSB-71.20.7
.2 Hot Melt Adhesive: of approved manufacturer.
.3 Resorcinol Adhesive: to CSA-O112.6 or O112.7.
.4 Sealer: water-resistant sealer or glue.

2.5 ACCESSORIES

.1 Draw Bolts: Industry standard, cadmium plated, self-tightening type for use in panel and countertop jointing.
.2 Nails and staples: to CSA-B111, plain finish.
.3 Wood screws: to CSA-B35.4, cadmium plated.
.4 Sealant: to Section 07900.
.5 Kitchen Sinks: Double bowl, stainless steel, drop-in, single hole.
.6 Kitchen Faucets: Single Lever Design, compatible with Moen 1225B faucet Cartridges; Chrome.

2.6 HARDWARE

.1 All cabinet hardware shall meet or exceed the requirements of ANSI/BHMA-A156.9.

.2 Acceptable Manufacturers
- .1 Haefele
- .2 Blum
- .3 Hettich
- .4 Grass
- .5 Salice
- .6 Roll-it

.7 Richelieu-Martin
.8 Knape & Vogt
.9 Mepla-Alfit Incorporated
10 Canadian Builders Hardware

.3 Drawer and Door Pulls: stainless steel, equivalent to 102mm CBH 220 “D” Pull.

.4 Hinges: shall be 170 degree opening, concealed type, incorporating a self-closing feature. Mounting to provide three-way adjustment in door alignment, with appropriate mounting plates equivalent to;

.1 Blum 170 BL91-653,

.2 Mepla-Alfit F65 Series, or

.3 Hettich Euromat 3955 Series,

.5 Door And Drawer Bumpers: self-adhesive pads for doors and drawers, positioned to contact the cabinet frame when door or drawer is closed; equivalent to Richelieu Martin #MP5312-11.

.6 Shelf Supports

.1 Pins: Stainless steel shelf pins adjustable on 32mm centres. Pre-drill gables with 6mm diameter holes vertically on 32mm centres.

.2 Standards: 20.6mm wide x 4.76mm deep x full height of cabinet, 1.06mm, zinc-coated steel; equivalent to #255ZC recessed#233ZC surface mounted, shelf standards by Knape & Vogt with #256ZC shelf supports.

.7 Drawer Slides: Steel ball bearing, full extension drawer slides for box application; minimum 34kg capacity.

.8 Cable Grommets: Black plastic, 2-part, minimum 45mm diameter size. Allow for 30.

2.7 FABRICATION

.1 All cabinets and cases shall be fabricated as self-contained modules. Exterior and interior surfaces shall be finished to allow for future relocation without the need for additional finishing.

.2 Make up the units in sections, which can be easily handled into and through the building to the final location without alteration or damage to the building, or fitments already in place.

.3 Shop-install cabinet hardware for doors, shelves and drawers.

.4 Provide site-measured cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.5 Countertop splices and joints shall be located a minimum of 305mm from any countertop opening. Coordinate with other trades to determine exact locations of fixtures.

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

.7 All exposed edges shall be finished with PVC edge band.

.8 Apply edge band to bottom of end gables where kick plate does not return.

.9 Factory-finish all casework and cabinetwork surfaces.

.10 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.11 Form shaped profiles and bends as indicated using postforming grade laminate, to laminate manufacturer's instructions.

.12 Apply laminate backing sheet to reverse side of core of plastic laminate flatwork.

.13 Cabinets:
.1 All Cabinets over 813 mm (2'-8") wide must have mullion installed adding a fifth support for the adjustable shelves.

.2 Front edges of gables and shelves must be PVC edge banded colour matched unless otherwise identified on the drawings.

.3 Cabinets must be assembled with dowels and bolts.

3 EXECUTION

3.1 GENERAL

.1 Examine the site and take all measurements necessary to ensure accurate and proper fitting of this work into the building and around all obstructions or projections already in place and/or shown on the drawings and to suit the locations of service piping, all as required to produce a neat, first class installation.

3.2 CABINETWORK INSTALLATION

.1 Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.

.2 Fasten and anchor millwork securely. Provide heavy-duty fixture attachments for wall-mounted cabinets.

.3 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects. Provide filler panels of same construction and finish as cabinets. Maximum size of fillers not to exceed 25mm. Maximum uniform joint between fillers and adjacent wall surface not to exceed 3mm.

.4 At junction of plastic laminate counter or backsplash and adjacent wall finish, apply small bead of clear sealant in accordance with Section 07900.

3.3 FASTENINGS

.1 Provide all fastenings, anchors, and accessories required for installation of this work.

.2 Keep exposed fastenings to a minimum; evenly spaced, and uniformly arranged.

.3 Supply adequate instructions and/or templates and if necessary supervise installation where fastening or accessories are required to be built into work of other trades.

3.4 HARDWARE INSTALLATION

.1 Supply and install all finish hardware required for cabinetwork, except for keyed locksets supplied by Section 08 80 50.

.2 Neatly mortise and fit finishing hardware. Cut mortises straight and sharp without ragged edges and sized accurately to accommodate hardware. Where mortising and application has not been done in a first class manner, such work must be replaced.

.3 Schedule

.1 Hinges: minimum two (2) per door panel, three (3) where doors exceed 1200mm in height.

.2 Pulls: One (1) for each door and drawer.

.3 Door and Drawer Bumpers: minimum two (2) per panel.

.4 Cabinet Locks: As shown on the drawings. Where locked panel is one of a pair, install interior

top and bottom surface bolts to opposite panel.

.5 Allow for drilling tops and installing plastic grommets. Locations to be determined on site by the Consultant.

3.5 PROTECTION

.1 Cover finished surfaces with heavy kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide rigid board insulation.

1.3 RELATED SECTIONS

.1 Sheet Vapour Retarders Section 07 26 00

.2 Air Barriers Section 07 27 00

.3 Batt and Blanket Insulation Section 07 21 16

.5 Insulation in Window Systems Section 08 50 50

.6 Gypsum Board Assemblies Section 09 21 16

.7 Insulation for Mechanical Work Division 21, 22, 23 & 25

1.4 REFERENCES

.1 ASTM International
- .1 ASTM C 208-[12], Standard Specification for Cellulosic Fiber Insulating Board.
- .2 ASTM C 591-[13], Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- .3 ASTM C 612-[14], Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
- .4 ASTM C 726-[12], Standard Specification for Mineral Fiber Roof Insulation Board.
- .5 ASTM C 728-[13], Standard Specification for Perlite Thermal Insulation Board.
- .6 ASTM C 1126-[14], Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
- .7 ASTM C 1289-[14], Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .8 ASTM E 96/E 96M-[13], Standard Test Methods for Water Vapour Transmission of Materials.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 71-GP-24M-AMEND-[77(R1983)], Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.

.3 CSA Group (CSA)
- .1 CSA B149 PACKAGE-[10], Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS).

.5 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S604-[2012], Standard for Factory-Built Type A Chimneys.

.2 CAN/ULC-S701-[11], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
.3 CAN/ULC-S702-[2012], Standard for Mineral Fibre Insulation for Buildings.
.4 CAN/ULC-S704-[11], Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.5 SUBMITTALS

.1 Samples: Submit samples of insulation furring system channels, fasteners and accessories, in accordance with Section 01 33 01.

.2 Product Data: Submit manufacturer's printed product literature, MSDS sheets, and application instructions for insulation materials in accordance with Section 01 33 01.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to the site in their original unopened packages, bearing all manufacturer's labels.

.2 Protect packages from damage, and materials from effects of weathering.

PART 2 – PRODUCTS

2.1 INSULATION

.1 General Application: extruded closed-cell polystyrene, to CAN/ULC-S701 Type 4, square edges, thickness as shown on the drawings.

.2 Foundation Insulation Application:

.1 Polystyrene: extruded closed-cell polystyrene to CAN/ULC-S701, Type 4, square edges, with integral grooved drainage system, thickness as shown on the drawings;
.1 Board size: 610mm x 2440mm.
.2 Compressive strength: 210kPa.
.4 Vapour Permeance: 60ng/Pa s m2 maximum.
.5 Dimensional stability: 1.5% maximum linear change at 70°C and 97% relative humidity for 7 days.
.6 Curing Time: minimum 24 hours, plus 24 hours per 25mm of thickness before shipment from manufacturer.
.7 Long Term Thermal Resistance (LTTR)
.1 RSI 0.87 for 25mm thickness of board.
.2 RSI 1.84 for 50mm thickness of board.
.3 RSI 2.81 for 75mm thickness of board.
.8 Acceptable Products;
.1 Perimate XPS Foam Insulation by Dupont
.2 Foamular C-300 by Owens Corning Canada.

.2 Exterior Crawl Space Insulation Application:

.1 IKO Enerfoil Sheathing Wall Insulation produced according to the requirements of CAN/ULC S704 for Type 1, Class 1 materials, and ASTM C1289 Type I, Class 1. EnerFoil Insulation as listed with CCMC under report number 13188-L, thickness as shown on the drawings;
.1 Board size: 610mm x 2440mm.

2.2 ADHESIVES

.1 Adhesive: Type recommended by insulation manufacturer for application.

PART 3 – EXECUTION

3.1 QUALITY OF WORK

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tightly around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75mm from heat emitting devices such as recessed light fixtures.

.5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.

.6 Offset both vertical and horizontal joints in multiple layer applications.

.7 Do not enclose insulation until it has been inspected and approved by Consultant.

3.2 EXAMINATION

.1 Examine substrates and immediately inform Consultant in writing of defects.

.2 Prior to commencement of work ensure substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 INSTALLATION

.1 General Application

.1 Apply adhesive to substrate by notched trowel in accordance with manufacturer's instructions.
.2 Embed insulation boards into adhesive, prior to skinning of adhesive.
.3 In addition to adhesive. Install mineral fibre insulation boards with insulation clips, 4-6 per board minimum, fit boards tight, cut off fastener spindle 3mm beyond disc.
.4 Leave unbonded joints in insulation board over line of expansion and control joints.

.2 Perimeter Foundation Insulation

.1 Exterior application: extend boards vertically below finish grade down to top of footings. Install on exterior face of perimeter foundation wall with adhesive.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide batt and blanket insulation.

1.3 RELATED SECTIONS

.1 Section 07 21 13 Board Insulation
.2 Section 07 26 00 Sheet Vapour Retarders
.3 Section 07 27 00 Air Barriers
.5 Insulation for Mechanical Divisions 21, 22, 23, & 25

1.4 REFERENCES

.1 ASTM International
  .1 ASTM C 553-[13], Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
  .2 ASTM C 665-[12], Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  .3 ASTM C 1320-[10], Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 CSA Group (CSA)
  .1 CSA B111-[1974(R2003)], Wire Nails, Spikes and Staples.
  .2 CSA B149 PACKAGE-[10], Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.

.3 Underwriters Laboratories of Canada (ULC)
  .1 **CAN/ULC-S604-[2012]**, Standard for Factory-Built Type A Chimneys.
  .2 **CAN/ULC-S702-[2012]**, Standard for Mineral Fibre Insulation for Buildings.

PART 2 – PRODUCTS

2.1 INSULATION

.1 Batt and Blanket Insulation: mineral fibre processed from rock, slag, or glass, to CAN/ULC-S702, Type 1. Thicknesses as shown on the drawings;
  .1 Comfortbatt by Rockwool.
  .2 Thermafiber Rainbarrier by Owens Corning Canada.
  .3 Cladstone by Johns Manville.

.2 Fire Blanket Insulation: mineral fibre processed from rock, slag, or glass, to CAN/ULC-S702 Type 1, non-combustible to CAN/ULC-S114, thickness as shown on the drawings;
  .1 Thermafiber UltraBatt by Owens Corning Canada.

.2 ComfortBatt by Rockwool.

.3 Sound Attenuation Blanket Insulation: to CAN/ULC-S702, Type 1, thickness as shown on the drawings;
.1 Thermafiber SAFB by Owens Corning Canada.
.2 Safe N Sound by Rockwool.
.3 Sound & Fire Block by Johns Manville.

2.2 ACCESSORIES

.1 Batt and Blanket Insulation Restraint Membrane: Variable-permeance air/vapour barrier membrane stapled to wall frame elements to retain cellulosic insulation injected into each wall cavity.
.1 Specified product: SOPRASEAL HVM membrane by SOPREMA

PART 3 – EXECUTION

3.1 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames, and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Keep insulation minimum 75mm away from heat emitting devices such as recessed light fixtures.

.5 Do not enclose or build over insulation until it has been inspected and approved by Consultant.

.6 Install Sound Attenuation insulation in non-fire-rated wall assemblies, as shown on the drawings.

.7 Install Fire Blanket/Sound Attenuation insulation in all fire-rated wall and ceiling assemblies, where indicated as having fire resistance ratings on the drawings.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide all spray-inplace foam insulation.

1.3 RELATED SECTIONS

.1 Sheet Vapour Retarders Section 07 26 00

.2 Mechanical Divisions 21, 22, 23 & 25

.3 Electrical Divisions 26, 27 & 28

1.4 REFERENCES

.1 ASTM International (ASTM)
- .1 ASTM C 1029-[15]. Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.

.2 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-[10**]**, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S127-[14]. Standard Corner Wall Method of Test for Flammability Characteristics on Non-Melting Foam Plastic Building Materials.
- .3 CAN/ULC-S705.1-[15], Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification. Includes Amendment 1.2.
- .4 CAN/ULC-S705.2-[2005-R2016**]**, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.5 QUALITY ASSURANCE

.1 Applicator Qualifications
- .1 Work of this section shall be performed by applicators having a minimum of 2 years documented experience in the installation of spray-in-place foam insulation. Submit proof of experience to Consultant.

.2 Installation
- .1 Work shall be performed in strict accordance with manufacturer's printed instructions, and in accordance with all warranty requirements.

.3 Pre-installation Meeting
- .1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
  - .1 Contractor (Site Superintendent & Project Manager)
  - .2 Installation Subcontractor (Site Foreman & Project Manager)
  - .3 Product Manufacturer and/or Distributor (Technical Representatives)
  - .4 Related Subcontractors (ie. Mechanical and/or Electrical)
  - .5 Consultant

1.6 SUBMITTALS

.1 Samples: Submit samples of insulation furring system channels, fasteners and accessories, in accordance with Section 01 33 01.

.2 Product Data: Submit manufacturer's printed product literature, MSDS sheets, and application instructions for insulation materials in accordance with Section 01 33 01.

.3 Installation Data: Indicate special environmental conditions and manufacturer’s special installation requirements.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Materials shall be delivered to jobsite in original and clearly marked containers with manufacturer's labels and seals intact.

.2 Store solvent base liquids away from excessive heat and open flame, at above freezing temperatures, and free from contact with cold or frozen surfaces.

.3 Do not double stack pallets of materials. Provide cover and adequate ventilation.

1.8 TEST RESULTS

.1 Submit copies of all performance test results, as performed by an independent testing laboratory, in accordance with Section 01 33 01.

1.9 MOCK-UP

.1 Construct mock-up of 10m2 minimum, of spray-in-place foam insulation including one inside corner and one outside corner. Mock-up may be part of finished work.

.2 Allow 24 hours for inspection of mock-up by Consultant before proceeding with insulation work.

1.10 ENVIRONMENTAL REQUIREMENTS

.1 Provide protection and environmental controls in accordance with CAN/ULC-S705.2.

.2 Ventilate areas to receive insulation, in accordance with Section 01 57 01, by introducing fresh air and exhausting air continuously during, and for 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.

.3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.4 Protect workers as recommended by insulation manufacturer. Applicator must wear appropriate breathing apparatus, safety goggles, and other protective clothing and equipment.

.5 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.6 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

.7 Dispose of waste foam daily in location designated by Consultant and decontaminate empty drums in accordance with foam manufacturer's instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Insulation: spray-applied rigid polyurethane foam to CAN/ULC-S705.1;
- .1 Compressive strength: 174kPa,
- .2 Flame spread rating: less than 500 to CAN/ULC-S102,
- .3 Air leakage of less than 0.02 L/s/m2 at 75Pa to CAN/ULC-S705.1, for 25mm thickness of board,
- .4 Water Vapour Permeance: 86.6 ng/Pa.s.m2, and
- .5 Long Term Thermal Resistance (LTTR) of minimum;
  - .1 1.05m2 °C/W for 25mm thickness of board.
- .6 Acceptable Products;
  - .1 Walltite CM01 by BASF Canada Inc.
  - .2 Heatlok Soya HFO by Demilec.
  - .3 Insulthane Extreme by Elastochem.

.2 Primers: in accordance with manufacturers recommendations for surface conditions.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verify that all surfaces to receive spray-in-place insulation are clean and free of all frost, oil, rust, or deleterious materials.

.2 Verify that all environmental conditions required for successful application of materials, can be met.

.3 Report in writing, any defects in surfaces or conditions which may adversely affect the installation or performance of the products provided under this section.

3.2 PREPARATION

.1 Mask all adjacent surfaces not to receive spray-in-place insulation which may be damaged or stained by insulation installation.

.2 Apply primers where recommended by insulation manufacturer.

3.3 APPLICATION

.1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions.

.2 Apply insulation in consecutive passes to thickness scheduled herein.

.3 Finished surface of foam insulation shall be free of voids and imbedded foreign objects.

.4 Finished installation shall be inspected and approved by Consultant prior to concealment.

3.4 TOLERANCES

.1 Maximum variation from specified thicknesses shall not exceed 6mm. Re-apply where cured material does not meet specified thickness or tolerance.

3.5 SCHEDULE

LOCATION	CURED THICKNESS
Around mechanical and electrical rough-ins at exterior walls	Fill voids full depth of wall
Exterior metal door frames	Fill voids
Voids between wall surfaces, and surfaces of exterior	Fill voids

door and window frames at heads, jambs, and sills	
Around exterior steel columns and beams as indicated on drawings	50mm minimum

END OF SECTION

PART ONE - GENERAL REQUIREMENTS

1.1 DESCRIPTION

.1 Provide the labour, materials and equipment necessary to complete the installation of cellulose fibre thermal insulation and its accessories as specified on the drawings.

1.2 PERFORMANCE REQUIREMENTS

.1 Provide cellulose fibre thermal insulation that complies with the requirements of standard CAN/ULC-S703.

.2 Provide continuity of insulation materials and assemblies in conjunction with materials described in related sections.

1.3 REFERENCES

.1 CAN/ULC-S703: Standard for Cellulose Fibre Insulation for Buildings.

.2 CAN/ULC-S102.2: Standard Method of Test for Surface Burning Characteristics of Flooring, Floor, Coverings, and Miscellaneous Materials and Assemblies.

1.4 RELATED WORK

.1 Division [01 00 00] [General Requirements]

.2 Division [01 33 00] [Submittals Procedure]

.3 Division [05 50 00] [Metal fabrications]

.4 Division [06 10 00] [Rough Carpentry]

.5 Division [06 17 53] [Shop- Fabricated wood trusses]

.6 Division [07 21 00] [Thermal Insulation]

.7 Division [09 29 00] [Gypsum Board]

1.5 SUBMITTALS

.1 Submit up-to-date technical data sheets from the manufacturer and related documentation for the insulation used.

.2 Submit samples of the insulation material specified in Section 01 33 00- Documents/ Samples to be submitted.

.3 Submit shop drawings in accordance with Section 01 33 00- Documents/ Samples to be submitted. The shop drawings shall contain a description of the materials.

.4 Provide CCMC Evaluation Report and the manufacturer’s documentation confirming material has been evaluated and conforms to the requirements of CAN/ULC S703 Material Standard.

.5 When cellulose is a material designated as insulation in the building component, submit documentation to confirm the material meets the requirements of the local building code.

1.6 CONTRACTOR QUALIFICATIONS

.1 The work described in this section shall be performed by an experimented installer with at least two years experience and trained and TRUFILL METHOD certified installer for the installation of products, systems and assemblies of this section.

.2 Installation shall comply with the manufacturer's installation instructions.

1.7 MANUFACTURER'S REPRESENTATIVE

.1 The contractor shall at all times permit and facilitate jobsite access to any representative of the insulation manufacturer.

1.8 MATERIALS STORAGE

.1 Materials shall be delivered in original packaging with the manufacturer's information and the Material Safety Data Sheet.

.2 Handle materials with proper equipment.

.3 Store materials in its original packaging, protected from direct sunlight, moisture and deterioration.

1.9 QUALITY ASSURANCE AND ENVIRONMENTAL MANAGEMENT

.1 Supply thermal cellulose insulation and accessories from one manufacturer to ensure total system compatibility and integrity.

.2 Manufacturing facilities of thermal cellulose insulation products to be ISO certified.

1.10 WARRANTIES

.1 The product manufacturer shall issue a written and signed document in the name of the owner, certifying the product will meet all the physical characteristic published by the manufacturer, for a period of 5 years, starting from the date of completion of installation of insulation. No letter amending the manufacturer's standard warranty will be accepted and the warranty certificate must reflect these requirements.

2 PRODUCTS

2.1 BASIS OF DESIGN:

.1 SOPREMA CANADA INC Drummondville, QC, J2C 8E9 Web site: www.soprema.ca

.2 Acceptable alternative manufactures:

.1 Climatizer

,2 Igloo Cellulose

.3 GreenFiber

2.2 CELLULOSE FIBRES INSULATION

.1 Insulation is made of more than 80% recycled paper and cardboard, odourless and low VOC content, used to reduce the transmission of heat and sound in walls, floors and attics.

.2 Properties:

.1	Colour:	Grey
.2	Thermal resistance:	RSI = 0.65 per 25.4 mm (R = 3.7 per inch)
.3	Flame spread rating: (CAN/ULC-S102.2)	< 150
.4	Smoke developed classification	< 45
.5	Open-flammability (W/cm²):	≥ 0.12
.6	Open-flammability permanency (W/cm²):	≥ 0.12

.7	Smoulder resistance (% of mass loss):	≤ 15
.8	Moisture vapour sorption (% of mass gain):	≤ 20
.9	Separation of chemicals (% of mass):	≤ 1.5
.10	Fungi resistance:	No growth

.3 Specified product: SOPRA-CELLULOSE by SOPREMA.

2.3 ACCESSORIES MATERIALS

.1 RULER

.1 Ruler to control and verify the thickness of cellulose fiber insulation in the attic.

.2 Specified product: SOPRA-CELLULOSE RULER by SOPREMA

.2 SELF-ADHESIVE PATCH FOR RESTRAINT MEMBRANE

.1 Self-adhesive patch which closes the injection holes in the restraint membrane after cellulose fibre insulation has been applied in the walls, the floors and the ceilings.

.2 Specified product: SOPRA-CELLULOSE PATCH by SOPREMA.

.3 RESTRAINT MEMBRANE

.1 Variable-permeance air/vapour barrier membrane stapled to wall frame elements to retain cellulosic insulation injected into each wall cavity.

.2 Specified product: SOPRASEAL HVM membrane by SOPREMA.

3 EXECUTION

3.1 EXAMINATION AND PREPARATION OF SURFACES

.1 Make sure that the area is well ventilated before installing the insulation.

.2 Check that there is no obstruction of the void space within the walls before installing the insulation.

.3 Check that the joints of the support panels attached to the uprights are perfectly butted together before installing the insulation.

3.2 INSTALLATION OF THE INSULATION IN THE ATTIC

.1 Secure aeration vents between the roof trusses before placing the insulation. Leave at least 1 1/2" (38 mm) space for air circulation in the ventilated roof between the vents and the roof deck.

.2 Secure the truss rulers with the numbering facing the access hatch. The bottom of the ruler must be installed at the same level as the bottom of the insulation. Use one ruler every 20 m² (200 ft²).

.3 Install the insulation by pneumatic blowing in the roof space between the roof joists in order to obtain a layer of insulation with regular density and thickness in accordance with the manufacturer's attic coverage chart.

.4 Leave clearance between the top of the insulation and the underside of the roof deck in accordance with the National Building Code of Canada in force.

.5 Stop the insulation at least 75 mm (3") from any heat-emitting elements and chimneys.

.6 Attach the attic coverage chart prepared by Soprema on a roof truss next to the access hatch, duly signed by the person in charge of the thermal insulation work. Provide an identical copy to the property owner. The installer also keeps a copy in his records, as required but the SOPREMA certification program.

3.3 INSTALLATION OF THE INSULATION IN WALLS (TRUFILL METHOD)

.1 Supply and install the HVM restraint membrane or the polyethylene (minimum 6 mil) restraint membrane on the studs with cardboard strips and staples. The membrane must be installed free of all wrinkles.

.2 Make an opening in the restraint membrane at about two-thirds of the height of the wall.

.3 Inject the dry insulation in the wall between the studs using a preapproved nozzle and obtain the minimal density recommended:

56 kg / m³ (3.5 lb / ft³) for structures of 150 mm (6 inches) and less

64 kg / m³ (4 lb / ft³) for structures greater than 150 mm (6 inches)

.4 Validate density according to TRUFILL method using the density cylinder set.

.5 Finish by installing the self-adhesive patch for restraint membrane to close the opening.

.6 Note the number of bags used on the "SOPRA-CELLULOSE: Coverage Chart for Walls" document. Provide a signed copy to the property owner. The installer also keeps a copy in his records, as required by the TRUFILL certification program by SOPREMA.

3.4 INSTALLATION OF THE INSULATION IN WALLS (BENO-MAT METHOD)

.1 Supply and install the BENO-MAT restraint membrane on the studs with cardboard strips and staples. The membrane must be installed free of all wrinkles.

.2 Make an opening in the restraint membrane at about two-thirds of the height of the wall.

.3 Inject the dry insulation in the wall between the studs and obtain the minimal density recommended:

56 kg / m³ (3.5 lb / ft³) for structures of 150 mm (6 inches) and less

64 kg / m³ (4 lb / ft³) for structures greater than 150 mm (6 inches)

.4 Validate density according by verifying the number of bags.

.5 Note the number of bags used on the “SOPRA-CELLULOSE: Coverage Chart for Walls” document. Provide a signed copy to the property owner. The installer also keeps a copy in his records, as required by the TRUFILL certification program by SOPREMA.

3.5 INSTALLATION OF THE INSULATION IN FLOORS/ CEILINGS

.1 Supply and install a restraint membrane on the floor or ceiling joists with staples. The membrane must be installed free of all wrinkles.

.2 Install resilient furring strips or bars every 406 mm (16”) o.c. on the restraint membrane.

.3 Make an opening in the restraint membrane and inject the dry insulation between the floor or ceiling joists using a preapproved TRUFILL insulating needle to obtain the density recommended: between 28.8 kg/m³ (1.8 lb / ft³) and 48 kg/m³ (3.0 lb / ft³).

.4 When continuity of the vapour barrier is required, finish by installing the self-adhesive patch for the restraint membrane on the opening of the restraint membrane.

3.6 PROTECTION AND CLEANING

.1 Protect all the other parts of the work during performance of the job.

.2 Repair all damaged parts of the work to the architect’s satisfaction.

.3 When the insulation work is finished, remove all surplus insulation material and waste from the site.

- END OF SECTION -

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide sheet vapour retarders for the following applications:
- .1 Under Concrete Slab-on-grade.

1.3 RELATED SECTIONS

.1 Section 31 23 10 Excavation and Fill

.2 Section 03 30 00 Cast-in-place Concrete

.3 Section 07 27 00 Air Barriers

1.4 REFERENCES

.1 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-51.33-[M89], Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .2 CAN/CGSB-51.34-[M86], Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

.1 .American Society for Testing Materials

- .1 ASTM D1709 - 09 Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method. Project Name / 12/20/2022 07 26 16-2 Below-Grade Vapor Retarders
- .2 ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
- .3 ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs.
- .4 ASTM E1643 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .5 ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
- .6 ASTM F1249-01 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

1.5 JOB MOCK-UP

.1 Construct mock-up of sheet vapour retarder installation including one lap joint one inside corner and at one electrical box.

.2 Notify Consultant when mock-up is complete and allow sufficient time for inspection before proceeding with this work.

.3 If accepted without revision, mock-up will demonstrate minimum standard for this work, and may form part of the finished Work. If rejected, mock-up must be removed, re-built, and re-inspected until approved.

PART 2 – PRODUCTS

2.1 SHEET VAPOUR RETARDER

.1 Underslab Application: Polyethylene film, PERMINATOR™ by W.R. Meadows of Canada, 15mil thick.

.2 Acceptable alternatives:
- .1 Stego Wrap, Stego Industries, 15mil thick.
- ,2 Florprufe 120, GCP Applied Technologies.

2.2 ACCESSORIES

.1 Joint Sealing Tape:
- .1 For Underslab Applications: PERMINATOR™ TAPE by W.R. Meadows of Canada, 100mm wide for lap joints and perimeter seals, 50mm elsewhere.
- .2 As per acceptable alternatives sheet vapour retarder manufacturer's own products.

.2 Pipe Collars
- .1 Construct pipe collars from vapour retarder material and pressure sensitive tape per manufacturer's instructions.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Ensure mechanical and electrical services to be concealed within building envelope, are installed and inspected prior to installation of vapour retarder.

.2 Ensure base course for concrete slab-on-grade is placed and compacted.

3.2 INSTALLATION

.1 Underslab Application
- .1 Install sheet vapour retarder over compacted base prior to installation of concrete to form continuous barrier.
- .2 Lap sheets minimum 100mm and seal continuously with tape.

.2 Surface Openings
- .1 Cut sheet vapour retarder to form around openings and irregular objects and ensure material is lapped and sealed.

.3 Perimeter Seals
- .1 Seal perimeter of sheet vapour retarder as follows:
  - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
  - .2 Lap sheet over sealant and press into sealant bead.
  - .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

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

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide complete air/vapour barrier membrane, including the following:
- .1 Preparation of substrates for installation of membrane,
- .2 Installation of membrane, and
- .3 Installation of all periphery detailing around all interruptions in, penetrations through, and terminations of membrane.

1.3 RELATED SECTIONS

.1 Section 04 21 13 Masonry Restoration

.2 Section 04 22 00 Concrete Unit Masonry

.3 Section 07 26 00 Sheet Vapour Retarders

.4 Section 07 21 13 Board Insulation

1.4 REFERENCE STANDARDS

.1 ASTM C920-01; Standard Specification for Elastomeric Joint Sealants.
.2 ASTM D412-98a; Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
.3 ASTM D882-00; Test Methods for Tensile Properties of Thin Plastic Sheeting.
.4 ASTM E96-00; Test Methods for Water Vapor Transmission of Materials.
.5 ASTM E283-91(1999); Test Method for Determining the Rate of Air Leakage Through Exterior Windows Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen.
.6 ASTM E1677-95; Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.

1.5 QUALITY ASSURANCE

.1 Applicator Qualifications
- .1 Work of this section shall be performed by applicators having a minimum of 2 years documented experience in the installation of air barriers. Submit proof of experience to Consultant.

.2 Installation
- .1 Work shall be performed in strict accordance with manufacturer's printed instructions, and in accordance with all warranty requirements.

.3 Pre-installation Meeting
- .1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
  - .1 Contractor (Site Superintendent & Project Manager),
  - .2 Installation Subcontractor (Site Foreman & Project Manager),
  - .3 Product Manufacturer and/or Distributor (Technical Representatives),
  - .4 Related Subcontractors (ie. Mechanical and/or Electrical), and
  - .5 Consultant.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver all products to the site in manufacturer's original unopened packages with all labels intact.

.2 Store materials in such a manner so as to protect them from precipitation, ground moisture, and temperature extremes. Raised platforms, waterproof coverings or interior storage shall be employed when and where necessary.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.

.2 Maintain temperature and humidity recommended by materials manufacturers before, during and after installation.

.3 Concrete block substrates shall be cured for a minimum of seven (7) days prior to application of air/vapour barrier products. Concrete substrates shall be cured for a minimum of fourteen (14) days prior to application of air/vapour barrier products. All substrates shall be allowed to dry a minimum of 24 hours following any precipitation.

1.8 COORDINATION

.1 Coordinate work of this Section with all related Sections.

.2 Sequence work to permit installation of materials in conjunction with related air/vapour seals.

.3 Schedule work such that insulation or building veneer installation follows as closely as possible the installation of the air barrier system so as to minimize exposure.

1.9 EXTENDED WARRANTY

.1 Provide a three (3) year extended system warranty against defects in manufacturer's materials or defective installation. Warranty shall include coverage of installed materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion/cohesion, or do not cure.

PART 2 – PRODUCTS

2.1 SELF-ADHESIVE SHEET AIR/VAPOUR BARRIER MEMBRANE

.1 Membrane: 1.02mm composite sheet of rubberized asphalt integrally bonded to high density polyethylene film. Use low temperature (LT) versions where ambient temperatures are below 10°C;
- .1 Blueskin SA by Henry.
- .2 Air Shield, by W.R. Meadows of Canada.
- .3 Sopraseal Stick 1100T, by Soprema.

.2 Transition Membrane: primer and membrane as recommended by AVB product manufacturer.

.3 Primer: Rubber-based, dispersed in solvent, designed for use at min. ambient temperature of -10°C.

.4 Mastic: Single component rubber-based mastic.

PART 3 – EXECUTION

3.1 GENERAL

.1 Examine all substrates to receive air barrier system, to ensure they are suitable for installation to commence. Report any unsatisfactory conditions in writing to the Contractor prior to commencement of the installation.

.2 Surfaces shall be clean, dry, continuous and be free of voids, excessive gaps and foreign matter that would impair the adhesion or regularity of the air barrier installation.

.3 Tape joints in sheathing boards, and fill cracks in masonry or concrete with mastic.

.4 Have Consultant inspect air barrier installation immediately upon completion. Deficiencies must be corrected immediately. Replace any torn sheet membranes, and touch up any liquid-applied membranes.

3.2 PREPARATION

.1 Clean and prime substrate surfaces to receive air barrier in accordance with manufacturer's instructions.

3.3 SELF-ADHESIVE SHEET AIR BARRIER MEMBRANE INSTALLATION

.1 Apply sheet membrane horizontally to the primed substrate between the projecting masonry reinforcing, beginning at the base of the wall.

.2 Each length shall be installed such that its upper edge runs along the underside of the reinforcing. Subsequent sheets shall overlap by a minimum of 50mm. Cut and seal around reinforcing with mastic.

.3 End laps shall be a minimum of 50mm.

.4 The membrane shall be pressed firmly into place by means of a hand roller.

.5 Fit membrane tightly around all penetrations and seal with mastic.

.6 Cut, lap and seal flashing and transition strips where required. Where flashing strips pass through outer veneer to exterior of wall, cut back membrane 25mm from outside face of wall to prevent contact with building sealants.

END OF SECTION

Part 1 GENERAL

1.1 SUMMARY

.1 Work of this section includes installing 2-ply Modified Bitumen membrane, including but not limited to the following:

- .1 Mechanically fastened deck covering boards
- .2 Self-adhesive vapour retarder.
- .3 Base layer of insulation boards mechanically fastened
- .4 Top later of insulation boards in adhesive.
- .5 Tapered insulation in adhesive
- .6 Composite board of overlay board and base sheet in adhesive.
- .7 Self-adhesive Base Sheet Flashing
- .8 Self-adhesive Cap and Cap Sheet Flashing

1.2 NOTES

.1 All conditions of the Contract apply to the work of this Section.

.2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Trades which affect the quality or dimensions of this Contractor's work. Commencement of this Contractor's work shall imply complete acceptance of all work by other Trades.

1.3 RELATED REQUIREMENTS

.1 Comply with Division One as applicable.
.2 Section 06 10 00 – Rough Carpentry.
.3 Section 07 27 00 – Air Barriers.
.4 Section 07 21 13 – Board Insulation.
.5 Section 07 61 00 – Vegetative Roof Assembly
.5 Section 07 84 00 – Fire Stopping.
.6 Section 07 92 00 – Joint Sealants.
.7 Division 22 – Plumbing as applicable.

1.4 REFERENCES

.1 ASTM International Inc.

- .1 ASTM C 726-05, Standard Specification for Mineral Fiber Roof Insulation Board.
- .2 ASTM C 728-05, Standard Specification for Perlite Thermal Insulation Board.
- .3 ASTM C 1177/C 1177M-06, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .4 ASTM C 1396/C 1396M-06a, Standard Specification for Gypsum Board.
- .5 ASTM D 41-05, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- .6 ASTM D 312-00(2006), Standard Specification for Asphalt Used in Roofing.
- .7 ASTM D 448-03a, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
- .8 ASTM D 2178-04, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
- .9 ASTM D 6162-00a, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
- .10 ASTM D 6163-00e1, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.

.11 ASTM D 6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
.12 ASTM D 6222-02e1, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcement.
.13 ASTM D 6223-02e1, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcement.
.14 ASTM D 6509-00, Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcement.

.2 Canadian General Standards Board (CGSB)

.1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
.2 CGSB 37-GP-56M-80b(A1985), Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
.3 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.

.3 Canadian Roofing Contractors Association (CRCA)

.1 CRCA Roofing Specifications Manual-[1997].

.4 Canadian Standards Association (CSA International)

.1 CSA A123.21-04, Standard Test Method for the Dynamic Wind Uplift Resistance of Mechanically Attached Membrane-Roofing Systems
.2 CSA-A123.3-05, Asphalt Saturated Organic Roofing Felt.
.3 CSA-A123.4-04, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
.4 CSA A231.1-06, Precast Concrete Paving Slabs.
.5 CSA O121-08, Douglas Fir Plywood.
.6 CSA O151-04, Canadian Softwood Plywood.

.5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 Underwriters Laboratories' of Canada (ULC)

.1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.2 CAN/ULC-S702.2-03, Standard for Mineral Fibre Thermal Insulation for Buildings.
.3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
.4 CAN/ULC-S706-02, Standard for Wood Fibre Thermal Insulation for Buildings.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one week prior to beginning waterproofing Work, with roofing contractor's representative, Contractor, Owner and Consultant.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:
- .1 Provide two copies of most recent technical roofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide two copies of WHMIS MSDS.

.3 Provide shop drawings:
- .1 Indicate number of built-up roof layers, sheets direction, thickness and type of insulation, type of vapour barrier, roof curbs details, control joint details, and coping / parapet details.
- .2 Provide layout for tapered insulation.

.4 Samples: submit two (2) sample roofing membrane sheets, walkways and insulation.

.5 Manufacturer's Certificate: certify that products meet or exceed specified requirements.

.6 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens and roofing felts and membrane with specification requirements.

.7 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.

.8 Manufacturer's field report: in accordance with Section 01 45 01 – Quality Control. .9 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

1.7 QUALITY ASSURANCE

.1 Installer qualifications: company or person specializing in application of modified bituminous roofing systems with 5 years documented experience approved by manufacturer.

1.8 FIRE PROTECTION

.1 Fire Extinguishers:

- .1 Maintain one stored pressure rechargeable type with hose and shut-off nozzle,
- .2 ULC labelled for A, B and C class protection.
- .3 Size 4.5 kg on roof per torch applicator, within 6 m of torch applicator.

.2 Maintain fire watch for 1 hour after each day's roofing operations cease.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 – Common Product Requirements.

.2 Storage and Handling Requirements:
- .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
- .2 Provide and maintain dry, off-ground weatherproof storage.
- .3 Store rolls of felt and membrane in upright position. Store membrane rolls with salvage edge up.
- .4 Remove only in quantities required for same day use.
- .5 Place plywood runways over completed Work to enable movement of material and other traffic.
- .6 Store sealants at +5 degrees C minimum.
- .7 Store insulation protected from daylight and weather and deleterious materials.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates paddling and packaging materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .2 Fold up metal banding, flatten and place in designated area for recycling.

1.10 SITE CONDITIONS

.1 Ambient Conditions:
- .1 Do not install roofing when temperature remains below -18 degrees C for torch application, or to manufacturers' recommendations for mop application. Minimum temperature for solvent-based adhesive is -5 degrees C.
- .2 Install roofing on dry deck, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into roofing system.

1.11 WARRANTY

.1 Provide a total system [10 year] written warranty stating that the Membrane Manufacturer will repair at its own expense any actual leaks in the roofing membrane or supplied materials resulting from defects in the manufacture of the roofing membrane or from faulty quality of work of the Roofing Membrane Manufacturer's Registered Contractor for a period of [10 years] from the date of the Final Inspection Report.

.2 Provide contractor's workmanship warranty valid for a period of two (2) years.

1.12 PERFORMANCE CRITERIA

.1 Compatibility between components of roofing system is essential. Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.

.2 Roofing System: to CSA A123.21 for wind uplift resistance.

Part 2 PRODUCTS

2 Specification based on Soprema. Acceptable materials by Johns Manville, Henry, IKO, and Garland would be accepted provided they meet the specification's requirements.

2.1 DECK COVERING

.1 Multi-ply, semi-rigid asphaltic roofing substrate board composed of a mineral fortified asphaltic core formed between two asphaltic saturated fibreglass liners. Length 1200 mm x width 1500 x thickness 6.4 mm.

.2 Specified product: SOPRABOARD by SOPREMA or approved equivalent

2.2 VAPOUR RETARDER

.1 Self-adhesive air/vapour barrier membranes composed of bitumen modified with thermoplastic polymers and high-density polyethylene film. The width of the membrane shall be 1,14 meters (45 inches) to allow the membrane to fit on the top flute of most structural steel decks. The self-adhesive under face is covered with a silicone release sheet. Water vapour permeability: 0.92 ng/Pa□s□m2 (0.016 Perm)

.2 Specified product: SOPRAVAP'R by SOPREMA or approved equivalent

2.3 POLYISOCYANURATE INSULATION

.1 Rigid closed cell, polyisocyanurate foam with glass reinforced facers. Conforming to CAN/ULC S704 Type 2 Class 2 and CAN/ULC S770-03 with Long Term Thermal Resistance of 6.0. RGC and FM approved.

.2 Acceptable Products;
- .1 SopraISO by Soprema.
- .2 Johns Manville ENERGY 3 or approved equivalent

.3 Primer for vapour retarder as per manufacturer's recommendations.

2.4 TAPERED INSULATION

.1 Description: Polyisocyanurate insulation to CAN/ULC S-704-03, 1200mm x 1200mm minimum size, square edge, top and bottom face finished with inorganic/organic. Tapered starting from (12.7mm) at the drain with a 1% and 2% slope or as shown on drawings.

.2 Acceptable Products;
.1 SOPRAISO by Soprema, Posi-slope or approved equivalent.

2.5 FASTENERS

.1 Description: #14 Phillips [pre-assembled] mechanical fasteners made of case-hardened carbon steel with a rust preventive coating that comply with FMR approval standards. 50 mm diameter, barbed stress plates that comply with the CSA B35.3 and FM 4470 approval standard.

.2 Specified products: SOPRAFIX FASTENERS/PLATES by SOPREMA as approved by FM for the specified system.

.3 Roofing nails: spiral nails with steel round-top cap 25 mm in diameter and 3 mm diameter shank; long enough to penetrate solid wood supports by at least 38 mm and plywood substrates by at least 20 mm.

2.6 ADHESIVE

.1 Low-rise two-part urethane adhesive with no solvents. Allows a complete cure in few minutes, with no temperature restrictions.

.2 Specified product: DUOTACK INSULATION ADHESIVE by SOPREMA or approved equivalent

2.7 PRIMER

.1 Surface conditioner used to enhance adhesion of self-adhered membranes.

.2 Specified product: ELASTOCOL STICK by SOPREMA (for self-adhesive membranes)

.3 Specified product: ELASTOCOL 500 by SOPREMA (for hot mopped and heat welded membranes)

2.8 ASPHALTIC DECK COVER BOARD WITH LAMINATED BASE SHEET MEMBRANE

.1 CSA A123.23, SBS modified base sheet membrane and polyester reinforcement, factory-laminated on asphaltic board. Top surface lightly sanded. Side laps 60% self-adhesive and 40% thermofusible. 7 mm total thickness.

.2 Specified product: 2-1 SOPRASMART BOARD SANDED by SOPREMA or approved equivalent.

2.9 MEMBRANES

.1 Roof membrane base sheet flashing:
.1 CGSB 37-GP-56M, Type 2, Class C, Grade 2 (CSA A123.23, Type C, Grade 3)

.2 Roofing membrane with glass and polyester reinforcement and SBS modified bitumen. Top face sanded, under side self-adhesive. Top face marked with three (3) distinctive blue chalk lines to ensure proper roll alignment.

.3 Specified product: SOPRAPLY STICK DUO by SOPREMA or approved equivalent.

.2 Roofing membrane Cap Sheet and Cap Sheet Flashing:

.1 CGSB 37-GP-56M, Type 1, Class A, Grade 2 (CSA A123.23, Type C, Grade 1)

.2 Roofing membrane with glass & polyester composite reinforcement and SBS modified bitumen. Top face covered by white, highly reflective granules, under face with silicone release film. SRI=90

.3 Specified products: SOPRASTAR STICK GR by SOPREMA or approved equivalent.

2.10 WATERPROOFING MASTIC

.1 Mastic made of synthetic rubbers, plasticized with bitumen and solvents.

.2 Specified product: SOPRAMASTIC by SOPREMA.

.3 Specified product: SOPRAMASTIC ALU by SOPREMA. (for exposed areas).

2.11 WATERPROOFING OF PENETRATIONS

.1 Description: One component polyurethane /bitumen resin to waterproof roof penetrations and complex details.

.2 Specified product: Alsan Flashing and Alsan Flashing reinforcement by Soprema

2.12 CARPENTRY

.1 Refer to Section 06 10 00 Rough Carpentry.

2.13 CANT STRIPS

.1 Cut from Asphalt coated fibreboard material, to measure 140 mm on slope.
.1 Approved Manufacturer: POSI Slope or approved equal.

3 EXECUTION

3.1 QUALITY OF WORK

.1 Do examination, preparation and roofing Work in accordance with Roofing Manufacturer's Specification Manual, CRCA Roofing Specification Manual and Provincial Roofing Association Manual, particularly for fire safety precautions.

.2 Do priming in accordance with manufacturers written recommendations.

.3 The interface of the walls and roof assemblies will be fitted with durable rigid material sheet metal providing connection point for continuity of air barrier.

.4 Assembly, component and material connections will be made in consideration of appropriate design loads, with reversible mechanical attachments.

.5 A manufacturer’s representative shall inspect the installation during regular intervals to ensure correct installation of all materials.

3.2 EXAMINATION OF ROOF DECKS

.1 Verification of Conditions:

.1 Inspect deck conditions including parapets, construction joints, roof drains, plumbing vents and ventilation outlets to determine readiness to proceed.

.2 Evaluation and Assessment

.1 Prior to beginning of work ensure:
.1 Decks are firm, straight, smooth, dry, free of snow, ice or frost, and swept clean of dust and debris. Do not use calcium or salt for ice or snow removal.
.2 Curbs have been built.
.3 Roof drains have been installed at proper elevations relative to finished roof surface.
.4 Plywood and lumber nailer plates have been installed to deck, walls and parapets as indicated.

.2 Do not install roofing materials during rain or snowfall.

3.3 PROTECTION OF IN-PLACE CONDITIONS

.1 Cover walls, walks and adjacent work where materials hoisted or used. Provide a plywood landing area on roof deck for receiving materials and equipment.

.2 Keep only as much material on roof as can be used in one working day. Keep roof deck clean and orderly as work progresses.

.3 Protect the work of other trades from damage resulting from the work of this Section. Make good any damaged caused to building or premises to the satisfaction of the Consultant, at no additional cost.

.4 Use warning signs and barriers. Maintain in good order until completion of Work.

.5 Clean off drips and smears of bituminous material immediately.

.6 Dispose of rain water off roof and away from face of building until roof drains or hoppers installed and connected.

.7 Protect roof from traffic and damage. Comply with precautions deemed necessary by Consultant.

.8 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed Work and materials out of storage.

.9 Metal connectors and decking will be treated with rust proofing or galvanization.

3.4 PREPARATION OF SUBSTRATE

.1 Ensure that the deck is dry, smooth, free of depressions or projections. Remove debris, snow, water and ice from deck.

.2 Treat steel decking with rust proofing or galvanization.

3.5 DECK COVERING

.1 Lay boards with tightly butted joints.

.2 Mechanically fasten boards to deck with self-tapping, non-corroding screws, spaced evenly to each board. Use 8 fasteners per 4’ x 8 ‘ panels and 12 fasteners per corner panels

.3 Ensure boards are immediately covered with membrane

3.6 VAPOUR RETARDER

.1 Allow primer to dry

.2 Beginning at the bottom of the slope, without adhering the membrane, unroll onto the substrate for alignment. Do not immediately remove the silicone release sheet.

.3 Align the roll parallel to the corrugations of the steel deck. Make sure the membrane overlaps are supported along their entire length.

.4 Peel back one end of the silicone release sheet and adhere this part of the membrane to the substrate. Peel back the remaining release sheet at a 45º angle to avoid wrinkles in the membrane.

.5 If the membrane is not properly aligned, do not try to adjust it. Instead, cut the roll and start again, making sure that it is properly aligned and that it overlaps the end of the misaligned piece by 150 mm.

.6 Overlap adjacent membranes by 75 mm. Overlap end laps by 150 mm. Stagger end laps by at least 300 mm.

3.7 INSULATION

.1 Install base layer of insulation with fasteners in conformance with manufacturer's recommendations. Mechanically fasten insulation in place with 4 fasteners per 1220 mm x 1220 mm board. Fasteners must be attached to steel deck's upper flutes.

.2 Install top layer of insulation in adhesive.

.3 Install only as much insulation as can be covered in the same day.

.4 Install insulation in two layers and stagger seams between layers.

.5 Around the drains lower insulation by 1” to create a sump 4’ X 4’ in area. Bevel the edge of the 3” insulation on a 45° angle.

.6 Install tapered insulation in adhesive where indicated on drawings.

3.8 ASPHALTIC DECK COVER BOARD WITH LAMINATED BASE SHEET MEMBRANE

.1 Install composite board in continuous strips spaced 30 cm (12 in) on the field. Decrease the spacing between ribbons to a minimum of 15 cm (6”) at the perimeter and 10 cm (4”) at the corners.

.2 Adhere the first 60 mm (2.5 in) of the self-adhesive side and end laps by removing the silicone release paper and using a membrane roller, then heat-weld the last 40 mm (1.5 in) (self-adhesive, heat-welded side laps).

.3 Seal end laps by installing a 330-mm (13-in) wide protection strip centered on the joint.

.4 Ensure all boards are evenly and tightly butted together.

.5 Avoid forming wrinkles, swelling or fishmouths

3.9 BASE SHEET FLASHING

.1 Apply primer to the substrate at a rate of .25 L/m2. Allow primer to dry before installation of Base Sheet

.2 Install reinforcing gussets at all inside and outside corners.

.3 Install base sheet flashing in one- (1) metre widths to cover roofing substrate over 100 mm. Overlap side laps by 75 mm. Stagger side laps by at least 100 mm from base sheet overlaps on roof to avoid excessive layering.

.4 Apply base sheet flashing directly onto substrate by removing siliconed paper cover sheet. Proceed from top to bottom. Once in place, apply pressure manually in a uniform fashion to obtain homogenous adherence over entire surface. Preferably seal seams with rubber roller. Nail outside edge at 300 mm o/c.

.5 Avoid forming wrinkles, air pockets or fishmouths.

.6 Always seal overlaps at the end of the workday.

3.10 CAP SHEET

.1 Apply primer to the area to be covered and allow to dry.

.2 Starting at drain, unroll the cap sheet membrane on the base sheet, taking care to align the edge of the first selvedge with the edge of the roof.

.3 Cut off corners at end laps at areas to be covered by the next roll.

.4 Ensure each selvedge overlaps the previous one laterally along lines provided for this purpose and by 150 mm (6 in) at the ends. Space end laps a minimum of 300 mm (12 in).

.5 Remove the silicone release film, pressing down the membrane using a membrane roller to ensure good adhesion.

.6 Adhere the first part of the self-adhesive side laps using a membrane roller, then heat-weld the last part (self-adhesive, heat-welded side laps).

.7 Apply adhesive for the first 125 mm (5 in) of the end laps using a steel trowel with 5 mm (3/16 in) notches.

.8 Complete the application by welding the last 25 mm (1 in) of the overlap to the field surface, using an electric hot-air welder and a membrane roller.

.9 Immediately after placing the cap sheet membrane, apply pressure on the whole surface with a membrane roller to ensure complete and uniform adherence.

.10 Repeat these steps to install the other membranes.

.11 Avoid the formation of wrinkles, swellings or fishmouths.

3.11 CAP SHEET FLASHING

.1 Install this cap sheet in one-metre-wide strips (3.25 ft).

.2 Ensure each selvedge overlaps the previous one laterally along lines provided for this purpose and by 150 mm (6 in) the field surface. Membranes for flashings must be spaced at least 100 mm (4 in) with respect to the cap sheet membranes on the field surface, to avoid areas of excessive membrane thickness.

.3 Cut off corners at end laps of areas to be covered by the next roll.

.4 Use a chalk line to draw a straight line on the field surface 150 mm. from the upstands and parapets.

.5 Prime the surface of the upstand and allow to dry.

.6 Position the pre-cut membrane piece. Peel back 100 to 150 mm. (4 to 6 in.) of the silicone release paper to hold the membrane in place at the top of the upstand. As you progressively remove the paper, use the aluminum applicator to ensure good adherence and a perfect transition between the upstand and the field surface.

.7 Apply primer before installing the next strip.

.8 Smooth the entire membrane surface with a roller for full adhesion.

.9 Adhere the first 50 mm (2.0 in) of the self-adhesive side laps using a membrane roller, then heat-weld the last 50 mm (2.0 in) (self-adhesive, heat-welded side laps).

.10 Apply adhesive for the first 125 mm (5 in) of the end lap using a steel trowel with 5 mm (3/16 in) notches.

.11 Finish by heat-welding the last 25 mm. (1 in.) to the existing surface with an electric hot-air welder and roller. Provide a smooth application, free of wrinkles, fishmouths or air pockets.

3.12 METAL FLASHINGS

.1 Metal Cleat Fasten:
  .1 20 gauge copper as shown on drawings

.2 Caulking:
  .1 CAN/CGSB 19.13M87, single component, moisture cure, polyurethane sealant

.3 Metal Coping Cap Flashing:
  .1 20 gauge copper; “S” lock seams, as shown on drawings

3.13 WATERPROOFING OF PENETRATIONS

.1 Ensure substrate is clear of loose granules and all foreign substances that can impair adhesion.

.2 Apply a base coat of liquid waterproofing.

.3 Trim reinforcing material to conform to shape of penetrations and embed in base coat.

.4 Apply a second coat fully saturating the reinforcement.

.5 To add colour or match existing granules, apply a thin coat of liquid waterproofing and embed granules before it dries.

3.14 FIELD QUALITY CONTROL

.1 Inspections:
- .1 Inspection and testing of roofing application will be carried out by testing laboratory designated by Consultant.
- .2 Costs of tests will be paid under the cash allowance as per Section 01 29 83 – Payment Procedures for Testing Laboratory Services Contractor.

3.15 CLEANING

.1 Remove bituminous markings from finished surfaces.

.2 In areas where finished surfaces are soiled caused by work of this section, consult manufacturer of surfaces for cleaning advice and complying with their documented instructions.

.3 Repair or replace defaced or disfigured finishes caused by work of this section.

.4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 - Rough Carpentry.

.2 Section 07 21 29 - Wood Shingles.

.3 Section 07 35 52 -Modified Bitumen Protected Membrane Roof.

.4 Section 07 62 20 - Gutters and Downspouts.

.5 Section 07 92 13 - Joint Sealants.

1.2 REFERENCES

.1 The Aluminum Association Inc. (AA)
- .1 AA ASM35-2000 Specifications for Aluminum Sheet Metal Work in Building Construction.
- .2 DAF45-03(R2009), Designation System for Aluminum Finishes.

.2 ASTM International (ASTM)
- .1 ASTM A653/A653M-20, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM A792/A792M-10(2015) Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .3 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
- .4 ASTM D4586-07(2018), Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- .5 ASTM F1667-18a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.3 Canadian Roofing Contractors Association (CRCA)
- .1 Roofing Specifications Manual.

.4 CSA Group (CSA)
- .1 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
- .1 SMACNA Architectural Sheet Metal Manual.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:
- .1 Coordinate work of this Section with interfacing and adjoining Work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.4 ACTION AND INFORMATION SUBMITTALS

.1 Submit in accordance with Section 01 33 01 – Submittals.

.2 Product Data:
- .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 QUALITY CONTROL

.1 Installer: Engage an experienced installer having a minimum of three years experience who has completed projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

.2 Construct and install roof metal flashings in accordance with CRCA Manual details and in accordance with the CRCA Manual. If requirements conflict, this specification takes precedence over the manual.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Stack pre-formed and pre-finished material in manner to prevent twisting bending and rubbing.

.2 Provide protection for galvanized surfaces.

.3 Prevent contact of dissimilar metals during storage and protect from acids, flux, and other corrosive materials and elements.

.4 Protect prefinished surfaces from scratches and from rust staining.

1.7 WARRANTY

.1 The same warranty provisions apply to flashings associated with roofing as to the roofing.

.2 Provide Warranty for sheet metal flashing and trim to include in maintenance manuals.

Part 2 Products

2.1 PREFINISHED GALVANIZED STEEL FLASHING

.1 Copper: ASTM B370; minimum temper H00 (cold-rolled) except where temper 060 is required for forming;
1. Flashings and Trim: 16 oz. per sq. ft. (0.0216-inch thick) (0.55 mm) except as otherwise indicated.

2.2 ACCESSORIES

.1 Solder: ASTM B32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder.

.2 Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.

.3 Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

.4 Bituminous Coating: SSPC - Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

.5 Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates. Refer to Division 07.

.6 Metal Accessories: Provide cleats, straps, hangers, anchoring devices, and similar accessory units as required for installation of work, noncorrosive, size and gage required for performance.

.7 Rivets:
1. Pop Rivets: 1/8-inch (3 mm) to 3/16-inch (4.5 mm) diameter, with solid brass mandrels.
Provide solid copper rivet (tinner's rivets) where structural integrity of seam is required

2.3 FABRICATION

.1 General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of Copper Development Association (CDA) "Copper in Architecture" handbook and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

2. Fabricate to allow for adjustments in field for proper anchoring and joining.
3. Form sections true to shape, accurate in size, square, free from distortion and defects.
4. Cleats, Spacers, Straps, and Hanger Brackets: Fabricate of same material as gutters and downspouts, interlockable with sheet in accordance with CDA recommendations.

.2 Seams: Fabricate nonmoving seams with 1 inch (25 mm) lapped riveted and soldered seams. Tin edges to be seamed, lap seams, rivet seams, and solder.

.3 Expansion Provisions: Follow CDA Copper in Architecture Handbook guidance and provisions to accommodate expansion and contraction of gutter systems.

.4 Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

.5 Solder

a. Solder metal joints except those indicated or required to be movement type joints in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
b. Tin edges of copper sheets and cleats at soldered joints.
c. After soldering, remove flux. Wipe and wash solder joints clean with fresh water and baking soda to neutralize flux.

.6 Copper Thickness: Comply with CDA recommendations for copper size and shape.

.7 All straight run joints shall be S-Lock in roof flashings.

.8 Make joints to allow for thermal movement, space S-Lock joints at 3000 mm maximum centers.

.9 Make flashings for building into masonry and concrete so that joints can be lapped 100 mm or more.

.10 Strengthen free edges of metal flashings by folding to form a 13-mm hem.

.11 Make flashings to curbs, walls, and parapets a minimum of 100 mm high, where possible.

.12 Make joints for corners and intersections with standing seams except where exposed of pre-finished metal when seams shall be flat locked.

.13 All bends machine made. Form sections square, true, and accurate to size, free from distortion and other defects detrimental to appearance or performance.

2.4 FINISHES

.1 Natural weathering mill finished copper. No applied finish.

.2 To retard natural weathering, apply a uniform coating of high grade paraffin oil (brown tones), or a clear lacquer coat (shiny).

.3 Clear Lacquer Coating:
.1 Clear, Organic Coating: Clear, air-drying, acrylic lacquer specially developed for coating copper alloy products, equivalent to Incralac by StanChem applied by air spray in 2 coats per manufacturer's directions, with interim drying, to total thickness of 1.0 mil

Part 3 Execution

3.1 EXAMINATION

.1 Check mounting and counterflashing of mechanical items and report any defect to the Consultant.

.2 Verify that solid wood blocking or sheathing provided to back-up all flashings and that all nails, screws set and wood provides a smooth flat plane.

.3 Verify that all reglets, provided under other Sections or built-in by other trades, properly and securely located, true and level in line.

.4 Commencement of Work means acceptance of existing conditions.

3.2 INSTALLATION

.1 Install copper flashing and trim in accordance with applicable CRCA 'FL' series details, SMACNA's Architectural Sheet Metal Manual, and as indicated.

.2 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.

.3 Do not install metal flashings over flexible roof flashing until the flexible roof flashing has been inspected and approved by the Consultant. This includes curbs for roof mounted items.

.4 Do not use exposed fastening unless indicated, or concealed fastening is not possible. Locations and methods shall be approved by Consultant.

.5 Anchor units of work securely in place, providing for thermal expansion of metal units. Conceal fasteners where possible and set units true to line and level.

.6 Install work with laps, joints, and seams that are watertight and weatherproof.

.7 Install exposed sheet metal work that is without oil canning, buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weatherproof performance.

.8 Install surface mounted reglets true and level, and caulk top of reglet with sealant. Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.9 Insert metal flashing into reglets or under cap flashing as indicated to form weather tight junction.

.10 Fasten metal base flashing to walls or upstands along top of flashing. Do not secure to cant strip. Form lapped corner joints. Extend rolled edge of base flashing approximately 25 mm on to roof from toe of cant, and rest on top of roof surface.

.11 Expansion Provisions:
- .1 Provide for the thermal expansion of exposed sheet metal Work.
- .2 Space movement joints at maximum of 3050 mm, with no joints allowed within 610 mm of a corner or intersection.
- .3 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints) where lapped or bayonet type expansion provisions in the work cannot be used or are not sufficiently weatherproof and waterproof.

.12 Sealed Joints:
- .1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant.
- .2 Fill joint with sealant and form metal to conceal sealant completely.
- .3 Use joint adhesive for non-moving joints specified.

.13 Lock Seams:
- .1 Fabricate non-moving seams in sheet metal with flat lock seams.

.14 Separations:
- .1 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with bituminous paint or other permanent separation as recommended by the manufacturer.
- .2 Underlayment: Install a slip-sheet of No. 15 perforated asphalt saturated felt and a course of polyethylene underlayment where installing sheet metal directly on ementitious or wood substrates. Secure in place and lap joints minimum 100 mm.
- .3 Bed flanges of work in a thick coat of roofing cement where required for waterproof performance.

.15 Counter Flashing:
- .1 Coordinate installation of counter flashing with installation of assemblies being protected by counter flashing.
- .2 Secure in a waterproof manner.
- .3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.

.16 Flashing and metal closures: where flashing and metal closures overlap at any point in a system, ensure that flashing and closures are shingled over top lower sheet(s) and not behind, so that water is directed, and drains, to the exterior.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 01 Cleaning. Leave Work

area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 01 Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 74 03 - Waste Management and Disposal.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

PART 1 - GENERAL

1 GENERAL REQUIREMENTS

1.1 SUMMARY

.1 Section Includes shop and field formed copper roofing accessories and trim, such as:

1. Built-in Gutters.
2. Hung gutters
3. Downspouts (rain drainage).
4. Through-wall scuppers and conductor heads.
5. Miscellaneous accessories such as downspout strainers and gutter covers.

.2 Related Requirements
:

1 Section 06 10 10 - Rough Carpentry.
2 Section 07 21 29 - Wood Shingles.
3 Section 07 35 52 -Modified Bitumen Protected Membrane Roof.
4 Section 07 60 00 -Heritage Sheet Metal Flashing and Trim.
5 Section 07 92 13 - Joint Sealants.

1.2 COORDINATION

.1 Coordinate work of this section with interfacing and adjacent work for proper sequencing. Ensure weather resistance and durability of work and protection of materials and finishes.

1.3 PERFORMANCE REQUIREMENTS

.1 Installation Requirements: Fabricator is responsible for installing system, including anchorage to substrate and necessary modifications to meet specified and drawn requirements and maintain visual design concepts in accordance with Contract Documents and following installation methods as stipulated in the "Copper in Architecture" handbook published by the Copper Development Association (CDA).

1. Drawings are diagrammatic and are intended to establish basic dimension of units, sight lines, and profiles of units.
2. Make modifications only to meet field conditions and to ensure fitting of system components.
3. Obtain Architect's approval of modifications.
4. Provide concealed fastening wherever possible.
5. Attachment considerations: Account for site peculiarities and expansion and contraction movements so there is no possibility of loosening, weakening and fracturing connection between units and building structure or between components themselves.
6. Obtain Architect's approval for connections to building elements at locations other than indicated in Drawings.
7. Accommodate building structure deflections in system connections to structure.

.2 Performance Requirements:

1. System shall accommodate movement of components without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects when subjected to seasonal temperature changes and live loads.
2. Design system capable of withstanding building code requirements for negative wind pressure.

1.4 SUBMITTALS

.1 General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Sections.

.2 Product data for gutters, downspouts, and accessories: Manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product.

.3 Shop drawings showing layout, profiles, expansion provisions, gutter slopes, methods of joining, and anchorage details, including downspout strainers, gutter covers, scuppers, and conductor head, and attachments to built-in plumbing drain lines, scuppers, and conductor head systems. Provide layouts at 1/4 inch (1:50) scale and details at 3 inch (1:4) scale.

.4 Samples of the following flashing, sheet metal, and accessory items:
1. 6-inch (150 mm) or 12-inch (300 mm) square samples of specified sheet materials to be exposed as finished surfaces.
2. 6-inch (150 mm) or 12-inch (300 mm) long samples of fabricated products exposed as finished work. Provide complete with specified finish.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance data in Operations and Maintenance manual for maintaining applied coatings on copper panels.

1.6 QUALITY ASSURANCE

.1 Fabricator's Qualifications: Company specializing in copper gutter and downspout work with three years experience in similar size and type of installations.

.2 Installer: A firm with 3 years of successful experience with installation of copper gutter and downspout work of type and scope equivalent to Work of this Section.

.3 Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Conform to dimensions and profiles shown.

.4 Mock-Up: Before proceeding with final purchase of materials and fabrication of copper gutter and downspout work components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at location directed by Architect. Retain accepted mock-up as quality standard for acceptance of completed copper work. If accepted, mock-up may be incorporated as part of copper work.
1. Mock-up area is indicated on Drawings.
2. Provide mock-up of sufficient size and scope to show typical pattern of seams, fastening details, edge construction, and finish texture and color.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling, and Unloading: Protect finish metal faces.

.2 Acceptance at Site: Examine each component and accessory as delivered and confirm that material and finish is undamaged. Do not accept or install damaged materials.

.3 Storage and Protection:
1. Stack pre-formed material to prevent twisting, bending, and abrasions.
2. Provide ventilation.
3. Prevent contact with materials which may cause discoloration or staining.

1.8 WARRANTY

.1 Warrant installed gutters, downspouts, and trim components to be free from defects in material and workmanship for period of 2 years.

.2 Include coverage against leakage and damages to finishes.

PART 2 - PRODUCTS

2.1 GUTTER AND DOWNSPOUT MATERIALS

.1 Copper: ASTM B370; minimum temper H00 (cold-rolled) except where temper 060 is required for forming;
1. Hung Gutters and Downspouts: 16 oz. per sq. ft. (0.0216-inch thick) (0.55 mm) except as otherwise indicated.

2. Built-in Gutters: 20 oz. per sq. ft. (0.0270-inch thick) (0.69 mm) unless otherwise required by guidance indicated in the Copper Development Association (CDA) "Copper in Architecture Handbook" and other recognized industry practices.

.2 Gutter Cover Guards: 20-gage bronze mesh or fabricated units, with selvaged edges and noncorrosive fasteners. Select materials for compatibility with gutters and downspouts.

.3 Bronze wire ball downspout strainer meeting the Copper Development Association Inc details.

2.2 ACCESSORIES

.1 Solder: ASTM B32; Provide 50-50 tin/lead or lead free alternative of similar or greater strength solder.

.2 Flux: Muriatic acid neutralized with zinc or approved brand of soldering flux.

.3 Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal as recommended by sheet manufacturer. Match finish of exposed heads with material being fastened.

.4 Bituminous Coating: SSPC - Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

.5 Joint Sealant: One-part, copper compatible elastomeric polyurethane, polysulfide, butyl or silicone rubber sealant as tested by sealant manufacturer for copper substrates. Refer to Division 07.

.6 Metal Accessories: Provide cleats, straps, hangers, anchoring devices, and similar accessory units as required for installation of work, noncorrosive, size and gage required for performance.

.7 Rivets:
1. Pop Rivets: 1/8-inch (3 mm) to 3/16-inch (4.5 mm) diameter, with solid brass mandrels.
2. Provide solid copper rivet (tinner’s rivets) where structural integrity of seam is required.

2.3 FABRICATION

.1 General Metal Fabrication: Shop-fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of Copper Development Association (CDA) "Copper in Architecture” handbook and other recognized industry practices. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed copper work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

1. Fabricate to allow for adjustments in field for proper anchoring and joining.
2. Form sections true to shape, accurate in size, square, free from distortion and defects.
3. Cleats, Spacers, Straps, and Hanger Brackets: Fabricate of same material as gutters and downspouts, interlockable with sheet in accordance with CDA recommendations.
4. Fabricate corners from one piece with minimum 18 inch (450 mm) long returns; solder corners for rigidity.

.2 Seams: Fabricate nonmoving seams with 1 inch (25 mm) lapped riveted and soldered seams. Tin edges to be seamed, lap seams, rivet seams, and solder.

.3 Expansion Provisions: Follow CDA Copper in Architecture Handbook guidance and provisions to accommodate expansion and contraction of gutter systems.

.4 Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

.5 Solder

1. Solder metal joints except those indicated or required to be movement type joints in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
2. Tin edges of copper sheets and cleats at soldered joints.
3. After soldering, remove flux. Wash and wash solder joints clean with fresh water and baking soda to neutralize flux.

.6 Copper Thickness: Comply with CDA recommendations for copper size and shape.

.7 Gutters and Downspouts:
1. Fabricate as indicated on Drawings and in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA).
2. Fabricate front edge at least 1 inch (25 mm) lower than back edge.
3. Transverse Seams in Gutter Liners: lapped, riveted and soldered for watertight gutter condition.
4. Provide spacers, hanger brackets and straps, and fasteners as indicated and as recommended by CDA.
5. Fabricate gutters and downspouts to sizes and profiles shown on Drawings.

.8 Through Wall Scupper: As indicated on Drawings and in accordance with the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Fabricate scuppers of dimensions required with closure flange trim to exterior, 4 inches (100 mm) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.
1. Fasten gravel guard angles to base of scupper.

.9 Conductor Head: As indicated on Drawings and in accordance with CDA "Copper in Architecture" handbook. Coordinate with Section 076220 for connection to downspout.

2.4 FINISHES

.1 Natural weathering mill finished copper. No applied finish.

.2 To retard natural weathering, apply a uniform coating of high grade paraffin oil (brown tones), or a clear lacquer coat (shiny).

.3 Clear Lacquer Coating
1. Clear, Organic Coating: Clear, air-drying, acrylic lacquer specially developed for coating copper alloy products, equivalent to Incralac by StanChem applied by air spray in 2 coats per manufacturer's directions, with interim drying, to total thickness of 1.0 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 General: Examine conditions and proceed with work when substrates are ready.

.2 Confirm that substrate system is even, smooth, sound, clean, dry, and free from defects.

3.2 INSTALLATION

.1 General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with the "Copper in Architecture" handbook published by the Copper Development Association (CDA). Anchor units of work securely in place by methods indicated, providing for thermal expansion of units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.

1. Install units plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction; except install gutters with required slope.
2. Apply asphalt mastic on copper surfaces of units in contact with cementitious materials and dissimilar metals.
3. Fit gutters to downspouts and flashings for watertight connections. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
4. Miter, lap seam and close corner joints with solder. Seal seams and joints watertight with solder
5. Install expansion joints at frequency recommended by the CDA "Copper in Architecture" handbook. Do not fasten moving seams such that movement is restricted.
6. Coordinate with installation of roofing system and roof accessories.

.2 Gutters and, Downspouts:

1. Flash and seal gutter to downspout.
2. Slope gutters not less than 1/8 inch per foot (1:100).
3. Provide expansion joints at 48'-0" (14 400 mm) maximum, not more than 24 feet (7200 mm) from corners.
4. Hang gutter with copper straps spaced 30 inches (750 mm) centers maximum. Closer spacing may be required to handle system loads.
5. Integrate gutter flashing conditions with requirements of adjacent roofing for watertight installation.
6.

.3 Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters. Install "beehive"-type strainer-guard at downspouts in open gutters; removable for cleaning downspouts.

.4 Install counterflashing as indicated to prevent water from migrating behind gutter system.

.5 Parapet Scuppers:

1. Install scuppers where indicated through parapet.
2. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.
3. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.
4. Loosely lock front edge of scupper with conductor head
5. Seal or solder exterior wall scupper flanges into back of conductor head.

.6 Conductor Heads: Flash and seal conductor head to scupper.

3.3 CLEANING

.1 Remove protective film (if any) from exposed surfaces of copper promptly upon installation. Strip with care to avoid damage to finishes. Do not allow protective film to fuse to copper.

.2 Clean exposed copper surfaces, removing substances that might cause abnormal discoloration of metal.

.3 Upon completion of each area of soldering, carefully remove flux and other residue from surfaces. Neutralize acid flux by washing with baking soda solution, and then flushing clear water rinse. Use special care to neutralize and clean crevices.

.4 Clean exposed metal surfaces of substances that would interfere with uniform oxidation and weathering.

3.4 PROTECTION

.1 Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section and all related sections.

.2 The work of this section and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide curtain tracks as specified herein and as indicated on the drawings.

1.3 RELATED SECTIONS

.1 Division 05: Section 05 12 00 Structural Steel
.2 Division 07: Section 07 81 00 Cementitious Fireproofing

1.4 REFERENCE STANDARDS

.1 CAN/ULC-S101-1989; Fire Endurance Tests of Building Construction and Materials.
.2 CAN/ULC-S102-1988 (R2000); Surface Burning Characteristics of Building Materials and Assemblies.
.3 CAN4-S114-1980 (R1997); Determination of Non-Combustibility in Building Materials.
.4 ASTM-E84; Test Method for Surface Burning Characteristics of Building Materials.
.5 ASTM-E119-00a; Test Methods for Fire Tests of Building Construction and Materials.
.6 ASTM-E595-93 (1999); Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Out-gassing in a vacuum Environment.
.7 ASTM-E605-93 (R2000); Test Methods for Thickness and Density of Sprayed Fire-Resistive Materials (SFRM) Applied to Structural Members.
.8 ASTM-E736-00; Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members.
.9 ASTM-E759-92 (2000); Test Method for Effect of Deflection on Sprayed Fire-Resistive Materials Applied to Structural Members.
.10 ASTM-E761-92 (2000); Test Method for Compressive Strength of Sprayed Fire-Resistive Materials Applied to Structural Members.
.11 ASTM-D2240-00; Test Method for Rubber Property - Durometer Hardness.
.12 ASTM-D2794-93 (1999); Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
.13 ASTM-D3960-98; Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings.
.14 ASTM-D4060-95; Test Method for Abrasion Resistance of Organic Coatings by the Taber Abrader.
.15 Underwriters Laboratories Inc. (ULI); Fire Resistance Directory, Volume 1, current edition.
.16 Intertek Testing Services / Warnock Hersey International, Inc. (ITS/WH); Directory of Listed Products, current edition.
.17 Underwriters' Laboratories of Canada (ULC); List of Equipment and Materials, Fire Resistance, current edition.
.18 Factory Mutual Research (FM); Approved Products Guide, current edition.

1.5 QUALITY ASSURANCE

.1 Applicator Qualifications
.1 Work of this section shall be performed by applicators having a minimum of 2 years documented experience in the installation of intumescent thin film fire-resistive coating. Submit proof of experience to Consultant.

.2 Installation
.1 Work shall be performed in strict accordance with manufacturer's printed instructions, and in accordance with all warranty requirements.

.3 Pre-installation Meeting
.1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
.1 Contractor (Site Superintendent & Project Manager),
.2 Installation Subcontractor (Site Foreman & Project Manager),
.3 Product Manufacturer and/or Distributor (Technical Representatives),
.4 Related Subcontractors (ie. Mechanical and/or Electrical), and
.5 Consultant.

1.6 SYSTEM DESCRIPTION

.1 Thin-film intumescent fire-resistive coating system shall provide a fire resistance rating:
.1 Columns: 1 hour for columns, in accordance with the following:
.1 UL Design No.'s: X639, X640, X641, X642, X643, X644 and X645.
.2 ITS/WH Design No.'s: AD/CA 90-02, AD/CA 120-02, AD/CA 120-03, AD/CA 120-04, AD/CA 180-01 and AD/CA 180-02.
.3 ULC Design No.'s: Z608, Z609, Z610, Z611, Z612, Z616 and Z617.
.4 Factory Mutual: Column Protection Methods 3, 4 and 5.

.2 Beams/ Diagonal Bracing: (exposed location): 1 hour for beams and/or floor assembly in accordance with the following:
.1 ITS/WH Design No.: AD/FCA 120-01.
.2 ULC Design No.'s: F906 and F910.

1.7 SUBMITTALS

.1 Submit manufacturer's product specifications including certification of compliance with the Contract Documents, as may be required by the Consultant.
.2 Submit test results in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
.3 For assemblies not tested and rated, submit proposals based on related designs using accepted intumescent thin film fire-resistive coating design criteria.

1.8 SAMPLES

.1 Submit duplicate 300mm x 300mm samples of final exposed finish of intumescent thin film fire-resistive coating in accordance with Section 01 33 01.

1.9 MOCK-UP

.1 Site prepare mock-up of one column in intumescent thin-film fire-resistive coating in accordance with Section 01 33 01. Mock-up shall include all materials and layers representing complete coating system.

.2 Notify Consultant upon completion of mock-up and request review.

.3 Approved mock-up shall serve as the minimum standard of work for the balance of Intumescent Coating work. Approved mock-up may remain in place as part of the final work.

.4 Rejected mock-up shall be removed and replaced with new material. Request re-inspection until approved by Consultant.

1.10 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.2 Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer. Do not store in direct sunlight. Protect from freezing.

.3 Store materials at a temperature not less than 10°C in a dry, protected area, off ground in original, undamaged, sealed containers with manufacturer' s labels and seals intact.

1.11 SITE CONDITIONS

.1 Substrate and ambient air temperature shall be in accordance with manufacturer's requirements.

.2 Protect work area from windblown dust and rain. Protect adjacent areas from over spray.

.3 Provide ventilation in areas to receive work of this section, during application and 24 hours (minimum) after application.

.4 Temperature and Humidity Requirements: Maintain air temperature and relative humidity in spaces where products will be installed for a time period before, during and after installation as recommended by manufacturer.

.5 Do not apply thin-film intumescent fire-resistive coating when temperature of substrate and/or surrounding air is below 10°C. Use electric heat if supplemental heat is required.

.6 Maintain relative humidity of 40% to 60% in work area. Relative humidity must not exceed 75% throughout total period of application and drying for intumescent coating, and must not exceed 65% throughout application and drying for protective decorative finish coat.

.7 Manufacturer's recommended temperature and humidity conditions must be maintained throughout the entire application and drying period until intumescent coating and basecoat are fully dried and top coated, including any interim period prior to application of top coat.

1.12 SEQUENCING AND SCHEDULING

.1 Sequence work in conjunction with ceiling hanger tabs,, sprinkler pipes, HVAC systems and other mechanical systems.

.2 Do not apply thin-film intumescent fire-resistive coating until concrete toppings and/or roofing applications have been installed.

.3 Steel surfaces with less than 1 meter clear working access may necessitate the application of materials to inaccessible surfaces prior to erection of the finished steel members, either at the point of fabrication or on-site.

2 PRODUCTS

2.1 MATERIALS

.1 Primer: Select primer from manufacturer's list of approved primers, or other only as approved by A/D Fire Protection Systems.

.2 Basecoat: non-intumescent base coat material for use in conjunction with UL Designs X640 and X644, ITS/WH Designs AD/CA 120-02 and AD/CA 180-02, ULC Designs Z609 and Z616, and Factory Mutual Column Protection Methods 3 and 4);
.1 A/D BASECOAT by A/D Fire Protection Systems, or
.2 equivalent by Cafco Industries Inc., Mississauga ON,
.3 Intumescent Fire-Resistive Coating: water-based, two-component, intumescent thin-film fire-resistive coating, labelled and listed;
.1 Hardness (Shore "D"): Durometer D81.8, 230ºC.
.2 Surface Burning Characteristics (ASTM E84):
.1 Flame Spread: 0 -20,
.2 Smoke Development: 0-50, Class "A".
.3 Dry Weight: 2.2 kg/m_2 at 1.6mm dry.
.4 Cohesion / Adhesion (Bond or Tensile) (ASTM 736): 3.24 kgm_2 at 3mm dry.
.5 Compressive strength (ASTM E761): 7.6MPa at 10 % deformation.
.6 Impact Resistance (ASTM D2794): 1.4 kg-m (direct) at 1.6mm.
.7 Abrasion Resistance (ASTM D4060): 508 cycles at 1.6mm dry.
.8 Acceptable Products;
.1 CAFCO® Sprayfilm™ WB II; by Cafco Industries Inc., Mississauga ON,

.2 A/D FIREFILM® II; by A/D Fire Protection Systems Inc., Scarborough ON, or
.3 Primers: Solvent-based (xylene), short oil alkyd/zinc phosphate, one coat primer.

3 EXECUTION

3.1 EXAMINATION

.1 Examine surfaces to receive work of this Section and report any defects which may affect the application. Identification marking of steel components must be by wax crayon to facilitate ease of removal prior to application of intumescent coating.

.2 Verify that substrate surfaces are ready to receive work. Commercial Blast Cleaning (SSPC-SP6/NACE No.3) is required for minimum surface preparation. Weld flashes shall be ground smooth prior to commencement of application.

.3 Verify that all clips, hangers, sleeves and similar devices have been attached. Confirm compatibility of surfaces to receive intumescent coating. Steel surfaces must be primed with a compatible primer.

.4 Beginning of installation means acceptance of substrate.

.5 Verify substrate and workspace temperature and humidity conditions are in accordance with manufacturer's recommendations.

3.2 PREPARATION

.1 Substrate shall be free of material which would impair bond.

.2 Verify that painted substrate are compatible and have suitable bonding characteristics to receive intumescent coating. Remove incompatible materials.

.3 Ensure that surface mounted conduits and fixtures, and any other items required to penetrate intumescent coating, are placed before installation.

.4 Ensure that ductwork, piping, mechanical equipment, or other items which would interfere with application of intumescent coating are not positioned until work of this section is completed.

.5 Remove all existing paint from steel surfaces to receive intumescent coating.

.6 Provide drop sheets or other protection to adjacent areas or surfaces not to receive intumescent coating.

.7 Mask all adjacent surfaces to prevent over spray or contamination.

3.3 APPLICATION

.1 General
- .1 Apply products in accordance with manufacturer's instructions in sufficient thickness to achieve required fire resistance rating. Spray application is recommended. Base Coat (where required) is to be applied by spray only. Apply decorative colour finish according to manufacturer's recommendations.
- .2 Priming
  - .1 Apply Intumescent Coating and Base Coat only to primed surfaces. Use only primer as approved by the manufacturer. Follow primer manufacturer's instructions.
- .3 Application Rates and Thickness Measurements
  - .1 Comply with fire test designs or manufacturer's thickness selection tables for determination of dry film thickness of Intumescent Coating and Base Coat (where required) for size of steel element to be protected, and for required fire resistance rating (s). Apply Top Coat.
  - .2 Apply Intumescent Coating at a maximum rate of 0.76mm wet or approximately 0.58mm dry per coat. Apply Base Coat (where required) at a maximum rate off 1.52mm wet per coat.

.3 Final dry film thickness must be measured with a dry-film thickness gauge. Do not apply Top Coat until it has been determined that the required dry film thickness of Intumescent Coating and Base Coat (where required) have been provided.

.4 Application

.1 Spray Equipment: Use spray application for best coverage, finish and appearance. For Intumescent Coating, use an airless sprayer capable of 20685kPa pressure, minimum, without surging. For Base Coat, use sprayer capable of 27580kPa pressure, minimum, without surging. Remove all filters except pump filter. For Intumescent Coating use a 3/17 to 4/23 size, heavy duty type, self-cleaning (reversible) tip. For Base Coat, use a 0.58mm tip. Adjust pressure and distance between tip and surface to minimize orange peel. Adjust fan width to minimize over spray. Use a 0.38mm tip for Top Coat.

.2 Hand Application: Use a brush recommended for use with latex paint and a low pile roller to apply Intumescent Coating. Use a China bristle brush or roller to apply Top Coat. Apply Base Coat by spray only.

.3 Handling: When applying by brush or roller, work from a small container, mixing frequently. Keep original pail tightly closed with the surface of the material covered by the plastic sheet provided.

.4 Drying and Recoat Time: Drying time will vary with temperature and humidity conditions. Apply next coat of Base Coat only after previous coat is dry.

.5 Patching

.1 Patch and repair any fire resistive coating that has been damaged in accordance with patching recommendations of material manufacturer. If coating becomes damaged, rebuild thickness by spray or brush. Fill small areas with trowel. When dry, smooth and finish with Top Coat to match.

3.4 INSPECTION AND TESTING

.1 The intumescent coating basecoat application shall be tested for dry film thickness (DFT) in accordance with ASTM E605 tested assembly requirements, and manufacturer's specifications.

.2 The cost of inspection and testing shall be paid from a cash allowance, as allocated in Section 01210.

3.5 PATCHING

.1 All patching of and repair to intumescent coating due to damage by other trades, shall be performed by this section and paid for by the trade responsible for the damage.

3.6 CLEANING

.1 Remove intumescent coating material from all adjacent materials not designated to receive intumescent coating application.

.2 Upon completion of the intumescent coating work, promptly remove all equipment, protection sheets, and excess materials from the site.

3.7 SCHEDULE

LOCATION RATING (HRS.)
steel columns 1 hour
exposed steel beams / diagonal bracing 1 hour

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide caulking and sealing of joints between building components, including joint preparation.
- .1 Interior Joints
  - .1 Perimeter of metal frames in interior walls,
  - .2 Base of metal frames at floor,
  - .3 Joints between dissimilar materials,
  - .4 Full length of door thresholds,
  - .5 Control and expansion joints,
  - .6 Perimeter of plumbing fixtures,
  - .7 Perimeter of fixed equipment.

1.3 RELATED SECTIONS

.1 Masonry Restoration Section 04 21 13
.2 Concrete Unit Masonry Section 04 22 00
.3 Gypsum Board Assemblies Section 09 21 16
.4 Firestopping related to Mechanical work Sections 21, 22, 23 & 25
.5 Firestopping related to Electrical work Sections 26, 27 & 28

1.4 REFERENCE STANDARDS

.1 ASTM C920-01; Standard Specification for Elastomeric Joint Sealants.
.2 CAN/CGSB-19-GP-5M; Sealing Compound, One Component, Acrylic Base, Solvent Curing.
.3 CAN/CGSB-19-GP-14M; Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
.4 CAN/CGSB-19.17-M90; Sealing Compound, One Component, Acrylic Emulsion Base.
.5 CAN/CGSB-19.13-M87; Sealing Compound, One Component, Elastomeric, Chemical Curing.
.6 CAN/CGSB-19.24-M90; Sealing Compound, Multi-Component, Chemical Curing.

1.5 QUALITY ASSURANCE

.1 Applicator Qualifications
- .1 Work of this section shall be performed by applicators having a minimum of 3 years documented experience in the installation of joint sealants. Submit proof of experience to Consultant.

- .2 Installation
  - .1 Work shall be performed in strict accordance with manufacturer's printed instructions, and in accordance with all warranty requirements.

- .3 Pre-installation Meeting
  - .1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
    - .1 Contractor (Site Superintendent & Project Manager),
    - .2 Installation Subcontractor (Site Foreman & Project Manager),
    - .3 Product Manufacturer and/or Distributor (Technical Representatives),
    - .4 Related Subcontractors (ie. Mechanical and/or Electrical), and
    - .5 Consultant.

1.6 MOCK-UP

.1 Test sealant in contact with samples of materials to be caulked to ensure that proper adhesion will be obtained and no staining of the material will result. Prepare sample joints at the site of each type of sealant for each joint condition to provide mock-up as specified in Section 01 33 01.

1.7 SUBMITTALS

.1 Submit samples of sealants and backing materials.

.2 Submit product list with manufacturer's product name for each sealant to be used for this project, along with recommendations for use of the sealant, before commencing joint sealing.

1.8 ENVIRONMENTAL CONDITIONS

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

1.9 EXTENDED WARRANTY

.1 Submit a warranty for the work of this Section for a period of three(3) years from the Date of Substantial Performance, including materials and application.

.2 Replacement of joint sealants shall include removal of defective materials, preparation for and application of new material, and the repair and making good of damaged adjacent materials.

.3 Defective joint sealant installation shall include, but not be restricted to, joint leakage, hardening, cracking, crumbling, melting, bubbling, shrinkage, running, sagging, change of colour, loss of adhesion, loss of cohesion, and staining of adjoining of adjacent materials or surfaces.

2 PRODUCTS

2.1 APPROVED MANUFACTURERS

.1 Tremco Limited
.2 Dow Corning
.3 GE Silicones
.4 Sika Canada Inc.

2.2 MATERIALS

.1 All materials utilized in a sealant system shall be compatible and non-staining.

.2 Specified proprietary products are minimum acceptable quality. Products of other manufacturers of equal or superior quality will be acceptable where specifically approved by Consultant.

.3 Provide sealant formulation recommended by manufacturer for type of joint, substrate and service conditions applicable.

2.3 SEALANTS

.1 Refer to Caulking Schedule for utilization of the following sealants:

Sealant Type 1: Multi-component, chemical-cure polyepoxide polyurethane sealant, to CAN/CGSB-19.24, Type 2, Class B; equivalent to DYMERIC 240 by Tremco Canada (div. of RPM Canada).

Sealant Type 2: One-part, moisture-cure polyurethane sealant, to CAN/CGSB-19.13, Classification MC-2-25-B-N; equivalent to DYMONIC or Vulkem 116, by Tremco Canada (div. Of RPM Canada).

Sealant Type 3: One-part, acrylic latex sealant, to CAN/CGSB-19-GP-5M; equivalent to TREMFLEX® 834, by Tremco Canada (div. of RPM Canada).

Sealant Type 4: One-part, acetoxy silicone sealant, to CAN/CGSB-19.13; equivalent to TREMSIL® 200, by Tremco Canada (div. of RPM Canada).

Sealant Type 5: One-part, non-skinning, non-hardening, synthetic rubber acoustical sealant, to CGSB 19-GP-14M; equivalent to Tremco Acoustical Sealant, by Tremco Canada (div. of RPM Canada).

.2 Colours of sealants will be selected by the Consultant from manufacturers full standard range.

2.4 ACCESSORIES

.1 Primer: Type recommended by sealant manufacturer.

.2 Backer Rods: 30% greater diameter than joint width, with Shore-A hardness of 20, and 830-900Kpa tensile strength;
- .1 Vertical Surfaces: extruded polyolefin rod; SofRod by Tremco Canada (div. of RPM Canada).
- .2 Horizontal Surfaces : closed
- .3 Bond Breaker: pressure sensitive plastic tape, for installation where minimum specified depth of joint is unobtainable; 3M #266/#481, or Valley Industries #40.

3 EXECUTION

3.1 EXAMINATION

.1 Before commencing joint sealing, verify at the site that joint configuration and surfaces have been provided as specified in other Sections to meet intent of sealant specification.

.2 Verify that joint conditions will not adversely affect execution, performance or quality of completed sealed joints, and that they can be put into acceptable condition by means of preparation specified in this Section. If in doubt, verify site conditions together with manufacturer's representative of the sealant to be applied.

.3 Verify that sealers and coatings applied to sealant substrates are compatible with the sealant used and that full bond between sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and bond if necessary.

.4 Verify that specified environmental conditions are ensured before commencing joint sealing.

.5 Defective sealed joints resulting from application to unsatisfactory joint conditions will be considered the responsibility of this Section.

.6 Examine joint sizes for anticipated movement, and for proper width/depth ratio per manufacturer's recommendations for specified sealant.

3.2 PREPARATION

.1 Remove loose mortar, dust, oil, grease, oxidation, mill scale, coatings and all other materials affecting bond of compounds from surfaces to which sealant compounds must adhere, except for painted surfaces, by brushing, scrubbing, scraping or grinding.

.2 Clean down caulked metal surfaces with clean cellulose sponges or rags soaked in solvent recommended by sealant manufacturer, and wipe dry with clean cloths. Ensure that solvent is not injurious to painted surfaces.

.3 Use methods of preparation suitable for substrate as recommended by sealant manufacturer, and that does not damage adjacent surfaces.

.4 Ensure that releasing agents, coatings or other treatments have either not been applied to joint surfaces, or that they are entirely removed.

.5 Where necessary to protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or caulking.

3.3 APPLICATION

.1 Except where specified in other Sections, seal open joints in surfaces exposed to view, and to make the building weather-tight and airtight as applicable; as indicated typically on the Drawings,

and as otherwise specified and instructed by Consultant. Refer to Caulking Schedule at the end of this section.

.2 Prime surfaces to receive sealants as required by substrate and manufacturer's specifications to ensure positive and permanent adhesion, and to prevent staining.

.3 Pack joints tightly with backer rod set at depth specified for sealant. Fill other voids with filler.

.4 Install joint backing material or apply bond breaker tape to achieve correct joint depth and prevent threesided adhesion. Install bond breaker tape in bottom of joints in lieu of sealant backing where proper depth cannot be obtained when backing is installed.

.5 Maintain depth of sealant as follows:
JOINT WIDTH JOINT DEPTH
6mm (minimum) 6mm
6 to 13mm depth = joint width
13 to 20mm depth = ½ joint width

.6 Maximum widths of joints are as follows:
.1 Exterior: 20mm.
.2 Interior: 10mm.

.7 Perform joint sealing in accordance with compound manufacturer's specifications, under manufacturer's supervision, and using pressure guns and other equipment as approved by the manufacturer.

.8 Finish joints with a full bead so that they are smooth; and free from ridges, wrinkles, air pockets and embedded foreign materials. Tool surface of joints to a slight concave profile.

.9 Caulk joints in site-painted materials after surfaces have been prime painted.

.10 Do not allow sealants to cover or spot surfaces outside of joints. Use masking tape protection to prevent coating of adjacent surfaces if necessary.

.11 All work shall be performed in accordance with manufacturer's specifications for sealants specified.

3.4 CLEANING

.1 Remove sealant smears and droppings, and masking tape immediately on completion of joint sealing.

.2 Do not use chemicals, scrapers, or other tools, which would damage surfaces from which excess compounds, or droppings are removed. Make good materials damaged by cleaning by the installer of the damaged material and at the expense of this Section.

3.5 CAULKING SCHEDULE

Sealant Type 1 or 2	Interior joints between dissimilar materials Interior joints at perimeter of all built-in equipment Interior joints at perimeter of metal door and window frames (custom colour)
Sealant Type 3	Interior non-movement joints 6mm or less for painting (painter's caulk)
Sealant Type 4	Interior joints where mildew resistance is required Interior joints at perimeter of all plumbing fixtures
Sealant Type 5	Perimeter of all gypsum board partitions where sound insulation is indicated.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

1.2 RELATED WORK

.1 Section 07 92 10 Joint Sealing
.2 Section 08 71 10 Door Hardware
.3 Section 08 80 50 Glazing
.4 Section 09 91 00 Painting
.5 Door and Screen Schedule

1.3 QUALIFICATIONS

.1 Execute work of this Section only by a Subcontractor who has adequate plant, equipment, and skilled workers 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 and is a member in good standing with the Canadian Steel Door & Frame Manufacturer's Association.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

.1 Construct fire rated doors, frames, and screens of ratings indicated, in accordance with validating label requirements, and as otherwise required by jurisdictional authorities.

.2 Ensure that hardware and installation meet requirements of NFPA No. 80, Standard for Fire Doors and Windows, as adopted by Canadian Underwriters' Association, where applicable.

.3 Doors, frames and screens indicated as labelled, shall meet all conditions of NFPA No. 80, for installation, and shall have attached ULC labels.

.4 Include all costs for testing and making modifications to doors and frames to achieve label requirements and to enable product to be label bearing for door and frame types indicated.

1.5 TOLERANCES

.1 Fabricated door deformation (bow, cup, twist, warp) shall not exceed 3 mm when measured with a straight edge placed diagonally across door extending from top to bottom.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

.2 Store doors in a secure dry location to ensure that they are not damaged until hung. Remove wrappings when finally stored in location secure from damage. Store doors vertically, resting on planks, with blocking between to allow air to circulate.

.3 Repair damage to finishes immediately it occurs to prevent rusting. Use zinc rich primer for painted surfaces.

2 PRODUCTS

1.1 ACCEPTABLE DOOR MANUFACTURERS

.1 Masonite HD Steel-Edge High-Definition Steel Entry Door, 2P Square with upper lite panel

.2 Stanley

2.2 MATERIALS

.1 Steel Sheet: Hot dip (wipe coat) galvanized cold rolled steel with stretcher level degree of flatness meeting the specified requirements of ASTM A526.

.2 Core Materials:
- .1 Interior doors excluding fire rated doors: honeycomb core of rigid, pre-expanded resin impregnated kraft paper having maximum hexagonal shaped shells of 25mm.
- .2 Exterior doors foam insulated.

.3 Finishing Materials:
- .1 Touch up paint: zinc rich paint to meet the specified requirements of CAN/CGSB-1.181-92.
- .2 Metal filler: two component epoxy type.

2.3 FABRICATION

.1 Generally:
- .1 Fit and assemble work in shop where possible. Make trial assembly in shop when not possible.
- .2 Fabricate, reinforce, and anchor component parts and assemblies to support loads that usage will impose without deflection detrimental to function, appearance, or safety. Provide structural steel vertical support for frames and screens as indicated on Drawings. Secure structural support to slab and structure above.
- .3 Reinforce components to resist stresses imposed by hardware in use.
- .4 Prepare frames and doors for specified hardware with mortises, and reinforcement. Provide steel reinforcement of 16 ga. for locks, strikes and flush bolts, and of 10 ga. for hinges, push-pulls, and panic devices. Drill and tap to template information. Reinforce for surface mounted hardware, and for door closer brackets and arms with 12 ga. steel. Install metal mortar guards of min. 22 ga. steel. Install metal mortar guards of min. 22 ga. steel at cut-outs for hardware in frames installed in masonry walls.
- .5 Provide for anticipated expansion and contraction of frames and supports.
- .6 Fit elements at intersections and joints accurately together, in true planes, and plumb and level.
- .7 Weld frame and door assemblies together. Weld continuously at joints exposed to view, or at joints through which air or water could penetrate from the exterior of building to the interior.
- .8 Where welding is impossible, connections may be bolted. Ream drilled holes and leave exposed edges clean and smooth.
- .9 Isolate from each other dissimilar metals, and metal from concrete or masonry to prevent electrolysis.
- .10 Two and three point latch hardware as supplied under the work of Section 08710, shall be shop fitted under the work of this Section.

.2 Frames and Framing Members:
- .1 Fabricate frames to details shown on Door Schedule and Details.
- .2 Fabricate steel frames in minimum thickness of 18 ga. unless otherwise specified indicated.

.3 Fabricate steel frames of 16 ga. for exterior frames, and for interior frames with doors over 1.07 m wide, or 2.18 m high, or both.

.4 Minimum frame material thickness applies only to frames not otherwise requiring heavier gauges to meet specified fire rated construction

.5 Where members join at corners, cut mitres and weld continuously along inside of section. Do not weld removable stop corners.

.6 Where tubular mullions meet frame members, join by butt welding.

.7 Attach two 18 ga. steel channel spreaders at bottom of door frames to maintain square alignment. Provide removable attachment for spreaders on frames and remove them after frames are built in.

.8 Incorporate head drips for exterior frame members. Fabricate of same gauge material as frame and continuously weld along head member of frame.

.9 Prepare frames, for single stud rubber door bumpers supplied as specified in Section 08710. Provide for three bumpers at single openings and two at double openings. Do not prepare frames for bumpers if door is fire rated or is an exterior door.

.10 Fasten removable stops by counter-sunk Phillips head screws at approximately 230 mm o.c. symmetrically spaced on stop length and maximum 50 mm from ends.

.11 Anchor frames to floor by 16 ga. angle clips, welded to frame and provided with two holes for floor anchorage.

.12 For frames in masonry walls, attach adjustable, Tee, wall anchors fabricated of primed steel in same gauge as frame. On each jamb provide: Three anchors for openings up to 2.28 m high, four anchors for openings from 2.28 m to 2.44 m high, and one anchor for each 610 mm or fraction thereof, of openings over 2.44 m high.

.13 For frames occurring in steel stud walls provide steel anchors of suitable design, for installation inside each jamb as follows: 4 anchors for frames up to 2.28 m height, 5 anchors for frames 2.28 m to 2.44 m, for frames over 2.44 m provide 5 anchors, plus one additional anchor for each 610 mm or fraction thereof.

.14 Secure frames set into previously constructed concrete or masonry openings by counter-sunk expansion bolts at same centres as for adjustable Tee wall anchors. Reinforce frame at fastening location to prevent indentation of frame by fastening device.

.15 For frames exceeding 3 m in length and installed in stud partitions, provide 12 ga. steel channel extension members, for lateral support. Weld extension members to top of frames and extend to underside of structure above, locate at 3 m o.c. maximum. Securely bolt extension members to structure above.

2.4 DOORS AND PANELS

.1 Acceptable Manufacturers

.1 Masonite HD Steel-Edge High-Definition Steel Entry Doors

.2 Stanley

.3 Approved equal as per Section 01 74 01 Common Product Requirements.

.2 Door Panel:

.1 Masonite HD steel-edge steel doors shall be fabricated using 4-piece construction that includes primed white 0.0215” (+/-0.0015) hot dipped galvanized strike side and hinge side steel facings, coated with multiple protective chemical layers to promote paint adhesion and deter corrosion. Top rail is finger jointed wood or steel channel. Composite bottom rail is moisture and decay resistant. Lock areas reinforced for single and double bore configurations. Door facings are to be interlocked together utilizing plastic thermal break forming a mechanical bond. Insulated core to be poured-in-place, high performance polyurethane foam (2.0 pcf minimum) forming a secure attachment to all door components.

.1 Bottom rail to be machined to accept factory installed weather seal. Mounting surface for latching hardware to be reinforced with solid internal blocking. Hinge preparations with 12 gauge reinforcement plate are to be placed at MASONITE specifications and are to be machined for standard weight full mortise 127 x 89 mmbutt hinges. Latch preparations are to be placed at MASONITE specifications.

.2 Glass Insert: Specialty insulated glass inserts shall be fabricated in 12mm double pane pane construction. Masonite glass finish “Pearl” privacy Glass frame may be “lip lite” design in rigid plastic or cellular vinyl.

.2 Minimum panel thickness applies only to doors not otherwise requiring heavier gauges to meet specified fire rated construction.

.3 Finish doors and panels with: factory prime

.4 Provide doors with 1.5 mm clearance at heads and jambs, and no more than 19 mm at floor, except fire rated doors shall be no more than 6 mm at floor. Provide clearance at floor with allowance made for intended finish flooring.

.5 Bevel edges of stiles to suit door swing.

.6 Locate hardware to manufacturer's standard unless shown otherwise on Drawings or Door Schedule.

.7 Fabricate removable stops and glass mouldings of minimum 20 ga. steel.

.8 Prepare doors to receive glass. Secure removable stops with countersunk Phillips head screws at approximately 450 mm o.c., 50 mm from each end, and symmetrically spaced on stop lengths.

2.5 FINISHING

.1 File and grind exposed welds smooth so that assemblies have appearance of one piece construction. Fill depressions with metal filler and finish smooth. Prime paint where galvanizing is removed by grinding or welding.

3 EXECUTION

3.1 EXAMINATION

.1 Take field dimensions of work upon which the work of this Section depends before fabrication. Field adaptation of work fabricated in error or without field check will not be allowed without Architect's approval.

3.2 INSTALLATION

.1 Pressed Metal Frames:

.1 Set up pressed metal frames for installation under the work of this Section. Supply frames for installation in gypsum board assemblies as specified in Section 09 21 16.

.2 Secure frames to floor construction with two fasteners at each jamb, and set and brace them securely to maintain true alignment until built in.

.2 Doors:

.1 Install doors only when work has progressed to a stage when no damage will occur to them in place.

.2 Hang doors to swing easily and freely on their hinges, to remain stationary in any position, and to close tightly and evenly on frames without binding.

3.3 ADJUSTMENT AND CLEANING

.1 Adjust doors to move freely, without excessive play and to fit accurately.

.2 Refinish damaged and defective work. Refinishing of exposed surfaces shall show no discernible variation in appearance.

.3 Clean work for specified finishing at completion of installation.

.4 Final cleaning is specified in Section 01 74 01.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide all wood doors, including:
- .1 Factory fabrication.
- .2 Factory prep for finish hardware.
- .3 Factory finishing.
- .4 Shipment to the site.

1.3 RELATED SECTIONS

.1 Installation and supply of Door Hardware Section 08 71 10

.2 Installation of Wood Doors Section 06 20 00

.3 Metal Doors and Frames Section 08 11 14

.4 Painting Section 09 91 00

.5 Door and Screen Schedule

1.4 REFERENCE STANDARDS

.1 AWI / AWMAC Quality Standards for Architectural Woodwork 2003.
.2 CAN4-S104-M80 (R1985); Fire Tests of Door Assemblies.
.3 CAN4-S105-M85 (R1992); Fire Door Frames.
.4 CAN/CSA-O132.2 SERIES-90 (R1998); CSA Standards for Wood Flush Doors.
.5 CSA-O115-M1982 (R2001); Hardwood and Decorative Plywood.
.6 CSA O112.6/O112.7-M1977, Resorcinol Resin Adhesive.
.7 CAN/CGSB-71.19-M88 Adhesive, Contact, Sprayable.
.8 CAN/CGSB-71.20-M88 Adhesive, Contact, Brushable.
.9 CAN/CGSB-11.3-M87; Hardboard.
.10 NFPA 80 – Fire Doors and Windows; National Fire Protection Association
.11 WDMA IS 1A; Wood Door Manufacturers Association Installation Standard.

1.5 SUBMITTALS

.1 Product Data
- .1 Manufacturer's specifications and technical data including the following:
  - .1 Detailed specification of construction and fabrication.
  - .2 Facing, core design and material, glue type, rails, and blocking for screw attached hardware.
  - .3 Details of construction, light and louver opening details, and glazing thickness.
  - .4 Indicate blocking for hardware attachment as applicable to each door type.
  - .5 Indicate lead thickness for lead lined doors.
- .2 Manufacturer's installation instructions.
- .3 Manufacturer's finishing instructions for field finished doors.
- .4 Manufacturer's recommendations for care and maintenance of doors.

.2 Shop Drawings: Provide the following information:
- .1 Door type,
- .2 Door size,

.3 Hardware types and locations,
.4 Hardware blocking requirements and location,
.5 Vision panel or louver cutout size and location, and
.6 Factory finish system.

.3 Samples:
.1 Colour Samples of Factory Finishing: submit samples not less than 102x152mm size labeled with sample production date, of representative finish indicating range of colour and variation that can be expected.
.2 Colour Samples of Factory Veneer: submit samples not less than 450x914mm size labeled with sample production date, of representative veneer across width of door, unfinished or primed as specified, for field finishing, indicating range and variation that can be expected.
.3 Construction Samples. Corner sections with door faces, edges, and core representative of the specified door type(s). Corner samples to be not less than 152x228mm.
.4 Field Quality Control Sample: Provide one extra full sized, non fire rated door panel to be randomly selected in field and cut apart to verify specified construction.

1.6 QUALITY ASSURANCE

.1 Material Qualifications
.1 Comply with requirements of AWMAC/AWI Quality Standards for material, fabrication, finishing, and installation except where otherwise indicated.
.2 Supply doors from one manufacturer for entire project.

.2 Field Quality Control
.1 Consultant will randomly select one door from most common type of door construction specified for destructive verification., or as listed below:

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Store and protect doors in accordance with manufacturer's recommendations.

.2 Store doors flat and off the floor on a level surface in a dry, well-ventilated building. Do not store on edge. Protect doors from dirt, water and abuse.

.3 Certain wood species are light sensitive. Protect doors from exposure to light (artificial or natural) after delivery.

.4 Do not subject interior doors to extremes in either heat or humidity. HVAC systems should be operational and balanced, providing a temperature range of 10-32°C and 30% to 50% relative humidity.

.5 When handling doors, always lift and carry. Do not drag across other doors or surfaces. Handle all doors (finished or unfinished) with clean hands or gloves.

1.8 EXTENDED WARRANTY

.1 Provide a Warranty certificate from the door manufacturer which binds the manufacturer to replace all doors found to have defects in factory workmanship or materials, or which warp more than 6mm out of plane, under normal use, for a minimum of five (5) years from the Date of Substantial Performance. Replacement doors shall bear same warranty from date of replacement.

.2 "Replace" as used herein, does not include hanging, installation or field finishing. This work shall be performed by the Contractor for the warranty period stipulated in the General Conditions of the Contract. If doors were originally supplied factory finished, manufacturer must supply replacement doors with same finish.

2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 Masonite Residential Doors

.2 Door-Lam Manufacturing of Ottawa, Canada.

.3 Lambton Doors

2.2 FLUSH DOORS

.1 Door Panel
.1 Masonite® Lincoln Park Interior Molded series doors shall be fabricated using loose lay-up assembly that include hardboard facings, for paint finish wood stiles, wood rails and mineral core. Door facings are to be bonded to stiles, rails and core forming a 3-ply attachment. Adhesives, Hot press Type I – Waterproof (UF Free).

.2 Hinges and Lockets
.1 Preparations to be machined to accept 127 x 89 mm hinges and specified lockets. Provide internal blocking as required.

.3 Solid Mineral Core to CAN/CSA-O132.2; 3ply bonded and sanded core construction with no voids.

.4 Acoustical Performance
.1 Unit scheduled for installation in opening requiring a specific noise control rating shall be clearly noted when product is ordered. 45mm thick Flush door with wood veneer facings and mineral core sound transmission class (STC) rating is 35.

.5 Factory Finish
.1 Primed MDF

2.3 FABRICATION

.1 Laminate 3-ply door facing, cross banding, and assembled core in a hot press.

.2 Reinforcing
.1 Top Rail: 127mm wide Solid Lumber or LSL.
.2 Bottom Rail: 127mm wide Solid Lumber or LSL.
.3 Centre Rail: 127mm wide x 254mm high Solid Lumber or LSL lock blocks.
.4 Through-bolting of hardware or accessories is not permitted.

.3 Factory-prefit and bevel doors (3°) to suit frame sizes indicated, with 4.76mm prefit in width, +0mm/ -0.79mm, tolerances. Prefit top of door 3mm +1.6mm/ -0mm, and undercut as designated by floor condition.

.4 Factory pre-machine doors for hardware that is not surface applied. Locations and hole patterns to comply with specified hardware requirements as per NFPA-80 standards for doors specified; and to maintain door manufacturer's warranty.

.5 Specific locations for hardware will be coordinated between frame and door manufacturers.

.6 Hardware preparations as per hardware schedule(s) provided by Section 08710. Hardware preparations to be neatly and cleanly squared as required per hardware templates.

3 EXECUTION

3.1 EXAMINATION

.1 Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

.2 Verify door frames are of type required and are installed as required for proper installation of doors.

.3 Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Comply with door manufacturer's recommendations, AWI/AWMAC Quality Standards, and WDMA IS-1.

.2 Install doors using hardware, including fasteners, and in strict conformance with hardware manufacturer's instructions as specified under Section 08710.

.3 Install fire rated doors and transoms in compliance with requirements of labeling agency, and NFPA 80.

.4 Coordinate installation of doors with installation of hollow metal frames specified under Section 08110.

.5 Coordinate installation of glass and glazing specified under Section 08800.

.6 Field Finishing
- .1 Trim door height by cutting bottom edge to not more than 19mm. Trim fire-rated door height at bottom edge only, in compliance with fire-rating requirements.
- .2 Trim non-rated door width by cutting equally between both jamb edges.
- .3 Pilot drill screw and bolt holes.

3.3 TOLERANCES

.1 Maximum Diagonal Distortion: 6mm measured with straight edge or taut string, corner to corner, over not more than 1066 x 2134mm surface area.

.2 Maximum Vertical Distortion: 6mm measured with straight edge or taut string, top to bottom, over not more than 1066 x 2134mm surface area.

.3 Maximum Width Distortion: 6mm measured with straight edge or taut string, edge to edge, over not more than 1066 x 2134mm surface area.

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services
- .1 Manufacturer's representative to visit the site at the beginning of installation and at completion of installation. Review initial installation and provide written comments as necessary.

.2 Door Fabrication Verification
- .1 Randomly select a door from most common specified type for destructive verification. In presence of Consultant, manufacturer’s representative, and door supplier, saw door into quarters to verify fabrication meets specification requirements.

3.5 ADJUSTING

.1 Remove and rehang doors, which do not swing or operate freely. If door cannot be made to operate properly, remove and install new door.

.2 Remove doors damaged during installation and install new doors.

.3 Refinishing
- .1 If field fitting of prefinished doors is required, refinish affected surfaces to match original factory finish as directed by the door manufacturer.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide prefabricated rated floor door.

1.3 SUBMITTALS

.1 Product Data: Submit manufacturer's product data.

.2 Shop Drawings: Submit shop drawings including profiles, accessories, location, adjacent construction interface, and dimensions.

.3 Warranty: Submit executed copy of manufacturer's standard warranty.

1.4 QUALITY ASSURANCE

.1 Manufacturer: A minimum of 5 years experience manufacturing similar products.

.2 Installer: A minimum of 2 years experience installing similar products.

.3 Manufacturer's Quality System: Registered to ISO 9001 Quality Standards including in-house engineering for product design activities.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.6 WARRANTY

.1 Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of five years from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

2 PRODUCTS

1.1 MANUFACTURER

.1 Basis-of-Design Manufacturer: Type S Roof Hatch by The BILCO Company, P.O. Box 1203, New Haven, CT 06505, 1-800-366-6530, Fax: 1-203-535-1582, Web: www.BILCO.com.

.2 Acceptable alternative manufacturers are Acudor Access Panels, Cendrex Access Doors and Precision Ladders.

1.2 CEILING HATCH

.1 Furnish and install where indicated on plans metal roof hatch Type S, size width: 36" (914mm) x length: 54" (1372mm). Length denotes hinge side. The roof hatch shall be single leaf. The roof hatch shall be pre-assembled from the manufacturer.

.2 Performance characteristics:

.1 Cover shall be reinforced to support a minimum live load of 40 psf (195kg/m^2) with a maximum deflection of 1/150th of the span and a maximum design pressure of +/- 100 PSF (488 kg/m^2) with a design factor of 2 for aluminum (Type S-50)/
.2 Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
.3 Operation of the cover shall not be affected by temperature.
.4 Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
.5 Aluminum (Type S-50) roof.

.3 Cover: Shall be 11 gauge (2.3mm) aluminum with a 3” (76mm) beaded flange with formed reinforcing members. Cover shall have a heavy extruded EPDM rubber gasket that is bonded to the cover interior to assure a continuous seal when compressed to the top surface of the curb.

.4 Cover insulation: Shall be fiberglass of 1” (25mm) thickness, fully covered and protected by a metal liner 18 gauge (1mm) aluminum].

.5 Curb: Shall be 12” (305mm) in height and of 11 gauge (2.3mm) aluminum. The curb shall be formed with a 3-1/2” (89mm) flange with 7/16” (11.1mm) holes provided for securing to the attic deck.

.6 Curb insulation: Shall be rigid, high-density fiberboard of 1” (25mm) thickness on outside of curb.

.7 Lifting mechanisms: Manufacturer shall provide compression spring operators enclosed in telescopic tubes to provide, smooth, easy, and controlled cover operation throughout the entire arc of opening and closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit, and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe [for aluminum construction: welded to the curb assembly; for steel construction: through bolted to the curb assembly].

.8 Hardware

.1 Heavy pintle hinges shall be provided
.2 Cover shall be equipped with a spring latch with interior and exterior turn handles
.3 Roof hatch shall be equipped with interior and exterior padlock hasps.
.4 The latch strike shall be a stamped component bolted to the curb assembly.
.5 Cover shall automatically lock in the open position with a rigid hold open arm equipped with a 1” (25mm) diameter red vinyl grip handle to permit easy release for closing.
.6 All hardware shall be zinc plated and chromate sealed.
.7 Cover hardware shall be bolted into heavy gauge channel reinforcing welded to the underside of the cover and concealed within the insulation space.

.9 Finishes: Factory finish shall be mill finish aluminum.

.10 Accessories

.1 Fixed aluminum ladder 24’ wide (610mm) with 2 ½ “ (63mm) aluminum (6005-T5) channel siderails and 2 ¼” (57mm) aluminum (6005-T5) serrated treads, with min. 3 aluminum wall brackets and complete with expandable aluminum ladder safety post.

.2 Fixed aluminum safety posts and rail around access door opening in attic.

3 EXECUTION

3.1 EXAMINATION

.1 Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

.1 Install products in strict accordance with manufacturer's instructions and approved submittals. Locate unit level, plumb, and in proper alignment with adjacent work.

.1 Test units for proper function and adjust until proper operation is achieved.
.2 Repair finishes damaged during installation.
.3 Restore finishes so no evidence remains of corrective work.

3.3 ADJUSTING AND CLEANING

.1 Clean exposed surfaces using methods acceptable to the manufacturer which will not damage finish.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide wall and ceiling mounted access doors.

1.3 RELATED SECTIONS

.1 Section 04 22 00 Concrete Unit Masonry
.2 Section 06 10 10 Rough Carpentry
.3 Section 09 21 16 Gypsum Board Assemblies
.4 Section 09 30 13 Ceramic Tiling
.5 Mechanical Divisions 21, 22, 23 and 25
.6 Electrical Divisions 26, 27 and 28

1.4 SUBMITTALS

.1 Provide manufacturer's data and independent test reports/approvals for all fire-rated access doors.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver all products to the site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

.2 Store products indoors in a clean, dry area, having environmental conditions acceptable to product manufacturer.

.3 Protect products from damage during storage and installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

.1 Acudor Products Inc., Fairfield NJ.
.2 APS Access Panel Solutions Inc., Victoria BC
.3 Nystrom Building Products Inc., Brooklyn Park MN.
.4 Williams Brothers Corporation of America, Front Royal VA.

2.2 MATERIALS

.1 Steel for Doors and Frames: 16 gauge, wipe-coat galvanized, commercial grade sheet steel.
.2 Screws: Zinc plated.
.3 Springs: Stainless steel.

.4 Gasket: Rubber.

.5 Door Inlay:
- .1 For Painted Gypsum Board Finish: Gypsum board to ASTM C36. Thickness shall be the same as on the wall or ceiling in which the access door is to be installed.
- .2 For Ceramic Tile Finish: Reinforced Cement Board to ANSI A118.9. Thickness shall be the same as on the wall or ceiling in which the access door is to be installed.

2.3 ACCESS DOOR TYPES

.1 Non-fire Rated for Gypsum Board Finish: recessed access door for walls or ceilings, for flush installation in gypsum board surfaces where required to conceal door panel. Door panel recessed to receive inlay. Door flange shall be fabricated as a textured galvanized steel taping bead with pre-punched holes; size 300mm x 300mm unless noted otherwise sizes as indicated;
- .1 DW-5015, by Acudor Products Inc.
- .2 Bauco Plus Series, by APS Access Panel Solutions Inc.
- .3 RW Series, by Nystrom Building Products Inc.
- .4 WB-RDW, by Williams Brothers Corporation of America.

2.4 FABRICATION

.1 General:
- .1 Manufacture each access door assembly as an integral unit ready for installation.
- .2 Recessed panel: Form face of the door to provide a recess for the application of the finish material. Reinforce the door as necessary to prevent sagging.
- .3 Furnish the number of latches necessary to hold the door in a flush, smooth plane when closed.

.2 Hinge: Concealed, two-point hinge, non-corroding that allows the door to open 120 degrees.

.3 Latches: self-latching, tamper-resistant, recessed head, cam latch.

2.5 FINISH

.1 Factory-applied primer. .

PART 3 – EXECUTION

3.1 INSTALLATION

.1 Install access doors plumb and square, and flush with finished ceiling, in accordance with manufacturer's instructions.

.2 Ensure adequate bracing is present for support of access panel frame. Provide additional support as required.

.3 Adjust operable parts for correct function.

3.2 LOCATION

.1 1 per Unit (3 required in total) located on second floor of each Unit as indicated on drawings.

END OF SECTION

1 General

1.1 GENERAL REQUIREMENTS

.1 Comply with requirements of Division 1.

1.2 PRE-START HEALTH AND SAFETY REVIEW

1.3

.1 Provide a Pre-Start Health and Safety Review in accordance with the Occupational Health and Safety Act (Ontario), Regulation 851, as amended.

1.4 WORK INCLUDED

.1 Restoration of the original single pane painted wood windows as identified on drawings.

.2 Supply and install of new exterior storm windows for all windows – restored and replicated.

.3 Supply and install of new replica one over one single pane painted wood hung windows to match the original windows in proportions, profiles, dimensions and materials, as identified on drawings.

.4 All work necessary for completion of work of this section, including but not limited to setting up of scaffolding, permits, authorization from utilities, protection of adjacent roof areas, etc. The cost associated with these items will not be paid for separately but will be considered incidental to work of this section.

.5 Where conflict exists in the scope of work, requirements, standards, or codes, the most stringent criteria shall apply.

.6 All work to be completed in accordance with the Health and Safety Guideline for Silica on Construction Projects by Occupational Health and Safety Branch of the Ministry of Labour.

1.5 REFERENCE STANDARDS

.1 ASTM International
.1 ASTM E 779-[10], Standard Test Method for Determining Air Leakage Rate by Fa Pressurization.
.2 ASTM E 1186 - [03(2009)], Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
.3 ASTM E 1827-[11], Standard Test Methods for Determining Air tightness of Buildings Using an Orifice Blower Door.
.4 ASTM E 2178 -[13], Standard Test Method for Air Permeance of Building Materials.

.2 Canada Green Building Council (CaGBC)
.1 LEED Canada-NC Version 1.0-[2004], LEED (Leadership in Energy and Environmental Design)Green Building Rating System Reference Package For New Construction and Major Renovations (including Addendum [2007]).

.3 CSA Group (CSA)
.1 CAN/CSA-A440 -[00 (R2005)] Windows.
.2 **CAN/CSA-A440.2-[14] /A440.3-[14]**, Energy Performance of Windows and Other Fenestration Systems / User Guide to CSA A440.2-[04], Energy Performance of Windows and Other Fenestration Systems

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Safety Data Sheets (SDS).

1.5 SEQUENCING

.1 Sequence work of this Section with work of Section 04 03 06, 04 03 07 and 06 20 00.
.1 Sequence work to suit scope of work specified:
.2 Protect adjacent masonry and finishes around the window.
.3 Remove window hardware.
.4 Remove and repair existing wood sashes as required
.5 Repair window frame and sill in situ, unless otherwise noted or found condition reviewed with Consultant

.6 Install restored window components or replica window in opening.
.7 Repaint wood where not painted in shop.
.8 Install new hardware.
.9 Restore affected exterior and interior elements.
.10 Install new exterior storm windows

1.6 **SUBMITTALS**

.1 Samples: glazing, replacement wood, replacement hardware (TBC), weather stripping.

.2 Shop drawing for exterior storm window, including all fastenings and replica window.

.3 Test and Evaluation Reports.
.1 Provide one copy of air leakage test evaluation reports.

.4 Submit window documentation (Inventory of original windows) prior to beginning work for review by the Consultant.

.5 Submit the information directly to the Consultant.

.6 Do not fabricate Work of this Section until shop drawings have been reviewed, and related submittals and samples as required by the specifications have been reviewed by the Consultant.

1.7 **CLOSEOUT SUBMITTALS**

.1 Record Documentation.

.1 Provide one copy of photographic documentation before, during and after the wood window repairs.
.2 Provide one copy of As-built drawings.

1.8 **MOCK-UPS**

.1 Construct mock-ups in accordance with Section 01 45 01 - Quality Control.
.1 Construct a full-size mock-up of the exterior storm window for typical one over one window, corner section of a replica window and a 1000mm length of arch frame.

.2 Provide minimum 2 working days' notice to Consultant prior to beginning mock-up.

.3 Undertake each initial step, from labelling, disassembly and surface preparation through repair and painting of mock-up under the direct review of the Consultant.
.1 Adjust techniques as directed by the Consultant until desired results are achieved.
.2 Techniques approved by Consultant.

.4 Provide 48 hours' notice for inspection of mock-up by Consultant.

.5 Obtain Consultant's written approval of mock-up before proceeding with the Work.

.6 When accepted, the approved mock-up will serve as the quality standard for this work.

.7 Approved mock-up may remain as part of finished work.

1.9 **QUALIFICATIONS**

.1 The wood window restoration and fabrication of new replica and exterior storm windows shall be completed by a company specializing in historic wood window restoration work with a minimum of ten (10) years proven experience for projects of similar size and complexity.

1.10 **DELIVERY, STORAGE AND PROTECTION**

.1 Storage and handling of dismantled components:
.1 Protect from weather.
.2 Ensure easy accessibility.

.3 Store together in logical groupings.
.4 Pad, support and stack sashes and frames. Prevent damage to components.
.5 Maintain component labels in good condition and securely attached to components until reinstallation.

.2 Packaging Waste Management.
.1 Separate and recycle/reuse pallets, crates, padding and packaging materials of products and systems in accordance with Section 01 74 03 - Waste Management and Disposal and the Waste Reduction Workplan, and the Waste Management Plan to the maximum extent economically possible.
.2 Separate corrugated cardboard in accordance with the Waste Disposal Plan and place in designated areas for recycling.
.3 Do not burn waste at project site.
.4 Fold up metal banding, flatten, and place in designated area for recycling.

1.11 WARRANTY

.1 The Contractor shall submit a warranty of the work of this section covering a period of not less than five (5) years from the date of Substantial Performance of the Contract. Substantial completion shall be determined by the Consultant and the Owner.

1.12 ENVIRONMENTAL REQUIREMENTS

.1 All work shall be performed in strict accordance with manufacturer's written requirements for all products specified in the specification.

.2 Should a conflict arise between the requirements of this section and the manufacturer's requirements, the more stringent requirements shall govern.

1.13 DESIGN CRITERIA

.1 Consultants Drawings:
.1 Details shown on drawings are schematic and show general arrangement and intent.

.2 This section is responsible for:
.1 The engineering design of all miscellaneous metal fabrications provided by this section.
.2 The design, positioning, sizing and configuration of all anchoring devices, clips, angles and the like.
.3 Providing means of compensating for unevenness and dimensional differences in the Work of others to which Work of this section is secured.

1.14 HAZARDOUS MATERIAL MANAGEMENT

.1 GLAZING OF EXTERIOR STORM WINDOWS

.1 Designated Substance and Hazardous Materials Survey completed by xxxxxxxxxxxxxx, 2023 identified hazardous material in window glazing of the exterior storms. Refer to report for method of abatement.

.2 LEAD-CONTAINING PAINT

.1 Designated Substance and Hazardous Materials Survey completed by xxxxxxxxxxxxxxx, 2023 identified hazardous material (Lead) in paint associates with the work of this section. Refer to Refer to report for method of abatement.

.2 General: All work that disturbs lead-containing paint (LCP), should be handled, transported and disposed, including residue in compliance with all applicable federal, provincial, and local laws and regulations for identification, removal, labeling, handling, containerization, transportation, and disposal of lead-containing material including, but not limited to, those referenced herein.

2. Products

2.1 GENERAL

.1 Coordinate and confirm all new exterior storm and replica window dimensions with actual measure of window openings.

.2 All reinforcing and connectors shall be in conformance with CSA A370.

.3 Reinforcing connectors shall be installed in accordance with the manufacturer's instructions.

.4 All reinforcing and connectors shall have a corrosion protection level of II as specified in CSA Standard A370.

.5 Fasteners: Comply with NWWDA requirements for fabrication; and with manufacturer's printed recommendations for type and size of installation fasteners except as follows:
.1 Zinc-coated or non-ferrous nails and screws for installation of wood window units.
.2 Nails, Spikes, and Staples: Size and type to suit application; non-ferrous metal or galvanized steel for exterior locations, high humidity locations, and treated wood.

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Air infiltration for primary sashes: CAN/CSA-A440.2/A440.3

2.3 EXISTING COMPONENTS

.1 Glazing: Retain, restore and store existing glazing for re-installation.

.2 Sashes: Retain, restore and store existing sashes for re-installation.

.3 Frame: Retain and restore in situ, protect as required until project completion.

2.4 WOOD

.1 Lumber shall be of sound stock, solid wood without finger joints or other joints within members, thoroughly seasoned, and kiln-dried to a moisture content not exceeding 12 percent for exterior and 8 percent for interior.

.2 Wood shall be free from defects or blemishes on surfaces exposed to view that will show after paints and finishes have been applied. Materials that do not comply with specifications for quality and grade, are in any way defective, or are otherwise not in proper condition will be rejected.

.3 For existing wood restoration the intent is that all existing woodwork will be repaired and replaced, where necessary. If required, new wood shall be used to replace the existing at the direction of the Consultant. All replacement material shall match the existing wood species, grade and cut.

.4 For new wood window frames use kiln-dried, Clear C select, eastern white pine: match existing profile, thickness and dimensions of the existing windows.

2.5 WOOD FASTENERS

.1 Screws: Corrosion resistant self-tapping #8 wood screws. Length to suit application – at least 2 times the thickness of wood being secured.

2.6 ADHESIVES

.1 Adhesive for Dutchman Repairs: two-part, low-viscosity liquid epoxy, designed for use with wood.

.2 Adhesive for Window manufacturing: exterior grade polyvinyl acetate glue

2.7 FINISHING

.1 Boiled linseed oil

.2 Exterior Clear Protective Coating: Minwax Water-based Helmsman Spar Urethane or approved alternative. Gloss finish.

2.8 HARDWARE

.1 Hardware. TBC
- .1 Stay bars.
- .2 Locks. Solid brass
- .3 Latches. Solid brass
- .4 Sash fasteners. Solid brass
- .5 Handles. Solid brass
- .6 Hinges. Solid brass
- .7 Pivots. Solid brass
- .8 Closing bars.
- .9 Glazing beads.
- .10 Cam fasteners.
- .11 Spring catches.
- .12 Sill pulls. Solid brass
- .13 Weather bars.
- .14 Water dams.
- .15 Spring.
- .16 Spiral.
- .17 Coiled tape.

2.9 GLASS

.1 New glass: 3mm, clear
- .1 Edge Quality:
  - .1 Flared or splayed edges are not acceptable - except for the end of score up to a maximum size of 3mm.
  - .2 Scallops, flakes, shells and chips are permitted up to a maximum of 3mm.
  - .3 ‘Shark’s teeth’ are not to extend to more than 50% of the thickness of the glass substrate.
  - .4 Shells are not acceptable.
  - .5 Broken corners are not permitted.

.2 Stained, distorted, blistered and/or scratched glazing is not acceptable.

.3 Existing glass replacement, if required will be completed with glass to match the existing glass being replaced.

2.10 PUTTY

.1 For restoration of leaded-glass window: traditional linseed oil putty

.2 Restoration and storm windows: traditional linseed oil putty

.3 Replica window glazed with butyl tape and wooden glazing stops.

2.11 WEATHER STRIPPING

.1 Spring bronze weather stripping.

.2 Copper or bronze nails.

2.12 ACCESSORIES

.1 Sash Chords: best quality, 100% cotton, sized to suit weight of sash, or chain if weight deems necessary.

.2 Non-corroding glazing points.

.3 Counterweight to meet window sash weight requirements. Options to be reviewed with the Consultant.

.4 Draftproofing: H.M. comfort seal system, or approved alternative.

.5 For caulking refer to Section 07 09 10 Joint Sealing.

2.13 CLEANING SOLUTION FOR GLAZING

.1 Neutral pH, non-ionic cleaning product, such as Orvus WA Paste by Procter and Gamble Professional.

2.14 FINISH

.1 Four coats of premium quality linseed oil-based paint on exterior work.

.2 One coat alkyd oil-based stain block primer on interior faces of sashes and box.

.3 Two top-coats latex to interior face of sashes and box.

.4 Refer to Section 09 91 00 Painting for product specification.

2.15 Component labels for:

.1 Wood components: sheet brass tag with hole at one end, punched with required component information, and secured to component with stainless steel wire.

.2 Glazing components: gasket paper and waterproof marker. Secured to component with tape that will not leave non-removable residue.

2.16 Transportation crates

.1 Prepare wood crates with padding for transporting window components to and from workshop.

.2 Fabricate crates from:
- .1 Lumber and plywood to suit.
- .2 Padding: ethafoam.
- .3 Fasteners to suit.

2.17 SHOP FABRICATION / REPAIR

.1 Manufacture new insulated plywood window plug to fit existing window openings.
- .1 Construct from 13 mm thick plywood.
- .2 Install rigid insulation as part of the plywood window plug.
- .3 Window plugs: to be removable from the inside only, weather tight and secured against wind and entry.

.2 Fabricate window components in accordance with approved shop drawings.

.3 Surface preparation of sashes. Remove paint products.
- .1 Conduct surface preparation in the shop.

.4 Make repairs of window units plumb, level, square and true.

.5 Existing Glazing Removal
- .1 Remove existing glazing lights from sashes and label.
- .2 Remove existing glazing putty, paint and corrosion products from sash.
- .3 Remove remnants of glazing putty with scrapers, chisels and razor blades as required.
- .4 Clean with specified product and absorbent cloths.
- .5 Replace broken glazing lights with new to match existing.
- .6 Replace glazing broken during removal procedures at own expense.

.6 Splicing in new material.
- .1 Cut out deteriorated wood sections as identified from the assessment with the Consultant.

.2 Splice in new wood sections to match profile of existing wood section.
.3 Shop fit parts before connecting and gluing.
.4 Corners of sashes.
.1 Mitre corners.
.2 Connect and dress corners.
.3 Stile, and rail joints: glue and plane smooth.

.7 Surface Voids.
.1 Fill surface voids with compounds formulated for wood.
.2 Repair damaged area with two-pack resin and hardener.

.8 New and existing glazing installation.
.1 Sand and clean rebates.
.2 Prime rebates with light coat of mix of equal parts of boiled linseed oil and turpentine. Allow to dry for 24 hours.
.3 Apply back putty to rebate.
.4 Bed glass firmly into position in rebate. Ensure it is evenly seated.
.5 Install glazing points.
.6 Neatly apply exterior putty bevel in line with edges of stiles and rails.
.7 Strike off excess putty.
.8 Allow putty to cure for minimum 3 weeks before shipping and painting. According to manufacturer's specifications.
.9 Prepare window components for transportation to site.
.1 Prepare [sashes][ventilators] with glazing stops temporarily installed.
.2 Separately prepare glazing for transportation.
.3 Pack repaired window components in crates and padding.
.4 Transport to site.

3. Execution

3.1 **PROTECTION**

.1 Protect all adjacent surfaces including masonry and landscaping from any damage resulting from work of this section.

.2 Prevent dust and fumes from entering the building.

3.2 **INSPECTION AND DOCUMENTATION**

.1 Examine the areas and conditions where window restoration is to be executed. Take all necessary field measurements. Notify the Consultant of conditions detrimental to the proper and timely completion of Work. Do not proceed until unsatisfactory conditions are corrected.

.2 Prior to fabrication review locations and installation methods for each window location with the Consultant and Owner to confirm placement, dimensions for units and to identify any unique details for individual windows. Consultant to provide sign-off of review prior to fabrication.

3.3 **PREPARATION**

.1 Photograph window sash, frame elements and hardware.

.2 Install temporary enclosures in accordance with Section 01 57 01 - Temporary Controls.

.3 Protect window frames with tarpaulins for duration of the Work.
.1 Protect from direct sun.
.2 Keep dry.

.4 Identify, label and photograph window sash and frame elements.
.1 Use same component designation as shown on Contract Drawings.
.1 Provide sufficient additional information: ensure component configuration and orientation is recorded on label.
.2 Record component label information on Contract Drawings.

.3 Labels: gasket paper marked with waterproof marker. Securely attach to component [on hidden surface].
.4 Metal components: ensure required component information is on sheet brass tag. Secure tag to component with stainless steel wire.
.5 Glazing components: ensure required component information is marked on gasket paper with waterproof marker. Securely attach to component [on hidden surface].

.5 Discuss with Consultant intended approach for removal of window sash, frame and hardware.
.1 Provide written methodology for approval by the Consutlant.

.2 Obtain Consultant's written approval of approach for removal of window frame and hardware.

.6 Notify Consultant before removing window sashes.
.1 Remove sashes from frame, label components, carefully pack in crates and transport to shop for repairs.

3.4 IN-SITU RE-FINISHING

.1 Paint Removal
.1 Remove existing paint with tools in the following order:
.1 Wire brush
.2 Wire wool
.3 Wet and dry

.2 Undertake minor repairs including:
.1 Fill of the surface voids.
.1 Fill surface voids with compounds formulated for wood.
.2 Apply patching compound. Build up surfaces [where indicated on Contract Drawings].
.3 Slope built-up surfaces away from glazing.

.3 Re-painting and refinishing in accordance with Section 09 91 00 Painting

.4 Keep moving parts and flexible components free from primer and paint.
.1 Prime and seal glazing putties.
.2 Apply one primer base coat to sashes and frame.
.3 Apply two topcoats to sashes and frame.

3.5 EXISTING WOOD FRAME REHYDRATION

.1 Sand finish off existing wood window elements to bare wood.

.2 Clean and prep wood for application of linseed oil where wood is dry and requires re-moisturizing prior to finish application. Allow for 2 coat application on 25% of the window elements.

.3 Linseed oil to cure for specified time as per manufacturer's instructions.

.4 Prep and apply 2 coats clear urethane finish, sanding prior to each application.

3.6 DISMANTLING EXISTING WINDOW SASHES

.1 General.
.1 Remove paint using scraping and stripping techniques
.2 Avoid damaging materials and finishes adjacent to the windows being dismantled.
.3 Avoid damaging material and window components.
.4 Avoid marring, crushing or splitting components.
.5 Minimize risk of breakage: reinforce panes of glass with vinyl adhesive tape on both sides.
.6 Remove interior stop and parting bead.
.7 Remove interior sash.
.8 Detach sash cords from sides of sash and pin (with a nail) or tie (in a knot) loose ends
.9 Carefully remove parting bead set in a groove in the center of stile.
.10 Remove upper sash.

.11 Remove glazing stops and glass panes from sash.
.12 Retain dismantled components for duration of the Work.
.13 Cover window openings with plywood sheathing as per specification item 2.16 while the sash are out for repair.

.2 Storage and handling of dismantled components.
.1 Protect from weather.
.2 Ensure easy accessibility.
.3 Store together in logical groups.
.4 Pad, support and stack sashes. Prevent damage to sashes.

.3 Removal of hardware and screws.
.1 Clean screw heads.
.2 Apply penetrating oil to screw heads 24 hours in advance of removal.
.3 Use only screwdrivers that exactly fit screw heads.
.4 Retain and store for restoration removed hardware and screws.

.4 Components let into a groove or mortise, such as parting strips.
.1 Carefully and neatly cut adjacent paint using a sharp chisel or knife. Avoid tear out.

.5 Extraneous fasteners.
.1 Nails requiring removal: cut or pull nail through the back of component. Do not drive nail through face of component.
.2 Remove and discard extraneous fasteners.

3.7 **CONFIRMATION OF SEALANT LOCATIONS FOR RE-INSTALLATION**

.1 Inside and outside perimeters of window frame.
.1 Confirm sealant locations for re-installation of window frame with Consultant during window removal process.
.2 Obtain Consultant’s approval for sealant locations.

3.8 **INSTALLATION OF TEMPORARY WINDOW**

.1 New insulated plywood plug:
.1 Manufacture insulated plywood plug to fit window opening as described in item 2.16

.2 Install new insulated plywood window plugs, as described in item 2.16 in window openings.
.1 Seal perimeter of plugs with strippable caulking

3.9 **REPAIR OF WINDOW AND DOOR FRAME**

.1 Restore existing wood sill with epoxy as directed in Section 06 20 00.

.2 Repair minor holes checks and small pockets of decay using epoxy in accordance with Section 06 20 00.
.1 Allow for epoxy repairs in 3 locations per window frame.

.3 Install spring bronze weather stripping at all operable window and door jambs and at header. Apply clear sealant to backside of weather stripping and nail with bronze or copper nails at 38mm o/c.

3.10 **SURFACE VOIDS**

.1 Fill surface voids with filler.

.2 Build up surfaces by applying patching compound.

.3 Repair damaged area with two-pack resin and hardener.

3.11 **SPLICING IN NEW MATERIAL**

.1 Material.

.1 Same wood species as existing parent wood component.
.2 Grain orientation to match existing parent wood component.

.2 Cut out damaged or deteriorated wood sections.

.3 Splice in new wood sections to match profile of existing wood section.

.4 Fit parts before connecting and gluing.

.5 Stile, rail and muntin joints: glue, plane and sand smooth.

3.12 **DUTCHMAN REPAIRS**

.1 Restore original profile and ensure proper fit of wood components:
.1 Repair damage in sashes and frames with Dutchman repairs.
.2 Employ Dutchman repairs only where wood is broken or missing.
.3 Areas with minor wear of wood are acceptable for re-use.

.2 Material.
.1 Same wood species as existing parent wood component.
.2 Grain orientation to match existing parent wood component.

.3 Joints.
.1 Ensure joints are tight and visible only on close inspection.
.2 Exterior exposed joints: weather tight, bevelled for moisture drainage to exterior.

.4 Application.
.1 Prepare damaged area of existing parent wood component for Dutchman repair.
.2 Cut out damaged and deteriorated wood sections.
.3 Splice Dutchman repair piece into parent wood component.
.4 Fit parts before connecting and gluing.
.5 Attach Dutchman repair piece to parent wood component only. Do not attach to adjacent wood component.
.6 Clamp repair piece in place until adhesive has set. Protect repair piece and other wood components from pressure marks.
.7 Avoid using surface fasteners.
.8 Larger Dutchman repairs:
.1 Fasten repair piece to parent wood component with stainless steel screws, size to suit.
.2 Countersink screw and fill hole with wood plug.
.3 Match grain orientation of wood plug to parent wood component.
.9 Stile, rail and muntin joints glue, plane and sand smooth.

3.13 **REPAIR OF SASH**

.1 Repair of Upper and Lower sash Stiles
.1 Cut out existing kerf and groove.
.2 Splice-in new wood Dutchman repair as described above.
.3 Cut in new kerf and groove: minimum size to suit hardware and weather stripping.

.2 Repair of bottom rail of lower hung sash
.1 Cut out existing kerf.
.2 Splice-in new wood Dutchman repair.
.3 Cut in new kerf: minimum size to suit weather stripping.

.3 Repair of meeting rails of hung sashes
.1 Cut back damaged existing wood.

.2 Splice-in new wood Dutchman repairs.

.4 Parting strips repair
.1 Repair groove for parting strips where required. Cut out existing damaged portions and splice in new

wood portions as required.

.2 Replace parting strips in pulley stiles.

.5 Existing Glazing.
.1 Remove existing glazing putty, paint and corrosion products from sash and frame.
.2 Remove remnants of glazing putty with scrapers, chisels and razor blades.
.3 Clean with acetone and absorbent cloths.
.4 Replace broken glazing lights with new 3 mm thick glass to match existing.
.5 Replace glazing broken during removal procedures at own expense.
.6 New glazing installation.
.1 Sand and clean rebates.
.2 Prime rebates with light coat of mix of equal parts of boiled linseed oil and turpentine. Allow to dry for 24 hours.
.3 Apply back putty to rebate.
.4 Bed glass firmly into position in rebate. Ensure it is evenly seated.
.5 Install glazing points.
.6 Neatly apply exterior putty bevel in line with edges of stiles and rails.
.7 Strike off excess putty.
.8 Allow putty to cure for minimum 3 weeks before shipping and painting. According to manufacturer's specifications.

3.14 **RE-PAINTING AND FINISHING**

.1 Perform re-painting and finishing of wood windows in accordance with Section 09 91 00 Painting.

3.15 **SASH WEIGHTS**

.1 Weigh pair of sash weights and weigh new upper sash. Ensure the combined weight of counterweights match the sashes to which they are attached.
.1 Ensure pair of sash weights is 0.9 kg. heavier than upper sash.
.2 Add or remove weight from pair of sash weights to achieve weight differential.

3.16 **INSTALLATION OF NEW JAMB EXTENSIONS**

.1 Install solid backing behind new jamb extensions.

.2 Bed new jamb extensions into small bead of paintable sealant.

.3 Fasten new jamb extensions at locations indicated on Contract Drawings.

.4 Use 50mm wood screws 75mm from each corner and 300mm on centre. Countersink and fill hole with wood plug. Wood plug to match grain orientation of new jamb extension.

3.17 **REPAIR OF MORTAR AND MASONRY BACKUP**

.1 Repair mortar and masonry back-up materials removed or disturbed during window removal.

.2 Build up mortar and masonry back-up materials in window opening to support re-installed window.

3.18 **RE-INSTALLATION OF SASHES**

.1 Install restored glazed upper and lower sashes with new weather stripping and associated trim such as weight pocket covers, parting strips and interior stops.

.2 Set units plumb, level and true to line.

.3 Ensure that lower sashes are operable for their full height.

.4 Seal upper sashes at sides and interior with latex caulking.

.5 Install weather-stripping an draft-proofing in accordance with manufacturer's written instructions.

.6 Install new interior storm sashes with new weather-stripping and hardware.

.7 Apply final paint top coat to sash.

.8 After painting and finishing, install and adjust restored hardware.

.9 Adjust sashes to operate smoothly in frames.

3.19 **SEALANT BEAD APPLICATION**

.1 Prime wood frame.

.2 Apply clean bead of sealant on primed frame.

.3 Install bond-breaker tape on operable sash.

3.20 **CAULKING**

.1 Apply sealant in accordance with Section 07 92 10 Joint Sealing.

.2 Install sealant between exterior window frames and sills and perimeter masonry.

.3 Apply sealant after re-installation of shop-repaired windows and before final topcoat of paint.

.4 Paint sealant.

3.21 **NEW STORM WINDOWS**

.1 Confirm exterior storm window glazing sizing and locations on site.

.2 Fabricate woodwork to dimensions, profiles, and details indicated.

.3 Before fabrication of woodwork to be fitted to other construction, obtain field measurements and verify dimensions and shop drawings detail as required for accurate fit.

.4 Install woodwork plumb and level without distortion.

.5 Shim as necessary with concealed shims.

3.22 **TRANSPORTATION OF RESTORED SASHES AND NEW STORM WINDOWS FROM SHOP TO SITE**

.1 Prior to packaging and transporting the restored and new windows back to site Consultant to perform shop review of finished product.

.2 Sash and new storm windows to be transported to site with extreme care to ensure no damage is incurred to the finish product. Transport in protective crates.

3.23 `**WOOD ELEMENT TOLERANCES**

.1 Tolerance on any face dimension is + or – 1 mm.

.2 Tolerance on thickness is + or – 1 mm.

.3 Maximum variation from true plane on flat surface is 0.8 mm.

.4 Maximum variation on edge straightness is 0.8 mm.

3.24 **PROTECTION**

.1 Until time of substantial completion protect all restored and new windows from damage or deterioration.

3.25 **CLEANING**

.1 When directed, or just before the Project is turned over to the Owner, remove dirt and other foreign material from finished surfaces and both sides of glass. Wash and polish glass on both sides.

.2 Restore major visual damage to finish in a manner to match the appearance and performance of the original finish.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

.3 The scope of work includes the removal of hardware from existing doors and its re-install on new replacement doors. The supply and installation of new weather seals at all exterior doors. The supply of door stops at all interior doors.

1.2 SECTION INCLUDES

.1 Provision of all labour and materials necessary to remove and re-install existing finish hardware and new hardware where noted.

1.3 RELATED SECTIONS

.1 Section 08 14 10 Flush Wood Doors
.2 Re-wiring of existing electric locks, strikes, etc. Division 26

1.4 REFERENCE STANDARDS

.1 Canadian Metric Guide for Steel Doors and Frames; Canadian Steel Door and Frame Manufacturers' Association.
.2 ANSI/DHI A115.1G-94; Installation Guide for Doors and Hardware.
.3 CAN/CGSB 69.18-M90/ANSI/BHMA-A156.1-2000; Butts & Hinges.
.4 ANSI/BHMA-A156.2-1996; Bored & Preassembled Locks & Latches.
.5 CAN/CGSB 69.20-M90/ANSI/BHMA-A156.4-2000; Door Controls – Closers.
.6 CAN/CGSB 69.21-M90/ANSI/BHMA-A156.5-2001; Auxiliary Locks.
.7 CAN/CGSB 69.22-M90/ ANSI/BHMA-A156.6-2001; Architectural Door Trim.
.8 CAN/CGSB 69.23-M90/ ANSI/BHMA-A156.7-2003; Hinge Templates.
.9 CAN/CGSB 69.24-M90/ ANSI/BHMA-A156.8-2000; Door Controls - Overhead Holders and Holders.
.10 CAN/CGSB 69.28-M90/ ANSI/BHMA-A156.12-1999; Interconnected Locks & Latches.
.11 CAN/CGSB 69.29-93/ ANSI/BHMA-A156.13-2002; Mortise Locks & Latches.
.12 CAN/CGSB 69.32-M90/ ANSI/BHMA-A156.16-2002; Auxiliary Hardware.
.13 CAN/CGSB 69.33-M90/ ANSI/BHMA-A156.17-1999; Self Closing Hinges & Pivots.
.14 CAN/CGSB 69.34-93/ ANSI/BHMA-A156.18-2000; Materials & Finishes.
.15 CAN/CGSB 69.37-93/ ANSI/BHMA-A156.21-2001; Thresholds.
.16 ANSI/BHMA-A156.22-2003; Gasketing and Edge Seal Systems.

1.5 QUALITY ASSURANCE

.1 Installers
  .1 Hardware Installers must have a minimum of five (5) years experience in installation of hardware. The Contractor shall provide verification of installer’s qualification to the Consultant for approval. Installers to attend all review meetings with the Hardware Supplier and Distributor.

.2 Pre-installation Meeting
  .1 Convene a pre-installation meeting for the work specified in this section. Attendees must include, as a minimum, representatives of the following:
    .1 Contractor (Site Superintendent & Project Manager)
    .2 Installation Subcontractor (Site Foreman & Project Manager)
    .3 Related Subcontractors (ie. Electrical, Security Systems)
    .4 Consultant

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

.1 Products listed below are acceptable for use in finishing hardware groups specified in this section:

Hardware Item	Acceptable Manufacturers
Locksets	Assa Abloy
Overhead door holders / stops	Glynn-Johnson, Rixson, Dorma
Wall / floor stops	Canadian Builders Hardware, Ives, Gallery
Weather / smoke / sound seals	KN Crowder, National Guard, Pemko
Door sweeps / thresholds	KN Crowder, National Guard, Pemko

2.2 MATERIALS

.1 Supply all hardware with necessary screws, bolts or other fastening devices to anchor hardware in position neatly and properly in accordance with best practices.

.2 Only products listed in the hardware schedule or the approved alternates noted in the following list are to be used on this project.

.3 Use one manufacturer's products only for all similar items.

.4 All existing exterior doors shall be fitted with complete new perimeter weather seals.

2.3 FASTENINGS

.1 Supply all required bolts, screws, expansion shields, anchors, and other related accessories for satisfactory attaching or installing of all finish hardware.

.2 Exposed fasteners shall match finish of, and be of compatible material with hardware.

.3 Where push/pull hardware is scheduled, door pull must be through-fastened and have fasteners concealed by push plate on opposite side.

2.4 DOOR SEALS

.1 Supply perimeter seals to fully cover all gaps between door, frame, and floor condition to seal against weather, sound, or smoke as required and scheduled.

.2 Frame gaskets shall be closed cell neoprene. Extruded housing must have a rib to prevent distortion during installation. Aluminum frames will be provided with weather stripping inserts by the frame supplier.

.3 Door bottoms will be heavy-duty and have an adjustment screw to ensure proper contact with flooring. Supply correct drop insert for carpet where required.

2.5 THRESHOLDS

.1 Supply extruded aluminum thresholds to ensure the sweep or door bottom makes full contact. Supply thermally broken thresholds for all exterior door openings.

.2 Threshold height shall not exceed 13mm for barrier-free path of travel.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Ensure that doors and frames are properly prepared and reinforced to receive finish hardware prior to installation.

.2 Ensure that door frames and finished floor are sufficiently plumb and level to permit proper engagement and operation of hardware.

.3 Submit to Consultant in writing a list of deficiencies determined as part of inspection required in 3.3.1 and 3.3.2, prior to installation of finished hardware.

3.2 INSTALLATION

.1 Install hardware to ANSI/DHI-A115.1G.

.2 Reinstall existing hardware at mounting heights to match existing heights.

.3 Other trades installing hardware must follow all manufacturers' instructions including door closer adjustment, handing of locksets as required, and degree of door swing.

.4 Hardware Distributor will include all labour to terminate secondary low voltage wire runs at all door control devices supplied by this section, including but not limited to; door operators, magnetic locks, push button code entry units (keypads), request to exit switches, electric strikes and any associated electrical equipment. Ensure system is tested and complete for Owner's use. Provide staff training for push button code system (keypads) including all programming function and maintenance.

3.3 FIELD QUALITY CONTROL

.1 Perform bi-monthly on-site inspections during hardware installation and provide inspection reports listing progress of work, unacceptable work and corrective measures. Repair or replace as directed by the Consultant.

.2 Upon completion of hardware installation, arrange with the Owner to instruct the Owner's personnel in the proper operation, adjustment, and maintenance of all finish hardware supplied under this Contract.

3.4 ADJUSTING AND CLEANING

.1 Check and make final adjustments to each operating item of hardware on each door to ensure proper operation and function.

.2 All hardware to be left clean.

.3 Check all locked doors against existing card security system.

3.5 PROTECTION

.1 Protect hardware from damage during construction period by removing and reinstalling or where necessary.

3.6 HARDWARE SCHEDULE

.1 Refer to Hardware Schedule.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide automatic power door operator systems including the following:
- .1 Operator equipment
- .2 Control system
- .3 Activation devices

1.3 RELATED SECTIONS

.1 Flush Wood Doors Section 08 14 10

.2 Power Supply Division 23

1.4 REFERENCE STANDARDS

.1 Aluminum Association (AA); DAF-45, Designation System for Aluminum Finishes.

.2 American Architectural Manufacturers Association (AAMA); Aluminum Curtain Wall Design Guide Manual.

.3 ASTM B209-01; Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 CSA-G40.21; Structural Quality Steels

.5 CAN/CSA G164-M92 (R1998); Hot Dip Galvanizing of Irregularly Shaped Articles.

.6 CAN3-S157-M83 (R2001); Strength Design in Aluminum.

.7 CSA W59.2-M1991 (R1998); Welded Aluminum Construction.

.8 CAN/CGSB-69.26-96/ANSI/BHMA A156.10-1991; Power-Operated Pedestrian Doors.

.9 CAN/CGSB-69.35-M89/ANSI/BHMA A156.19-1984; Power Assist and Low Energy Power-Operated Doors.

.10 CAN/ULC-S533-2002; Egress Door Securing and Releasing Devices.

1.5 SYSTEM DESCRIPTION

.1 Designed for low energy applications, surface mounted, automatic swing door operator consists of aluminum operator housing, A.C. electro-hydraulic motor, operator assembly, wiring harnesses, swing arm and electronic control.

.2 Power Open: Automatic door operator powers the door open by forces transmitted hydraulically to the drive shaft and maintains a constant engagement throughout the opening cycle. Both opening and closing speed are field adjusted per current ANSI 156.19. Automatic door system is self-contained, requiring no remote pumps, exterior piping or compressors. The operator shall be equipped with a hydraulic bypass (relief valve), to divert fluid back to a reservoir to prevent motor overload if the door is restricted during opening cycle. Automatic door system functions as a manual door closer in the

event of a power failure. Manual opening force is unaffected by opening speed adjustment. Manual force to open the door will not exceed 15 pounds, measured 25mm in from latch edge of door.

.3 Spring Close: The automatic door operator is spring closed. The spring is non-handed and returns the door to full close.

1.6 SUBMITTALS

.1 Shop Drawings
- .1 Submit shop drawings in accordance with Section 01 33 01.
- .2 Indicate on shop drawings, layout, dimensions, elevations, detail sections of members, materials, finishes, hardware including mounting heights, anchors and reinforcement, provisions for expansion, and other pertinent information.

.2 Maintenance Data
- .1 Provide complete operation and maintenance data for inclusion in Operations and Maintenance Manual. Include spare parts list.
- .2 Include manufacturer's parts lists, servicing frequencies, instructions for adjustment and operation applicable to each component.
- .3 Include name, address and telephone number of nearest authorized service representative.

1.7 QUALITY ASSURANCE

.1 Installation
- .1 Installation of power door operators shall be performed by a company which is a certified installer of the manufacturer, for both installation and maintenance, and with minimum five (5) years documented servicing and installing experience. Submit documentation.

.2 Pre-installation Meeting
- .1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
  - .1 Contractor,
  - .2 Installation Subcontractor (Site Foreman & Project Manager),
  - .3 Product Manufacturer and/or Distributor (Technical Representatives),
  - .4 Related Subcontractors (ie. Electrical), and
  - .5 Consultant.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Deliver materials to site protected from damage.

.2 Store materials in clean, dry area indoors in accordance with manufacturer's instructions.

.3 Protect materials and finish from damage during handling and installation.

1.9 MAINTENANCE SERVICE

.1 Manufacturer shall provide central-dispatch maintenance service available 24 hours per day, 365 days per year for maintenance service during the Contract Warranty period.

.2 Toll free phone number shall be prominently displayed on header of each operator.

2 PRODUCTS

2.1 MANUFACTURERS

.1 The following products and manufacturers are acceptable:
- .1 Type 1 Dormakaba Automatics Canada, ED 100 Series compact door operator with cover extension to match full width of door(s). (all washroom doors as noted in Door Schedule)

- .2 Type 2 Dormakaba Automatics Canada, ED 250 Series compact swing door operator with cover extension to match full width of door(s). (all exterior and vestibule doors as noted in Door Schedule)

2.2 MATERIALS

.1 Aluminum: Extrusions of minimum 3mm thick, Alcan 6061-T6 alloy for structural members, 6063-T5 for non-structural members.

.2 Screws, bolts and fasteners: where used with aluminum shall be of 300 series stainless steel or 400 series stainless steel cadmium plated.

.3 Steel Reinforcement: to CAN/CSA-G40.21, grade 300W.

2.3 AUTOMATIC SWING DOOR OPERATORS

.1 Operator: Electro-hydraulic type, self-contained operator, powered by a 1/6 HP motor. Operator is non-handed. The operator housing provides a seal against dust, dirt and moisture.

.2 Electronic Control: A self-contained, solid-state integrated circuit controls the operation and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. No external or auxiliary low voltage power source will be allowed. The controls include time delay (5 to 30 seconds) for normal cycle.

.3 Connecting Hardware: Surface-mounted operator is connected to the door by means of a steel door arm. doors, 1/4-20 binding head and post screws (sex bolts) for wood and hollow metal doors. Knurled door arm adaptor Door arm is secured to the top rail of the swing door using one piece threaded tubular inserts for
aluminum
is broached for positive engagement with shaft.

.4 Activation

.1 Wall Switches: Recessed push-button wall switches, with steel back-boxes and stainless steel push buttons engraved with standard barrier-free logo.

.2 Frame Switches: Recessed jamb-mounted push buttons.

.3 Provide activation devices as indicated on the drawings and in the door and frame schedule.

2.4 ELECTRICAL CHARACTERISTICS

.1 Nominal current draw 222 watts (1.85 amps at 120V AC). Motor shall draw 672 watts maximum. Electric motor shall be equipped with a built-in thermal overload protection, and shall not exceed 10 amps current draw.

.2 Provide two low-voltage 18 gauge stranded wires (per operator) from each automatic operator to remote activation devices.

2.5 FINISHES

.1 Finish: Clear Anodized, Class I to AA DAF-45-M12C22A44.

2.6 FABRICATION

.1 Fabricate units square and true with maximum tolerance of plus or minus 1.5mm for units with a diagonal measurement of 1800mm or less and plus or minus 3mm for units with a diagonal measurement over 1800mm.

.2 Provide all internal reinforcing as required for the proper structural design and support of the framing system.

.3 All joints shall be accurately machined, and assembled to provide neat joints.

3 EXECUTION

3.1 INSTALLATION

.1 Install power door operators in accordance with reviewed shop drawings and manufacturer's printed instructions, including controls, wiring, and all activation devices.

.2 Coordinate installation of components with related and adjacent work.

.3 Set work plumb, square, level, free from warp, twist and superimposed loads.

.4 Securely anchor work in required position.

.5 Apply isolation coating to separate aluminum and primed or galvanized steel surfaces at points of contact with cementitious materials.

3.2 SEALANT APPLICATION

.1 Comply with requirements of Section 07 92 10 for sealants, fillers and gaskets to be installed during installation of doors and frames.

.2 Conceal sealant within aluminum work except where exposed use is permitted by Consultant.

.3 Set sill members in bed of sealant.

3.3 ADJUSTING

.1 After repeated operation of completed installation equivalent to three days of use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum, smooth operating condition and safety and for weather tight closure. Lubricate hardware, operating equipment and other moving parts.

.2 Adjust doors to provide tight fit at contact points with enclosure.

3.4 PROTECTION OF FINISHED WORK

.1 Protect finished installation until time of final cleaning and inspection.

.2 Leave all factory installed protective films in place until time of final cleaning.

3.5 FINAL CLEANING

.1 Clean aluminum surfaces promptly after installation. Exercise care to avoid damage to coatings.

.2 Remove protective material from prefinished aluminum surfaces.

.3 Wash exposed surfaces with mild solution of detergent and warm water, using soft, clean wiping cloths. Remove dirt from corners. Wipe surfaces clean.

.4 Remove excess sealant by moderate use of solvent, of type acceptable to sealant manufacturer.

3.6 DEMONSTRATION

.1 Demonstrate operation, operating components, adjustment features, and lubrication requirements to Owner.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide glass and glazing for:
- .1 Interior doors and screens,
- .2 Exterior doors, and screens,
- .3 Exterior windows,

.2 Section includes but is not limited to the provision of:
- .1 Glass
- .2 Glazing sealants, gaskets, tapes, and backing materials
- .3 Miscellaneous glazing materials necessary to complete the work of this section

1.3 RELATED SECTIONS

.1 Joint Sealants Section 07 92 10
.2 Metal Doors and Frames Section 08 11 14
.4 Flush Wood Doors Section 08 14 10
.5 Windows Section 08 50 50
.6 Frameless Doors and Screens Section 08 44 30

1.4 REFERENCE STANDARDS

.1 ANSI/ASTM E330-90; Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
.2 ASTM C509-01; Standard Specification for Elastomeric Cellular Gasket and Sealing Material.
.3 ASTM C542-94(1999); Specification for Lock-Strip Gaskets.
.4 ASTM C864-99; Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
.5 ASTM C920-01; Specification for Elastomeric Joint Sealants.
.6 ASTM C1115-00; Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
.7 ASTM C1311-95; Specification for Solvent Release Sealants.
.8 ASTM D2240-91; Test Method for Rubber Property - Durometer Hardness.
.9 ASTM E84-91a; Test Method for Surface Burning Characteristics of Building Materials.
.10 ASTM F1233-92; Test Method for Security Glazing Materials and Systems.
.11 CAN/CGSB-12.1-M90; Tempered or Laminated Safety Glass.
.12 CAN/CGSB-12.3-M91; Flat, Clear Float Glass.
.13 CAN/CGSB-12.5-M86; Mirrors, Silvered.
.14 CAN/CGSB-12.8-M90; Insulating Glass Units.
.15 CAN/CGSB-12.9-M91; Spandrel Glass.
.16 CAN/CGSB-12.11-M90; Wired Safety Glass.

.17 CAN/CGSB-12.20-M89; Structural Design of Glass for Buildings.
.18 Flat Glass Manufacturers Association (FGMA) Glazing Manual.
.19 Laminators Safety Glass Association Standards Manual.

1.5 PERFORMANCE REQUIREMENT

.1 Provide continuity of building enclosure vapour and air barrier using glass and glazing material as follows:
  .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to a design pressure measured in accordance with the Ontario Building Code and CAN/CGSB-12.20.

.3 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.

.4 Provide thermal stress analysis for all single glazed lites and all sealed glass units. Make recommendations for additional heat treatment, thickness change, or other required modifications prior to ordering of materials or manufacture of sealed glass units.

1.6 SAMPLES

.1 Submit 300mm x 300mm samples of all tinted, coated, and surface treated glass in accordance with Section 01300.

1.7 QUALITY ASSURANCE

.1 Applicator Qualifications
  .1 Work of this section shall be performed by applicators having a minimum of 5 years documented experience in the installation of commercial glass and glazing. Submit proof of experience to Consultant.

.2 Installation
  .1 Work shall be performed in strict accordance with manufacturer's printed instructions, and in accordance with all warranty requirements.

.3 Pre-installation Meeting
  .1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
    .1 Contractor (Site Superintendent & Project Manager),
    .2 Installation Subcontractor (Site Foreman & Project Manager),
    .3 Product Manufacturer and/or Distributor (Technical Representatives),
    .4 Related Subcontractors, and .5 Consultant.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Install glazing when ambient temperature is 10°C minimum. Maintain ventilated environment for 24 hours after application.

.2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 MAINTENANCE DATA

.1 Provide maintenance data including cleaning instructions for incorporation into Operations and Maintenance manual.

1.10 EXTENDED WARRANTY

.1 Provide sealed glass unit manufacturer's warranty certificate stating that the factory-sealed insulating glass units specified under this section are guaranteed against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision, for a period of ten (10) years from the Date of Substantial Performance.

PART TWO – PRODUCTS

2.1 FLAT GLASS

.1 **GL 1 – Plain Glass**; Float glass to CAN/CGSB-12.3, glazing quality, clear 3mm thick.

.2 **GL2 - Safety Glass**;

.1 Type 2A: Tempered to CAN/CGSB-12.1, clear, 6mm thick, with visible after-installation factory-applied permanent impression in one corner which identifies each pane as tempered.

. .5 **GL3: Sealed Insulating Glass Unit**

.1 Insulating glass units: to CAN/CGSB-12.8, double unit, 18mm overall thickness.

.1 Glass thickness: 3mm clear tempered.

.2 Inter-cavity space thickness: 12mm, black spacer, Argon filled.

.3 Glass thickness: 3mm clear tempered.

2.2 GLAZING MATERIALS

.1 Setting Blocks: EPDM or Neoprene, 80 – 90 (Shore A) durometer hardness to ASTM D2240, to suit glazing method, glass weight, and area.

.2 Spacer Shims: EPDM or Neoprene, 50 – 60 (Shore A) durometer hardness to ASTM D2240, 75mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing Tapes

.1 Compression: 100% solids, preformed macro-polyisobutylene/butyl rubber with integral syntheic rubber spacing rod; coiled on release paper; size as required for frame stop heights; POLYSHIM II, by Tremco.

.2 Non-compression: 100% solids, preformed butyl rubber to ASTM C1281, 66 (Shore 00) durometer hardness to ASTM D2240; coiled on release paper; size as required for frame stop heights; Tremco 440 tape.

.3 Spacer for Structural Glazing Systems: high density closed cell urethane foam tape; coiled on release paper; size as required for frame stop heights; Tremco SGT-900 Series Structural Foam Tape.

.4 Glazing Gaskets

.1 Dense Gaskets for Compression Glazing

.1 Extruded from ozone-resistant compound, resistant to sunlight, weathering, oxidation and permanent deformation under load. Gasket Configuration shall provide for mechanical engagement with the metal. Gaskets shall meet either ASTM C-864 Option II, or ASTM C-1115 Type C (for silicone compounds).

.1 Dense Neoprene extrusions: Tremco Incorporated, 50, 60 and 70 durometer hardness.

.2 Dense EPDM extrusions: Tremco Incorporated, 40, 50, 60 and 70 durometer hardness.
.3 Dense SCR-900 extrusions: Tremco Incorporated, 60 and 70 durometer hardness.
.4 Dense Silicone extrusions: Tremco Incorporated, 40, 60 and 70 durometer hardness.

.2 Cellular Gaskets for Compression Glazing:
.1 Extruded from ozone-resistant compound, resistant to sunlight, weathering, oxidation and permanent deformation under load. Gasket configuration shall provide for mechanical engagement with the metal. Gaskets shall meet ASTM C-509 Option II.
.1 Cellular extrusions: Tremco Incorporated, Closed Cell Neoprene extrusions.
.2 Cellular extrusions: Tremco Incorporated, Closed Cell EPDM extrusions.

.5 Glazing Sealants
.1 Cap Beads
.1 Commercial Glazing: single or multi-component, non-acid curing silicone sealant to ASTM C920;
.1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.

.2 Heel and Toe Beads
.1 Commercial Glazing: single or multi-component, non-acid curing silicone sealant to ASTM C920;
.1 One part medium modulus silicone sealant; equivalent to Tremsil 600, by Tremco.

.3 Perimeter Seals
.1 Single or multi-component, elastomeric sealant to ASTM C920;
.1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.

.4 Metal Expansion Seals
.1 Single or multi-component, non-acid curing silicone sealant to ASTM C920;
.1 One part, low modulus, silicone sealant; equivalent to Spectrem 1, by Tremco.

.5 Metal to Metal Joinery Seals
.1 Single or multi-component, non-acid curing silicone sealant to ASTM C920;
.1 One part medium modulus silicone sealant; equivalent to Tremsil 600, by Tremco.

.6 Concealed Splice Sleeve Conditions
.1 Single component, non-drying, non-skinning synthetic rubber sealant;
.1 One part synthetic rubber; equivalent to Tremco Curtain Wall Sealant, by Tremco.

.7 Structural Glazing Tensile Bead
.1 Single or multi-component, non-acid curing silicone sealant to ASTM C920 and ASTM C1184;
.1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.
.2 Two part high-modulus silicone; equivalent to Proglaze II, by Tremco.

.8 Structural Glazing Weather Bead
.1 Single or multi-component, non-acid curing silicone sealant to ASTM C920;
.1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.
.2 Two part high modulus silicone; equivalent to Proglaze II, by Tremco.

.9 Butt Glazing Bead
.1 Single or multi-component, non-acid curing silicone sealant to ASTM C920;
.1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.

.2 Two part high modulus silicone; equivalent to Proglaze II, by Tremco.

2.3 GLAZING ACCESSORIES

.1 Glazing Clips: manufacturer's standard type.

.2 Mirror Attachment: Mirror adhesive, chemically compatible with mirror coating and wall substrate.

2.4 SEALED GLASS UNIT FABRICATION

.1 Fabricate sealed glass units through the Insulating Glass Manufacturers Association of Canada Certification Program to CAN/CGSB 12.8. Sealed units shall bear IGMAC Certified Products List number and be properly identified.

.2 Perimeter Seal shall consist of three components; a "Warm Edge" spacer manufactured in continuous lengths, to window configuration, a desiccant (drying agent), a primary polyisobutylene seal between spacer and glass sheets, and a secondary two-part silicone or polysulfide perimeter seal.

.3 Gas fill with Argon to manufacturer's specifications after completion of sealed unit fabrication.

PART THREE – EXECUTION

3.1 EXAMINATION

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

.1 Clean contact surfaces with solvent recommended for use by the sealant manufacturer, and wipe dry thoroughly.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 EXTERIOR GLAZING

.1 Aluminum Frames - Tape / Gaskets
- .1 Cut glazing tape to length and set against permanent stops, level with sight line. Seal corners by butting tape and dabbing with sealant.
- .2 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
- .3 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
- .4 Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
- .5 Install removable stops with gaskets inserted between glazing and applied stops.

3.4 INTERIOR GLAZING

.1 Wet Method - Sealant / Sealant

.1 Install glazing resting on setting blocks. Install applied stop and centre light by use of spacer shims at 600mm centres, 6mm below sight line.
.2 Locate and secure glazing light using spring wire clips or glazers' clips.
.3 Fill gaps between glazing and stops with glazing sealant until flush with sight line. Tool surface to straight line.

.2 Steel Frames - Tape / Sealant
.1 Cut glazing tape to length and set against permanent stops, 3mm below sight line. Seal corners by butting tape and dabbing with sealant.
.2 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
.3 Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
.4 Install removable stops with spacer strips inserted between glazing and applied stops below sight line. Place glazing tape on glazing light or unit with tape 6mm below sight line.
.5 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 6mm below sight line.
.6 Apply cap bead of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 CLEANING & PROTECTION

.1 During installation, remove all corrosive or foreign materials or droppings resulting from work of this trade.

.2 Perform initial cleaning operation of all glass and mirrors upon completion of installation. Do not remove labels or protective films until time of final cleaning.

.3 After initial cleaning, mark large lites with an "X" by using removable plastic tape. Do not use masking tape. Do not mark heat absorbing or reflective glass units.

.4 Provide instructions for the proper method and materials to be used in the cleaning and maintenance of finished surfaces. Remove all remaining labels and protective films at time of final cleaning.

3.6 GLAZING SCHEDULE

LOCATION	GLAZING TYPES (S)
Glass replacement existing heritage windows and doors	GL1
Interior vestibule doors and lights D101A, D103A, D009A	GL2
Exterior doors and lights D101, D103, D009	GL3

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

.1 Install fire separations and fire protection exactly as specified in test design specification Design No. W407 that validates the specified rating. Verify that work specified in other Sections, as a part of the entire assembly, meets applicable validating test design specification.

1.3 ALLOWABLE TOLERANCES

.1 Install work within 3 mm of dimensioned location unless approved otherwise by Architect, and flat to a tolerance of 3 mm maximum in 3 m and 1.5 mm maximum in any running 300 mm.

1.4 REFERENCE STANDARDS

.1 Reference standards quoted in this Section refer to:
CSA Standard A82.27-M1977, Gypsum Board Products.

.2 References:

- .1 ASTM C473-00; Test Methods for Physical Testing of Gypsum Panel Products.
- .2 ASTM C475-94; Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .3 ASTM C630/C630M-01; Specification for Water-Resistant Gypsum Backing Board.
- .4 ASTM C840-98; Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C954-98; Specification for Steel Drill Screws for the Application of Gypsum Board.
- .6 ASTM C1047-99; Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .7 ASTM C1278/1278M-01; Specification for Fiber-Reinforced Gypsum Panels.
- .8 ASTM C1395/C1395M-01; Specification for Gypsum Ceiling Board.
- .9 ASTM C1396/C1396M-02; Specification for Gypsum Board.
- .10 ASTM D3273-00; Test Method for Resistance to Mold Growth on the Surface of Interior Coatings in an Environmental Chamber.
- .11 ASTM-E90-99; Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- .12 ASTM-E119-00a; Test Methods for Fire Tests of Building Construction and Materials.
- .13 ANSI A118.9-1992; Test Methods and Specifications for Cementitious Backer Units.
- .14 CAN/ULC-S102-1988; Building Materials and Assemblies, Standard Method of Test for Surface Burning Characteristics of.
- .15 CAN/ULC-S114; Determination of Non-combustibility of Building Materials.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

.1 Package finish materials.

.2 Store materials in protected dry areas. Store gypsum board flat in piles with edges protected.

.3 Ensure that finish metal members are not bent, dented, or otherwise deformed.

.4 Package fire rated materials with Underwriter's Laboratories labels attached.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Install work only in areas closed and protected against weather, and maintained between 10 C and 21 C. In cold weather ensure that heat is introduced in sufficient time, before work commences, to bring surrounding materials up to these temperatures; and maintained until materials installed by this Section have cured.

.2 Do not install work in any area unless satisfied that work in place has dried out, and that no further installation of damp materials is contemplated.

2 PRODUCTS

2.1 MATERIALS

.1 Gypsum Board:
- .1 Plain Gypsum Board: in thicknesses specified for application, with tapered edges, and to meet specified requirements of CSA Standard A82.27.
- .2 Fire-Rated Gypsum Board: In thicknesses specified for application, with tapered edges, to meet specified requirements of CSA Standard A82.27, classified for fire hazard by Underwriters' Laboratories of Canada, and labelled in conformance with the ULC Label Service for the application specified.
- .3 Abuse Resistant Gypsum Board: Dens-Shield Plus Abuse Resistant Interior Panel by Georgia Pacific Corp. Thickness 16mm
- .4 Water Resistant Gypsum Board: In thickness specified for application, to meet specified requirements of CSA Standard A82.27.
- .5 Backing Board (B/BD): Dens-Shield by Georgia Pacific Corp., Latapanel MFR-100 with Latapanel Brand self adhesive glass tape by Ceratec Inc., Weston, Ontario or equal by Canadian Gypsum Company Limited.

.2 Joint Materials:
- .1 Joint Reinforcing Tape: 50 mm wide x 0.25 mm thick, perforated paper, with chamfered edges.
- .2 Joint Compounds: CSA A82.31-M1980, asbestos free, latex, resin base, possessing good adhesion, mixed with fresh, unadulterated water having no detrimental effect on compounds.

.3 Galvanizing:
- .1 Zinc Coating: To meet specified requirements of ASTM Specifications A525, G90 Coating Designation, for sheet steel; A153, Class B.3 Coating for hardware and bolts; A116, Class 3, Coating for wire and rods.
- .2 Wiped Coating: zinc coating wiped down to average weight of 76 g/m2.

.4 Accessories:
- .1 Corner Beads: 25 ga. steel, wiped coated, with flanges suitable for thickness of gypsum board on which applied.
- .2 Casing Beads: 25 ga. steel, wiped coated, angle shaped, in size to fit over edge of gypsum board. Domtar "L" Type.
- .3 Control Joints: crimped roll-formed zinc, as CGC #093, with flanges for tape reinforcement, or two casing beads, set with gap for movement, and backed with flexible air seal membrane.
- .4 Door Reveal Trim: Gordon Interior Specialties Division
  Final Forms I Series 300 – 314-5/8
  T: 1-800-747-8954, sales@gordonceilings.com, www.gordonceilings.com

.5 Screws: For metal furring: self-drilling, self-tapping, casehardened, Phillips head, drywall screws, with corrosion resistant finish. #6 x 50 mm for single thickness panel fastening and #7 x 41 mm for double thickness.

.6 Tie Wire: #16 ga. galvanized soft annealed steel wire.

.7 Sealant: As specified in Section 07 92 10.

3 EXECUTION

3.1 EXAMINATION

.1 Before application of gypsum board commences ensure that services have been installed, tested, and approved by relevant jurisdictional authorities and Architect; that conduits, pipes, cables, and outlets are plugged, capped or covered; that electrical boxes are not installed back-to-back; and that fastenings and supports installed by others are in place.

.2 Ensure that environmental conditions and work preceding that of this Section are satisfactory, and will permit compliance with the quality and dimensions required for work specified in this Section. Do not permit work of others to touch the back of gypsum board.

.3 Verify that work performed under other Sections as a part of an underwriter specification for a fire rated assembly has been done in accordance with that specification.

3.2 INSTALLATION

.1 Generally:

.1 Co-ordinate the work of this Section with that of other Sections. Ensure that adequate preparation is made for the attachment of fasteners, stiffeners, and reinforcing.

.2 Install work in accordance with approved manufacturers' specifications and, printed directions, as applicable for materials incorporated.

.3 At External Corners: Install corner beads secured to framing at 150 mm o.c. on alternate flanges.

.4 At Gypsum Board Edges: Exposed to view, where gypsum board butts against other materials with no trim to conceal junction, at control joints, at perimeter of ceiling surfaces, at tops of partitions where they stop against continuous ceiling surfaces, and where otherwise indicated on Drawings: Secure casing beads at 300 mm o.c.

.5 Do not install metal framing, trim, casings, or accessories which have been bent, dented, or otherwise deformed.

.6 Securely attach trim, casings, framing, and accessories.

.7 Erect finish materials to dimensions indicated on Drawings; plumb, level, straight, and square to adjoining elements.

.8 Provide control joints in walls, partitions and ceilings at no greater spacing than 9 m in each direction, at perimeters of ceilings where they abut walls and other vertical surfaces, or as otherwise indicated.

.9 Install casings and thermal breaks at junctions of gypsum board with exterior door, window, or screen frames.

.10 Install materials with the minimum of joints. Tightly butt joints, without force, and neatly align them.

.11 Co-operate with those installing work of other Sections. Where the work of others penetrates gypsum board construction fit openings snugly, and to ensure cover by escutcheons and plates utilized.

.2 Application of Gypsum Board:

.1 Extend gypsum board into door, window, and other opening reveals; behind mirrors, fitments, and other applied items of a fixed nature; and on metal stud partitions to ceiling above; except at fire rated walls and sound rated walls and where noted otherwise on Drawings, extend to structural deck above.

.2 Apply gypsum board with long dimension perpendicular to supports except at stud partitions where they shall parallel studs.

.1 Back all joints with a framing member. Edge joints on opposite sides of partitions shall occur on different studs, and at least 300 mm from opening jambs.

.3 Apply gypsum board over concrete and concrete masonry units on hat-shaped furring channels.

.4 Apply gypsum board over concrete and concrete masonry units with adhesive as recommended by gypsum board manufacturer.

.5 Install gypsum board in maximum lengths and widths to minimize joint, and never in lengths of under 2 m. Stagger end joints where they are unavoidable. Locate joints in ceilings where least prominently discerned, and never line them up with opening edges. Joint between gypsum board and floor shall be no more than 6 mm.

.6 Form neat joints at mill ends and at field cut edges of gypsum board panels. Cut paper on face with a knife. Smooth by sanding and rubbing edges together.

.7 Fasten gypsum board to metal support members by sheet metal drywall screws no closer than 10 mm to, and no farther than 12 mm from, centre of joints.

.1 At walls and ceilings at 300 mm o.c. at edges and in field.

.2 At ceilings of fire-rated board at 200 mm o.c. at edges and in field.

.3 At walls of fire-rated board at 200 mm o.c. at edges and in field.

.8 Locate screws opposite one another in adjacent panels. Start application on walls at corners or rooms, and on ceilings from centre line of spaces. Do not force adjacent boards into place; allow moderate contact. Provide extension clips where required. Drive screws to form a slight depression, but not so paper cover is broken.

.3 Finishing of Joints and Depressions:

.1 Fill joints, casing beads, corner beads, screwholes and depressions on gypsum board surfaces exposed to view to provide smooth seamless surfaces and square neat corners. Use jointing compounds and reinforcing tapes in conformance with manufacturer's specifications. Ensure that gypsum board is tight against framing members, fasteners are properly depressed, and adhesives have sufficiently cured.

.2 Fill joints by three–coat finish method.

.1 Embed reinforcing tape in a cover coat of joint filler.

.2 Apply level coat of joint filler when cover coat has dried.

.3 Apply skim coat of topping cement when level coat has dried.

.4 Feather edges of compounds into surfaces of gypsum boards. After skim coat has dried for at least 24 hours sand to leave smooth for decoration. Do not sand paper face of gypsum board.

.3 At bevelled joints: apply cover coat 180 mm wide, level coat 250 mm wide, and skim coat 300 mm wide.

.4 At end joints, and butt joints formed at cut edges of gypsum board: apply cover coat 355 mm wide, level coat 500 mm wide, and skim coat 600 mm wide. Camber treatment over end joints to 0.80 mm thick at most.

.5 At Internal Corners: first fill gaps between boards with joint filler. Imbed creased reinforcing tape into a thin coat of joint filler applied 50 mm wide at each side of corner. Apply cover coat as specified for bevelled joints. Apply skim coat (as specified for bevelled joints) to just one side of joint, and when dry apply skim coat to other side.

.6 At External Corners: fill to nose of corner bead with joint filler and topping cement as specified for bevelled joints.

.7 At casing beads: as specified for bevelled joints.

.8 At Screwheads and Nailheads: fill holes and depressions with a two coat application of joint filler.

.9 Provide for Level 5 skim coat finish over entire gypsum board surfaces to receive paint finish.

.9 Finish gypsum board joints above ceiling with tape and first coat of topping cement.

.4 Caulking:

.1 Caulk between casing beads and other construction where junctions are exposed to view.

.2 Caulk junctions between gypsum board fire separations and protections, and other construction to ensure that integrity of fire rating is maintained.

.5 Fire Separations:

.1 Construct gypsum board assemblies, where located at fire separations, of metal framing covered on both sides by fire-rated gypsum board.

.2 Fur assemblies tightly to enclosing constructions to maintain integrity of the separations. Install casing beads at all perimeter edges.

.3 Caulk joints at junctions of fire separations and other construction to meet specified requirements of Section 07 92 10. Ensure that caulked joints provide a continuous seal and that they are caulked before other work covers the joint.

.4 Assemblies constructed otherwise may be approved by Architect on presentation of affidavits which validate fire resistance ratings based on designs, acceptable to jurisdictional authorities.

3.2 ADJUSTMENT AND CLEANING

.1 Remove droppings and excess joint compound from work of others, and from work of this Section, before it sets.

.2 Make good to cut-outs for services and other work, fill in defective joints, holes and other depressions with joint compound.

.3 Make good defective work, and ensure that surfaces are smooth, evenly textured and within specified tolerances to receive finish treatments.

.4 Clean off beads, casings and other metal trim, and leave all surfaces ready for specified finishes.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide wall and floor tile.

1.3 RELATED SECTIONS

.1 Section 07 92 10 Sealants
.2 Section 09 21 16 Gypsum Board
.3 Section 10 28 10 Washroom Accessories

1.4 REFERENCE STANDARDS

.1 ANSI A108 Series; Specifications for Installation of Ceramic Tile.
.2 ANSI A118 Series; Specifications for Mortars and Grouts for Ceramic Tile Installation.
.3 ANSI A136.1-1992, Standard for Organic Adhesives for Installation of Ceramic Tile.
.4 ANSI A137.1; Recommended Standard Specifications for Ceramic Tile.
.5 ASTM C1027; Determining visible abrasion resistance of glazed ceramic tile.
.6 ASTM C1028; Determining the static coefficient of ceramic tile.
.7 ASTM D4580; Testing for delamination in concrete decks.
.8 ASTM C627; Evaluating ceramic tile installation systems (Robinson floor test).
.9 ASTM C920; Elastomeric joint sealants.
.10 CAN/CGSB-75.1-M88; Ceramic tile.
.11 Ceramic Tile Installation Manual 200-1979 (R1989); Terrazzo Tile and Marble Association of Canada (TTMAC).
.12 Handbook for Ceramic Tile Installation; Tile Council of America.

1.5 QUALITY ASSURANCE

.1 Installer
  .1 Installer shall have a minimum of two (2) years documented experience in the installation of ceramic tile, and shall be approved as such by the manufacturer. Documentation shall be submitted to the Consultant prior to commencement of work.

.2 Pre-application Meeting
  .1 Convene a pre-application meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
    .1 Contractor (Site Superintendent & Project Manager),
    .2 Application Subcontractor (Site Foreman & Project Manager),
    .3 Product Manufacturer and/or Distributor (Technical Representatives),
    .4 Related Subcontractors (ie. Drywall),
    .5 Consultant.

1.6 SUBMITTALS

.1 Submit sample panels of each tile type specified, in accordance with Section 01 33 01.

.2 Sample panels shall be minimum 1220mm x 1220mm in size, and shall consist of minimum 4 tiles bonded to 13mm G1S plywood, with grouted joints to represent project installation. Where cut tile patterns are indicated, include one sample of cut condition.

.3 Submit samples of preformed bases, trim and other specialty shapes.

1.7 MAINTENANCE MATERIAL

.1 Provide minimum 2% of each type and colour of tile required for project for maintenance use in accordance with Section 01 77 01.

.2 Maintenance material to be of same production run as installed material.

.3 Provide instructions for the care and maintenance of all tile for this project, for inclusion in Operations and Maintenance Manual.

1.8 ENVIRONMENTAL CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 10°C for 48 hours before, during, and 48 hours after installation.

.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 covers.

1.9 EXTENDED WARRANTY

.1 Provide Mortar and Grout manufacturer's system warranty guaranteeing that the listed products, installed as per the manufacturer's approved methods and practices, will not fail due to material or manufacturing defects for a period of five (5) years from the Date of Substantial Performance.

.2 Warranty shall cover the total replacement cost (all labour and materials) of the defective area.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 CT-1 - Wall Tile
.1 100 x 400mm glazed ceramic tile, Progetto Ceramiche: Bianco, matte finish
.1 Distributed by Stonetile, contact: Elizabeth Millar, T:416 902 0783, Email: elizabethm@stone-tile.com

.2 CT-2 - Floor Tile
.1 300 x 600 mm porcelain tile, Chromatica: Alloy, matte finish
.1 Distributed by Stonetile, contact: Elizabeth Millar, T:416 902 0783, Email: elizabethm@stone-tile.com

2.2 MORTAR AND ADHESIVE MATERIALS

.1 Dry Pack: pre-blended mixture of finely graded sand and Portland cement used for thick-bed mortar installations. An acceptable product is:
- .1 4 to1 Mud Bed Mix by Mapei Inc.

.2 Thin Set Floor Mortar: latex-modified Portland cement thin-set mortar, to ANSI 118.4. Acceptable products are:
- .1 Kerabond/Keralastic by Mapei Inc.
- .2 Laticrete® 4237/211, by Laticrete International Inc.
- .3 Full Flex™, by Tec Specialty Products Inc.
- .4 Premium-Blend™/Acrylic Mortar Admix, by Custom Building Products

.3 Organic Adhesive: to ANSI 136.1/CGSB 71-GP-22M, Type I. Acceptable products are:
- .1 Ultra/Mastic 1 by Mapei Inc.
- .2 101 Ceramic Tile Adhesive, by Tec Specialty Products Inc.
- .3 Latamastic® 9, by Laticrete International Inc. .4 TripleGrip™, by Custom Building Products.

2.3 GROUT

.1 Floor grout: sanded, latex-modified Portland cement grout, to ANSI 118.6. Colours as selected by Consultant. Acceptable products are:
- .1 Ker 200 Series, by Mapei Inc.
- .2 Laticrete® 500/1776, by Laticrete International Inc.
- .3 TA-650/869, by Tec Specialty Products Inc.
- .4 Polyblend® Sanded, by Custom Building Products.

.2 Wall Grout: unsanded, dry, latex-modified Portland cement grout, to ANSI 118.6. Colours as selected by Consultant. Acceptable products are:
- .1 Ker 800 Series, by Mapei Inc.
- .2 Laticrete® 1600 Series TriPoly Grout/1776 Admix Plus, by Laticrete International Inc.
- .3 TA-620/869, by Tec Specialty Products Inc. .4 Polyblend® Unsanded, by Custom Building Products.

2.4 ACCESSORIES

.1 Patching / leveling compound at all locations. Provide full skim coat over wood floor. Prepare substrate as recommended by compound manufacturer. Prior to patching and levelling repair all cracks and control joints with joint sealant. Acceptable supplier, Ardex K 60 Arditex, Rapid Setting Latex Smoothing and Leveling Compound and Ardex Ardifixm sealant for cracks and control joints.

.2 Anti-Fracture Membrane: two-part, cold-applied, fabric-reinforced, liquid rubber membrane. Acceptable products are;
- .1 Mapelastic PRP-M19, by Mapei Inc., or
- .2 Laticrete® Blue 92 Anti-Fracture Membrane, by Laticrete International Inc.

.3 Floor Tile Grout Release: water-based silicone pre-grout sealer. Acceptable products are:
- .1 511 H2O Water Base Penetrating Sealer, by Miracle Sealants Company.
- .2 GroutRite, by Tec Specialty Products Inc.

.4 Floor & Wall Joint Sealer: polymerized silicone grout sealer. Acceptable products are:
- .1 Grout Sealer, by Miracle Sealants Company, or
- .2 TA-256, by Tec Specialty Products Inc.

.5 Floor Drain with Integrated Bonding Flange:
- .1 Stainless steel floor drain 250 mm (9-27/32 inch) diameter integrated bonding flange with 75 mm (3 inch) no-hub outlet, and grate assembly. Grate assembly includes stainless steel grate, height adjustment collar, and lateral adjustment ring with trapezoid perforations.
- .2 Drain Housing Material:Stainless Steel.
- .3 Grate Material and Finish: E-Stainless Steel Type 304 = V2A.
- .4 Nominal Grate Size:150 mm (6 inch) square.
- .5 Drain Outlet:75 mm (3 inch) outlet.
- .6 Schluter-KERDI-DRAIN, Schluter Systems (Canada) Inc., 21100 Chemin Ste-Marie, Ste-Anne-de-Bellevue, QC H9X 3Y8. Tel: (800) 667-8746. Fax (514) 336-2410. E-mail: specassist@schluter.com. Web: www.schluter.com.

.6 Waterproof Building Panel For Ceramic Tile:
- .1 Description: moisture-resistant core and microbial barrier* with fiberglass mats.
- .2 Panel Thickness: 5/8 inch (16mm). Type X board (per ASTM C 1178) for use in appropriate fire-rated assemblies
- .3 Panel Size: 48 inch by 96 inch (122 by 244 cm).
- .4 DenShield® Tile Backer - Georgia Pacific Building Products.

.7 Outside Corners:
- .1 Tile outside corner trim: Schluter Systems (Canada) Inc.: JOLLY Straight-edge profile for the outside corners of tiled surfaces on walls.

.8 Ceramic Tile to Concrete or Wood Flooring Transition:
- .1 Aluminum Transitions by Schluter Systems.

2.5 MORTAR MIXES

.1 Thin Set System: 7.6 L polymer additive to 22.7kg powdered mortar mix.

.2 Measure mortar ingredients by volume. Mix thoroughly to smooth, homogeneous consistency.

.3 Use low speed mixer (150 rpm). Avoid air entrapment and prolonged mixing.

.4 Let slake 10 to 15 minutes. Re-stir without adding liquid.

PART 3 – EXECUTION

3.1 SURFACE PREPARATION

.1 Ensure substrates are dry, clean, and free of all oil, grease and other materials detrimental to the installation of setting bed materials.

.2 Ensure substrates are sound, level, free of cracks greater than 3mm in width, and changes in elevation that may adversely affect installation.

.3 Apply levelling or patch material to concrete substrate as recommended by mortar and grout manufacturer and allow to set thoroughly. Sand where necessary.

.4 Apply anti-fracture membrane to concrete substrate as recommended by manufacturer and allow to set thoroughly.

3.2 QUALITY OF WORK

.1 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even

.2 Maximum surface tolerance (1:800).

.3 Lay out tiles so perimeter tiles are minimum 1/2 size.

.4 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.5 Make joints between tile uniform and approximately 3mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Make inside corners square butt joints, and outside corners bullnosed.

.7 Use return edged (bullnosed) tiles at termination of wall tile panels, except where panel butts projecting surface or differing plane.

.8 Clean installed tile surfaces after installation and grouting cured.

3.3 TILE INSTALLATION

.1 Apply setting bed material with a clean, round or square-notched trowel of type recommended for that material. Do not apply more material than can be covered with tiles in 10 minutes (approx. 1m2).

.2 Slope setting bed to floor drains where indicated on the drawings.

.3 Install transitions in setting bed. Install in one piece for full length of openings. Mitre at all corners.

.4 Place tiles firmly into setting bed using a slight twisting motion to ensure full contact. Immediately beat-in tile to flatten all ridges or notches.

.5 Clean out joints of excess mortar, and wipe smudges from tile face.

.6 Install specified manufacturer's preformed bases and trim, or construct base 100mm high with square top edge.

.7 Allow minimum 24 hours after installation of tiles, before grouting.

3.4 CONTROL JOINTS

.1 Provide control joints 6mm wide at 5000mm intervals each way in all heated areas where indicated.

.2 Provide control joints around perimeter of large areas, around columns, in locations where area changes direction and where tile abuts other hard material. Place control joints directly over subfloor expansion/control joints.

.3 Fill joints with sealants in accordance with Section 0792 10.

.4 Keep building expansion and control joints free of mortar or grout.

3.5 GROUTING

.1 Prior to commencing floor tile grouting, apply grout release to tiles to protect from grout stain, and allow sufficient time to dry.

.2 Dampen surface of tile with a damp towel. Do not flood or overly wet tiles.

.3 Using a purpose-made rubber float, apply grout evenly by moving across tiles diagonally first in one direction and then in the opposite direction, to ensure joints are filled with material. Promptly remove excess grout as the work progresses, using rubber float.

.4 Remove remaining grout using dampened towel and clean water, by repeatedly dragging towel across the surface of the tiles, rinsing the towel and changing the water frequently.

.5 Allow grout to cure minimum 3 to 4 hours before cleaning off remaining grout "haze".

3.6 SEALING

.1 Ensure all grout has cured, and all residual grout has been removed from tile.

.2 Apply grout joint sealer with fine brush or narrow foam pad, to all grout joints in floor and wall tile. Remove all excess sealer from joints, and tile surfaces.

.3 Prohibit foot traffic on tile surfaces until after complete curing of sealer.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section and all related sections.

.2 The work of this section and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide manual and motorized roller style window blinds as specified herein and as indicated on the drawings.

1.3 RELATED SECTIONS

.1 Section 06 10 00 Rough Carpentry
.2 Section 06 47 00 Architectural Woodwork
.3 Section 09 91 00 Painting

1.4 REFERENCE STANDARDS

.1 ASTM International
  .1 ASTM D 2369-[10e1], Standard Test Methods for Volatile Content of Coatings.
  .2 ASTM D 2832-[2011], Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.2 Canadian General Standards Board (CGSB)
  .1 CGSB 37-GP-9Ma-[83], Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
  .2 CAN/CGSB-51.34-[M86], Vapour Barrier, Polyethylene Sheet for Use in Building Construction (and Amendment-[88]).

.3 Canadian Lumbermen's Association (CLA)
  .1 CLA Grading Rules for Canadian Hardwood Strip Flooring [1997].

.4 CSA Group (CSA)
  .1 CSA A123.3-[05(2010)], Asphalt Saturated Organic Roofing Felt.
  .2 CSA O151-[09], Canadian Softwood Plywood.
  .3 CSA O325-[07], Construction Sheathing.
  .4 CAN/CSA-Z809-[08], Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)
  .1 FSC-STD-01-001-[2004], FSC Principle and Criteria for Forest Stewardship.

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  .1 Safety Data Sheets (SDS).

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  .1 SCAQMD Rule 1113-[A2011], Architectural Coatings.
  .2 SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.

.8 Sustainable Forestry Initiative (SFI)
  .1 SFI-[2010-2014] Standard.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 01 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wood plank flooring and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
.1 Submit for review and acceptance of each unit.
.2 Samples will be returned for inclusion into work.
.3 Submit duplicate 300 mm long samples of finish flooring planks.

.4 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 77 01 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wood strip plank flooring for incorporation into manual.

1.7 QUALITY ASSURANCE

.1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Sustainable Standards Certification:
.1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

1.8 MOCK-UPS

.1 Construct mock-up in accordance with Section 01 45 01 - Quality Control.

.2 Construct mock-up 10 m² minimum, of wood strip flooring including one inside corner and one outside corner.

.3 Mock-up will be used:
.1 To judge quality of work, substrate preparation, operation of equipment and material application.

.4 Locate mock-up where directed.

.5 Allow 24 hours minimum for inspection of mock-up before proceeding with work.
.1 Proceed with work only after receipt of written acceptance by Consultant.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this work.
.1 Approved mock-up may remain as part of finished work.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in 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.
.1 Ensure concrete, masonry, sheet rock, paint and framing members are thoroughly dry before flooring is delivered.
.2 Do not truck or unload flooring in rain, snow or excessively humid conditions.

.3 Storage and Handling Requirements:

.1 Store materials in fully enclosed ventilated, clean and dry storage space for 72 hours minimum before starting of work.
  .1 Remove packaging and allow 72 hours to acclimatize in accordance with manufacturer's written recommendations.
.2 Cover flooring with tarpaulin or vinyl if atmosphere is foggy or damp.
.3 Leave adequate room for good air circulation around stacks of flooring.
.4 Divide flooring into small lots and store in spaces where it will be installed.
.5 Store and protect wood plank flooring from nicks, scratches, and blemishes.
.6 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

1.10 SITE CONDITIONS

.1 Site Requirements:
  .1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.

.2 Ambient Conditions:

  .1 Ventilation:
    .1 Provide continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.
    .2 Ventilate enclosed spaces in accordance with Section 01 51 01 Temporary Utilities.

  .2 Temperature:
    .1 Maintain ambient temperature minimum of 18 degrees C and minimum of 21 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
    .2 Maintain minimum temperature 10 degrees C within area of installation until final acceptance of building.
    .3 Ensure substrate is within moisture limits prescribed by flooring manufacturer.
    .4 Maintain heat and humidity levels near occupancy levels for 5 days prior to delivery and until sanding and finishing are complete during winter months.

2 PRODUCTS

2.01 MATERIALS

.1 WD-1, Size,19mm x 57 mm, Species, No. 1or better BC Fir tongue and groove solid boards to match existing wood floor boards in HPNC Program Space 120.

.2 Underlayment: No.15 Building Paper.

3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood strip and plank flooring installation in accordance with manufacturer's written instructions.
  .1 Visually inspect substrate in presence of Consultant.
  .2 Inform Consultant of unacceptable conditions immediately upon discovery.
  .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Consultant.

3.02 PREPARATION

.1 Check and record moisture content of both flooring and subflooring before beginning installation.
- .1 Ensure moisture content is within acceptable limits in accordance with manufacturer's written recommendations.

.2 Plywood Subfloor:
- .1 Grind down high spots with 20 grit paper.
- .2 Fill low spots with proper levelling compound.
- .3 Clean up grease, oil and other contaminants, and sweep slab clean.
  - .1 Moisture test subfloor.
  - .2 Add moisture barrier for moisture levels above 12% before applying underlayment.
  - .3 Building Paper System:
    - .1 Roll out No. 15 building paper, leaving 100 mm edge laps.

3.03 INSTALLATION

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

.2 Install finish flooring direction as indicated on drawings.

.3 Apply floor finish as per Section 09 91 00 Painting instructions.

3.04 FIELD QUALITY CONTROL

.1 Have manufacturer of products supplied under this Section review Work involved in handling, installation, protection and cleaning of its product, and submit written reports in acceptable format to verify compliance of Work with Contract within 3 days of review.

.2 Consultant Field Review:
- .1 Ensure consultant representative is present before and during critical periods of installation.
- .2 Schedule site visits:
  - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
  - .2 Twice during progress of Work at 25% and 60% complete.
  - .3 Upon completion of the Work, after cleaning is carried out.

3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 01 Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 01 - Cleaning.
  - .1 Clean flooring surfaces to flooring manufacturer's printed instructions.

3.06 PROTECTION

.1 Protect new floors from time of install until final inspection.

.2 Prohibit traffic on floor for 48 hours after installation.

.3 Repair damage to adjacent materials caused by wood strip plank flooring installation.

END OF SECTION

1 GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to cover with paint the surfaces of the building or structure, and the building services and accessories not otherwise protected or covered, to the full intent of the drawings and specifications.

.2 Surface preparation of substrates to receive painting and finishing is included in this section of work.

.3 This section of work shall include the painting and finishing of all exposed surfaces of the following substrates:

.1 Interior

- .1 Wood
- .2 Steel (Prime painted)
- .3 Steel (Galvanized)
- .4 Concrete and Masonry
- .5 Gypsum board
- .6 Existing plaster
- .7 Wood doors
- .8 Existing Wood Floors
- .9 Exposed Mechanical and Electrical equipment (Conduit, Piping, Ductwork, etc. Including hangers).

1.3 RELATED SECTIONS

.1 Shop priming metal fabrications Section 05 50 00
.2 Shop priming of ferrous doors and frames Section 08 11 14
.3 Intumescent Fireproofing Section 07 81 23
.4 Bands or stencils for identification of piping, and ductwork Divisions 22 & 23
.5 Bands or stencils for identification of electrical conduit Division 26 & 27

1.4 REFERENCE STANDARDS

.1 CAN2-85.100-M81, National Standards of Canada, Painting.

.2 Canadian Painting Contractors' Architectural (CPCA) Painting Specification Manual.

1.5 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

.1 Surfaces not to be painted shall be left completely free of droppings, over-spray, or accidentally applied materials resulting from the work of this Section.

.2 Items not to be painted include concealed structural elements, and equipment furnished with complete factory-applied, coloured paints and finish systems.

1.6 COOPERATION WITH OTHER TRADES

.1 Schedule and coordinate this work with other trades and do not proceed until other work and/or job conditions are as required to achieve satisfactory results.

.2 Examine all specification sections for materials and products, and become thoroughly familiar with all provisions regarding painting.

1.7 QUALITY ASSURANCE

.1 Material Manufacturers

.1 All paint and finish products shall be those listed in the CPCA manual, latest edition unless otherwise specified or listed herein.

.2 Applicators

.1 The painting subcontractor shall have a minimum of five (5) years documented experience in commercial painting and finishing, and shall maintain a qualified crew of size necessary to fully satisfy the requirements of this section.

.3 Pre-application Meeting

.1 Convene a pre-application meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:

.1 Contractor (Site Superintendent & Project Manager)
.2 Application Subcontractor (Site Foreman & Project Manager)
.3 Product Manufacturers and/or Distributors (Technical Representatives)
.4 Related Subcontractors (ie. Mechanical and/or Electrical)
.5 Consultant

.4 Mock-up

.1 If requested by the Consultant, finish one complete surface or item of each colour scheme required showing selected materials, colours and textures. If approved, the mock-up shall serve as a standard for similar work throughout the building.

.2 Finish complete rooms in colour scheme required showing selected materials, colours and textures. If approved, the mock-ups shall serve as a standard for similar work throughout the building. Mock-up area 10m2 GWB, location as directed on site by Architect.

.3 Approved Benchmark Samples are established utilizing full scale, on-site surface areas. These shall be prepared using the complete specified or approved paint, coating and/or decorative system. The sample is to include surface preparation, and the application of the primer, intermediate, finish coat and touch-up materials.

The Painting Contractor shall prepare and apply the complete coating system as specified in the contract documents to produce the Benchmark Samples.

The recommended Benchmark Sample area will be clearly defined in the bid documents. Small areas, such as doors, handrails and trim, may have a more practical square footage arrangement, as agreed by the parties involved. The specific number, placement and size of samples will be clearly defined in the bid documents.

The Benchmark Sample shall leave exposed a sampling of the approved substrate, before and after any specified surface preparation for the system. In addition, there should be left a separate and individual sampling of each designated and subsequently applied coating and any intercoat surface preparation.

After final approval, the sample surface area shall be secured and clearly identified with signage reading: “BENCHMARK SAMPLE! DO NOT PAINT, DEFACE, CHANGE OR ALTER IN ANY WAY WITHOUT MUTUAL CONSENT OF CONTRACTING ENTITY AND THE PAINTING AND DECORATING CONTRACTOR.”

1.8 COMPLETION SCHEDULE

.1 Furnish the Consultant with a schedule showing expected completion of the respective coats of paint for the various areas and surfaces. Keep this schedule current as the job progresses.

1.9 COLOUR SCHEDULE

.1 A colour schedule will be prepared as the job progresses by the Consultant. The final selection of colours and surface textures of all finishes throughout shall rest solely with the Consultant.

1.10 SUBMITTALS

.1 Product Codes

.1 Submit a complete list of product codes from the manufacturer(s) proposed for use on this project, for all products listed in finish systems specified herein, in accordance with Section 01 33 01.

.2 Samples

.1 Submit samples of all finishes specified herein, in accordance with Section 01300.

.2 Submit duplicate 200 x 300mm sample panels of each type of paint and finish application for approval by the Consultant.

.3 Where manufacturer of paint differs from that listed in the colour schedule, employ spectrograph technology to ensure accurate colour match. Selection of the "next nearest colour" by another manufacturer will not be acceptable.

.4 Use birch plywood for wood finishes, gypsum board for paint finishes over smooth surfaces, and 100mm concrete block for concrete masonry.

.5 Finished work to match approved samples.

1.11 DELIVERY, STORAGE AND HANDLING

.1 Paint and finish materials shall be delivered to the site in sealed original labelled containers bearing manufacturer's name, type of paint, brand name, colour designation and instructions for mixing and/or reducing.

.2 Store materials in a heated, dry, well ventilated, indoor place having a minimum ambient temperature of 7°C.

.3 Keep waste rags in metal drums and remove all rags, waste and trash from the building at the end of each working shift.

.4 Provide CO_2 fire extinguisher of minimum 9kg capacity in storage area.

.5 Ensure that health and fire regulations are complied with in storage area.

1.12 GENERAL COLOUR REQUIREMENTS

.1 Refer to the Room Finish Schedule for type and extent of finishes, and to the Colour Schedule for individual colour and sheen selections.

.2 Where manufacturer of paint differs from that listed in the colour schedule, employ spectrograph technology to ensure accurate colour match. Selection of the "next nearest colour" by another manufacturer will not be acceptable.

.3 The following, generally, will be painted colour, and sheen to match adjacent surfaces
.1 Access doors

.2 Exposed piping, conduit and ductwork

.4 The following major items, generally, will be painted the same colour throughout the Work, but different colours from each other:

.1 Interior
- .1 Doors
- .2 Door frames
- .3 Ceilings
- .4 Walls
- .5 Railings and balustrades
- .6 Exposed structural members

1.13 ENVIRONMENTAL CONDITIONS

.1 Temperatures: No painting shall be performed when substrate or ambient air temperatures are below 5°C. Minimum allowable temperatures for application of Latex paints are 7°C (interior work) and 10°C (exterior work).

.2 Relative humidity: shall not exceed 85%.

.3 Moisture content of substrates: Masonry and concrete materials shall be allowed to cure for a minimum of 28 days before application of paints. Substrates shall be measured by electronic moisture meter, to the following maximums:

- .1 Gypsum board: 12%.
- .2 Masonry, concrete/concrete block: 12% for solvent based paints.
- .3 Wood: 15%.
- .4 Lighting: Painting shall not proceed unless a minimum of 1.3 lx lighting is provided on the surfaces to be painted.
- .5 Ventilation: All areas where painting is proceeding require adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 7°C for 24 hours before during and after paint application.

1.14 ENVIRONMENTAL REQUIREMENTS

.1 Low Emitting Paints and Coatings

- .1 Materials:
  - .1 Provide paints with VOC and chemical component limits lower than stated in Green Seal's Standard GS-11, current edition.
  - .2 Provide anti-corrosive coatings with VOC and chemical component limits lower than stated in Green Seal's Standard GC-03, current edition.
- .2 Submittals:
  - .1 Product data for paints and coatings, including printed statement of VOC and chemical composition content, showing compliance with Green Seal's Standard GS-11. Include a statement indicating the amount of materials used on Project. Ensure Contractor and/or Subcontractors provide completed forms in accordance with Section 01359.
  - .2 Product data anti-corrosive coatings, including printed statement of VOC and chemical composition content, showing compliance with Green Seal's Standard GC-03. Include a statement indicating the amount of materials used on Project. Ensure Contractor and/or Subcontractors provide completed forms in accordance with Section 01359.

1.15 MAINTENANCE MATERIALS

.1 Supply Owner with one clearly identified, new and unopened litre gallon of each colour and type of paint,

stain and varnish used for this work, in accordance with Section 01780.

.2 All colour mixing codes must be clearly labelled, and colour numbers (P1, P2, etc.) must be marked on the container.

1.16 EXTENDED WARRANTY

.1 Provide upon completion of the work, a Warranty Certificate in the name of the Owner, stating that the work of this section was performed in accordance with these specifications and the CPCA manual (latest edition), and is warranted against defects in material or installation, for a period of two (2) years from Date of Substantial Performance.

2 PRODUCTS

2.1 MATERIALS

.1 Paint, varnish, stain, enamel, lacquer and fillers shall be of a type and brand herein specified and/or listed under Chapter 5 of the CPCA manual.

.2 Paint materials such as linseed oil, shellac, turpentine, and any materials not specified herein but required for first class work with the finish specified shall be the highest quality product of an approved manufacturer. All materials shall be compatible with finish paint or coating materials.

.3 Use only Low VOC products wherever possible.

.4 Acceptable Suppliers:
- .1 Sherwin Williams
- .2 Dulux
- .3 Benjamin Moore

.5 Air Barrier Primer: Benjamin Moore INSL-X VAPOR BARRIER PRIMER/SEALER
Product Class Water thinned paint, Color white. Acceptable alternative, Sherwin Williams Moisture Vapour Barrier Sealer, Class Water thinned paint, Colour white.

2.2 MIXING

.1 Paints shall be ready-mixed unless otherwise specified, except that any coating in paste or powder form, or to field-catalyzed shall be field-mixed in accordance with the directions of its manufacturer. Pigments shall be fully ground and shall maintain a soft paste consistency in the vehicle during storage that can and shall be dispersed readily and uniformly by paddle to a complete homogeneous mixture.

.2 The paint shall have good flow and brush properties and shall dry or cure free of sags or runs to yield the desired finish specified.

2.3 GLOSS LEVELS

.1 Gloss Level Category Units @60 degrees & Units @85 degrees.
- .1 Level 1 - (Flat): >0-5 & max. 10.
- .2 Level 2 – (Velvet): 0-10 & 10-30.
- .3 Level 3 – (Eggshell): 10-25 & 10-30.
- .4 Level 4 – (Satin): 20-35 & min. 30.
- .5 Level 5 – (Semi-Gloss): 35-70.
- .6 Level 6 – (Gloss): >70.

3 EXECUTION

3.1 INSPECTION OF SURFACES

.1 Examine surfaces to receive paint finishes for defects which cannot be corrected by procedures specified herein, and which may result in unsatisfactory paint finishes. Report items to Consultant and Contractor in writing, prior to commencement of work of this section, or after initial prime coat shows defects in

substrate.

.2 The application of subsequent prime and finish coats shall be construed as acceptance of the surfaces, and thereafter this subcontractor shall be fully responsible for satisfactory work as required herein.

3.2 PREPARATION OF SURFACES

.1 Refer to the CPCA manual Chapter 3 for surface preparations not specified in this section.

.2 Strip existing wood floor of paint and sand to bear wood.

3.3 PROTECTION

.1 Protect all adjacent surfaces from paint and damage resulting from the work of this section, and make good any damage caused by failure to provide such protection.

.2 Mask all adjacent finishes and surfaces with masking tape as required. Remove tape promptly after final finish coat has been applied and allowed to dry.

.3 Furnish sufficient drop cloths, shields and protective equipment to prevent spray or dropping from fouling surfaces not being painted or where painting has been completed.

.4 Cotton waste, cloths and material, which may constitute a fire hazard, shall be placed in closed metal containers and removed daily from the site.

.5 Remove and protect, prior to painting operations, all hardware, accessories, device plates, lighting fixtures, factory finished work, and similar items, or provide ample in-place protection such as masking tape. If removed, these items shall be labelled, stored, cleaned if necessary and re-installed following successful completion of the work in each area. Solvents detrimental to lacquer finishes are not to be used for cleaning these items.

3.4 APPLICATION

.1 Apply paints and coatings by currently accepted trade methods.

.2 Existing surface preparation includes filling, patching, taping cracks in drywall and properly dealing with “nail pops,” approximate matches to existing textures, and thorough sanding to minimize existing runs, sags, brush/roller marks, and the surface profile of cracked and peeling areas, and other existing surface defects. Thorough filling and sanding will be accomplished to eliminate defects causing abrupt surface profile differences exceeding 1/32 inch or 31 mils.

.3 Painting coats specified are intended to cover surfaces satisfactorily when applied in strict accordance with manufacturer's recommendations. Where proper coverage has not been attained, the Consultant may ask for additional coats as required, at no additional cost.

.4 Apply each coat at the proper consistency. Sand lightly between coats.

.5 Tint primers to same colour range as finish coats.

.6 Do not apply finishes on surfaces that are not sufficiently dry. Each coat of finish should be dry and hard before a following coat is applied unless specified otherwise by the manufacturer.

.7 Tint filler to match wood for clear finishes. Work filler well into wood grain and remove excess prior to setting.

.8 Interior woodwork to receive paint or enamel finish shall be back-primed upon arrival on site with enamel undercoater.

.9 Spraying of paint will not be allowed, unless specified herein, or approved by the Consultant.

.10 Where spray painting is specified, finish 10m_2 by spraying a sample of the finish upon the request of the Consultant, using materials specified.

.11 Provide complete coverage and hide. When colour, stain, dirt or undercoats show through final coat of paint, provide additional coats until the paint film is of uniform finish, colour, appearance and coverage, at no additional cost to the Owner.

.12 Allow all coats to dry to manufacturer's recommendations before applying succeeding coats.

.13 Touch up all suction spots or "hot spots" in concrete after the application of the first coat, before applying the second coat.

.14 Surfaces to be stained shall appear uniform in shading with colour variations caused only by the natural wood grain.

.15 Barricade areas where finishing is in progress to prevent traffic or other activities, and otherwise protect work until dry. Post "Wet Paint" signs and remove when no longer required.

.16 Replace at the expense of this section, materials soiled or damaged by finishing materials which cannot be removed.

3.5 CLEAN-UP

.1 Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature, not caused by Others, and leave this work in clean, orderly and acceptable conditions.

3.6 PAINTING AND FINISHING SCHEDULE

.1 The following titles and code numbers refer to Chapter 4 of the CPCA Manual, unless otherwise indicated For type of coating, grade, named products and their manufacturers.

.2 **INTERIOR PAINTING & FINISHING**

.1 **Wood Finishing Systems**

.1 Wood (doors, trim); Premium (3-coat) Grade Finish.

.1 IN. 1-D; Semi transparent stain/Polyurethane varnish (single component) finish, satin.

.2 IN. 1-I Clear Polyurethane (single component) finish, satin.

.2 Wood (Base, trim); Premium (3-coat) Grade Finish.

.1 IN. 1-D; Semi transparent stain/Polyurethane varnish (single component) finish, satin.

.2 IN. 1-I Clear Polyurethane (single component) finish, satin.

.2 **Interior Surfaces of Exterior Walls – Existing Plaster and New Gypsum Board**

.1 Existing Plaster and New Gypsum Board, Premium Grade (3-coat) Finish.

.1 Air barrier primer.

.2 IN. 4-B; Latex finish, flat for ceilings; eggshell for walls.

.3 **Plaster & Drywall Finishing Systems**

.1 Drywall (gypsum board) Premium Grade (3-coat) Finish.

.1 IN. 4-B; Latex finish, flat for ceilings; eggshell for walls.

.2 Wet Area Ceilings: IN. 4-C; Epoxy tile-like finish (waterborne), satin.

.4 **Concrete & Masonry Wall Finishing Systems**

.1 Concrete; Custom Grade (2-coat) Finish.

.1 IN. 7-A; Latex finish, eggshell.

.2 Concrete block; Premium Grade (3-coat) Finish.

.1 IN. 8-A; Latex finish, eggshell.

.2 IN. 8-D; Tile-like epoxy finish for wet surfaces, semi-gloss.

.5 **Existing and New Wood Floors**

.1 Existing Wood Floors Premium Grade (3-coat) Finish.

.1 High hiding all purpose primer.

.2 Latex enamel for existing wood floors, low sheen.

.6 **Concrete Floor Finishing Systems**

.1 Concrete floors; Custom Grade (2-coat) Finish.

.1 IN. 9-F; Epoxy finish (2 component waterborne), satin.

.7 **Metal Finishing Systems**

.1 Structural & Miscellaneous Steel (Shop primed ferrous metal); Premium Grade (3-coat) Finish.

.1 IN. 12-A; Alkyd finish, satin, for all brush painted steel.

.2 Exposed Structural Steel Requiring Fire Rating.

.1 Refer to Intumescent Fireproofing Section 07 81 23.

.3 Galvanized Steel (Doors and frames, pipes, conduit; Premium Grade (3-coat) Finish.

.1 IN. 13-A; Alkyd finish, satin.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 The Work of this Section includes the provision of all labour, materials, plant and equipment necessary for the completion of painting work, including but not limited to:
- .1 Painting of existing repaired and prepared exterior woodwork.
- .2 Painting of parapet parging/stucco.

1.2 RELATED REQUIREMENTS

.1 Section 02 41 91H – Heritage Dismantling & Salvage

.2 Section 06 03 40H – Heritage Exterior Woodwork Restoration.

1.3 REFERENCES

.1 ASTM International (ASTM)
- .1 ASTM D16-19, Standard Terminology for Paint, Related Coatings, Materials, and Applications.
- .2 ASTM E84-21, Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.3 Environmental Protection Agency (EPA)
.1 EPA Test Method for Determining Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings, Method 24-2017, (Surface Coatings).

.4 Master Painters Institute (MPI)
- .1 MPI Architectural Painting Specification Manual.

.5 Society for Protective Coatings (SSPC)
- .1 SSPC Painting Manual, Volume 1 (5th Edition) & Volume 2.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
- .1 Provide work schedule for various stages of painting to Heritage Consultant for approval. Provide schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Consultant for changes in work schedule.

.3 Coordinate painting operations with work of other trades to avid interferences and post-installation damage.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 01 – Submittals.

.2 Product Data:
- .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS.

.3 Confirm products to be used are in MPI’s approved product list.

.4 Upon completion, provide records of products used. List products in relation to finish system and include the following:
- .1 Product name, type and use.
- .2 Manufacturer's product number.
- .3 Colour numbers.
- .4 Manufacturer's Material Safety Data Sheets (MSDS).

.3 Samples:
.1 Provide duplicate 200 x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
.1 Existing repaired exterior woodwork.
.2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained onsite.

1.6 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.

.2 Include:
.1 Product name, type and use.
.2 Manufacturer's product number.
.3 Colour numbers.

.3 Extra Stock Materials:
.1 Submit 1 four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.7 QUALITY ASSURANCE

.1 Qualifications:
.1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.
.2 Qualified journeypersons as defined by local jurisdiction to be engaged in repainting work.
.3 Apprentices: may be employed provided they work under the direct supervision of qualified journeyperson in accordance with applicable trade regulations.
.4 Conform to latest MPI requirements for repainting work including cleaning, preparation and priming.

.2 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.

.3 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by the Heritage Consultant.

.4 Standard of Acceptance:
.1 No defects visible from a distance of 1000 mm at 90 degrees to surface.
.2 Final coat to exhibit uniformity of colour and sheen across full surface area.

.5 Mock-ups:
.1 Agree on location of a mock-ups with Consultant.
.2 Mock-up will be used:
.1 To judge quality of work, substrate preparation, operation of equipment and material application and skill to MPI Architectural Painting Specification Manual standards.
.2 Allow 24 hours for inspection of mock-up before proceeding with Work.
.3 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
.1 Labels to indicate:
.1 Type of paint or coating.
.2 Compliance with applicable standard.
.3 Colour number in accordance with established colour schedule. Store and handle in accordance with manufacturer's recommendations.

.2 Storage and Handling Requirements:
- .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Observe manufacturer's recommendations for storage and handling.
- .3 Store materials and supplies away from heat generating devices.
- .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return area to clean condition to approval of Consultant.
- .6 Remove paint materials from storage in quantities required for same day use.
- .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .8 Fire Safety Requirements:
  - .1 Provide one 9 kg dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada.
- .9 Replace defective or damaged materials with new.

1.9 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:
- .1 Ventilate enclosed spaces.
- .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Provide continuous ventilation for seven days after completion of application of paint.
- .4 Coordinate use of existing ventilation system with Consultant and ensure its operation during and after application of paint as required.
- .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:
- .1 Unless pre-approved written approval by Heritage Consultant and product manufacturer, perform no painting when:
  - .1 Ambient air and substrate temperatures are below 10 degrees C.
  - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
  - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
  - .4 The relative humidity is above 85% or when the dew point is more than 3 degrees C variance between the air/surface temperatures. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
  - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
  - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
- .2 Perform painting work when maximum moisture content of the substrate is below:
  - .1 12% for concrete and masonry (clay and concrete brick/block).
  - .2 15% for wood.
  - .3 12% for plaster and gypsum board.
  - .4 Allow new concrete and masonry to cure minimum of 28 days.
- .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Additional exterior application requirements:
.1 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
.2 Do not apply paint when:
.1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
.3 Surface to be painted is wet, damp or frosted.

.3 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.4 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.5 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

1.10 EXTRA MATERIALS

.1 Provide two sealed containers, each of four litres (one gallon) capacity of each paint product in each colour used in the work for Owner's maintenance use. Containers shall be new, clearly labelled with manufacturer's name, type of paint, colour and colour number. Store at the Place of the Work where directed by Owner.

1.11 WARRANTY

.1 Warranty period with regard to the work of this section is 2 years from date of Substantial Performance.

.2 Throughout the warranty period, painting systems shall remain free from failure due to causes including: material failure; surface preparation less than that specified; and paint film thickness less than that specified, or when not specified, less than that coverage recommended by manufacturer.

.3 Presence of any of following during the warranty period shall constitute failure: visible corrosion; film peeling, blistering, checking, scaling, embrittling or general film disintegration; and poor adhesion as determined by tape "peel-off" test procedures.

Part 2 Products

2.1 MATERIALS

.1 Paints:
.1 At Wood Surfaces:
.1 Benjamin Moore Aura Exterior Paint or approved equal.
.2 At Stuccoed/Parged Parapet Surfaces:
.1 MPI REX 3.1L Latex G2 finish (over alkali resistant primer).
.2 Paint colours for exterior woodwork: To be determined by Consultant.
.3 Second coat and third-coat in a multicoat systems to be tinted slightly lighter colour than top coat and each other to show visible difference between coats.
.4 Paint materials listed in latest edition of MPI Approved Product List (APL) are acceptable for use on this project.
.5 Where required by authorities having jurisdiction, paints and coatings to provide a fire-resistant rating.
.6 Paint materials for repaint systems to be products of single manufacturer.
.7 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, to be as follows:
.1 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.2 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
.3 Be manufactured without compounds which contribute to smog in lower atmosphere.
.4 Be manufactured where matter generating 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
.5 Be manufactured where total suspended solids (TSS) content in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.

.8 Paints and coatings must not be formulated or manufactured with formaldehyde, alogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

2.2 MIXING AND TINTING

.1 Unless otherwise specified or pre-approved, all paint shall be ready-mixed and pretinted. Re-mix all paint in contained prior to and during application to ensure break-up of lumps, completed dispersion of settled pigment, and colour and gloss uniformity.

.2 Mix paste, powder, or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.3 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with following values:

Description Gloss Level	**Gloss @ 60 degrees**	**Sheen @ 85 degrees**
G1 - Matte Finish (flat)	Max. 5	Max. 10
G2 - Velvet-Like Finish	Max. 10	10 to 35
G3 - Eggshell Finish	10 to 25	10 to 35
G4 - Satin-Like Finish	20 to 35	min. 35
G5 - Traditional Semi-Gloss Finish	35 to 70	
G6 - Traditional Gloss	70 to 85	
G7 - High Gloss Finish	More than 85	

.2 Gloss level ratings of painted surfaces as indicated or otherwise specified.

Part 3 Execution

3.1 CONDITION OF SURFACES

.1 Prior to commencement of repainting work, thoroughly examine (and test as required) all exterior conditions and surfaces scheduled to be repainted and report in writing to the Consultant any conditions or surfaces that will adversely affect work of this section.

.2 The degree of surface deterioration (DSD) shall be assessed using the assessment criteria indicated in the ***MPI*** Maintenance Repainting Manual. In general, the ***MPI*** DSD ratings and descriptions are as follows:

Condition	**Description**
DSD-0	Sound Surface (may include visual (aesthetic) defects that do not affect film’s protective properties).
DSD-1	Slightly Deteriorated Surface (may show fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.) / Minor cosmetic defects (runs, sags, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).

DSD-4 Substrate Damage (repair or replacement of surface i d b h)

.3 Other than the repair of DSD-1 to DSD-3 defects included under this scope of work, structural and DSD-4 substrate defects discovered prior to and after surface preparation or after first coat of paint shall be made good and sanded by others ready for painting, unless otherwise agreed to by the Owner and painter to be included in this Work.

.4 No repainting work shall commence until all such DSD-4 adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Painting Subcontractor. The Painting Subcontractor shall not be responsible for the condition of the substrate or for correcting defects and deficiencies in the substrate, which may adversely affect the painting work except for minimal work normally performed by the Painting Subcontractor and as, indicated herein. It shall always, however, be the responsibility of the Painting Subcontractor to see that surfaces are properly prepared before any paint or coating is applied. It shall also be the Painting Subcontractor's responsibility to paint the surface as specified providing that theowner accepts responsibility for uncorrected DSD-4 substrate conditions.

3.2 PREPARATION

.1 Prepare all exterior surfaces for repainting in accordance with MPI Repainting Manual requirements. Refer to the MPI Repainting Manual in regard to specific requirements for the following:
- .1 environmental conditions.
- .2 pH testing.
- .3 mildew removal.
- .4 Exterior Heritage wood surfaces (apart from new wood windows and doors which fall under the new work scope).

.2 Sand, clean, dry, etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.

.3 Remove and securely store all miscellaneous hardware and surface fittings / fastenings (e.g., electrical lights, mechanical louvers, door and window hardware (e.g. hinges, knobs, locks, trim, frame stops) and, removable hazard / instruction labels. from wall and soffit surfaces, doors and frames, prior to repainting and replace upon completion. Carefully clean and replace all such items upon completion of repainting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g., lacquer finishes). Doors shall be removed before repainting to paint bottom and top edges and then re-hung.

.4 Protect all exterior surfaces and areas, including landscaping, walks, drives, all adjacent building surfaces (including glass, aluminum surfaces, etc.) and equipment and any labels and signage from repainting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

3.3 APPLICATION

.1 Do not commence repainting unless substrates and all environmental conditions are acceptable for the application of products.

.2 Apply primer, paint or stain in accordance with MPI Painting Manual Premium Grade finish requirements.

.3 Apply primer, paint or stain in a workmanlike manner using skilled and trade qualified applicators as noted under Quality Assurance.

.4 Apply primer, paint or stain within an appropriate time frame after cleaning and preparation to prevent weathering or water staining of substrate or before environmental conditions encourage flash-rusting, rusting, contamination or when the manufacturer's paint specifications require earlier applications.

.5 Primer, paint or stain coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.

.6 Tint each coat of paint progressively lighter to enable confirmation of number of coats.

.7 Unless otherwise approved by the painting inspection agency, apply a minimum of four coats of paint where deep or bright colors are used to achieve satisfactory results.

.8 Sand and dust between each coat to provide an anchor for next coat and to remove defects (runs, sags, etc.) visible from a distance up to 1000 mm (39").

.9 Do not apply finishes on exterior surfaces that are not sufficiently dry. Unless manufacturer's directions state otherwise, each coat shall be sufficiently dry and hard before a following coat is applied.

.10 To avoid air entrapment in applied coats, apply materials in strict accordance with manufacturer’s spread rates and application requirements.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 01 - Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 01 - Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 74 03 - Waste Management and Disposal.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

3.6 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Heritage Consultant.

END OF SECTION

1 GENERAL

.1 GENERAL REQUIREMENTS

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

.1 Package toilet and bath accessories and label with description of contents and installation location.

.2 Deliver and store toilet and bath accessories in protective wrapping and protect from damage.

.3 Obtain information and templates from supplier as required for installation of toilet and bath accessories.

2 PRODUCTS

.1 TOILET AND BATH ACCESSORIES

.1 Provide reinforcing, anchorage and mounting devices with each product.

.2 Specified manufacturer's catalogue reference establishes minimum acceptable standards for work of this Section.

.3 Unspecified materials which form a part of complete assemblies shall be of manufacturer's standard.

.4 Toilet and bath accessories are to be as specified. If accessories of the same materials, construction, and finishes, similar in function, design, appearance, and conforming to the standards of those specified are desired, submit as alternates with bid form. Acceptable manufactures are Bobrick Washroom Equipment of Canada Ltd., Twin-Cee Limited and Watrous.

.2 FABRICATION

.1 Provide reinforcing, anchorage and mounting devices required for the installation of each product.

.2 Fit joints and junctions between components tightly and in true planes, conceal and weld joints where possible.

.3 Fabricate Products with materials and component sizes, metal gauges, hardware, reinforcing, anchors, and fastenings of adequate strength to ensure that work will remain free of warping, buckling, opening of joints and seams, and distortion within limits of intended use.

.4 Insulate between dissimilar metals, and metal and masonry, to prevent electrolysis.

.5 Fit joints and junctions between components tightly and in true planes, conceal and weld joints where possible.

.6 Fasteners shall be vandal resistant and theft resistant.

3 EXECUTION

.1 INSTALLATION

.1 Supplier shall provide handling instructions, anchorage information, roughing-in dimensions, and templates for installation of work of this Section.

.2 Install products to meet manufacturer's recommendations, and true, tightly fitted, level, and flush to adjacent surfaces if required by design.

.3 Verify location and mounting heights of products with Architect before roughing-in or installation.

.4 Install work plumb, level, straight, tight, and secure to mounting surfaces, and centred between joints on tile walls.

.5 Attach toilet and bath accessories to walls with only:

.1 38 mm long expansion shields in solid masonry or in concrete.

.2 Toggle bolts in cells of hollow masonry units.

.3 Sheet metal screws in metal reinforcing of steel stud walls.

.4 Use only fasteners that match material and finish of fastened work where exposed to view.

.2 ADJUSTMENT AND CLEANING

.1 Adjust operating units to provide free-acting, tightly closing, and properly functioning operation. Lubricate as required.

.2 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at site only if approved by Architect.

.3 Final cleaning is specified in Section 01 74 01.

.3 ACCESSORY SCHEDULE

.1 Grab Bars
Model: Bobrick, 32mm diameter stainless steel
Type 1: “L” shape, 762 mm x 762 mm, B-5898 Series
Type 2: 610 mm long horizontal mount, B-5806 Series
Location: Universal Washrooms 007, 117and Barrier Free Bathrooms104stall.
Mounting height: 850mm A.F.F.
Provide 16mm plywood blocking for grab bars.

.1 Robe Hook
Model: ASI No. 7345, satin #4 stainless steel.
Mounting height: See Interior Elevations
Location: All washrooms.
Provide 16mm plywood blocking.

.2 Toilet Paper Dispenser
Model: Bobrick – recessed multi – roll B-4388,
Location: All washrooms
Mounting height: See Interior Elevations

.3 Soap Dispenser
Model: Bobrick – Automatic wall mounted foam soap dispenser B-2013
Location: All washroom locations
Mounting height: See Interior Elevations, Bathroom Drawings

.4 Recessed Waste Receptacle
Model: Bobrick – recessed, B-3644
Location: All washrooms
Mounting height: See Interior Elevations

.5 Mirror
Model: 6mm thick, tempered, custom width to match sink width and height to match room height, no frame, polished edges.
Mounting height: Full height
Location: All non barrier free and Universal washrooms.
Mount: Direct glue to ceramic tile.

.6 Sanitary Napkin Disposal
Model: Bobrick – B353
Location: All washrooms.

.7 Hand Dryer
Model: Dyson Airblade V
Mounting height: Refer to washroom Drawings
Location: Refer to washroom Drawings

.8 Motorized Adult Change Table
Model: Pressalit 3000 – 75.25” Length, Width 31”
Mounting height: Refer to Interior Elevations
Location: Universal Washrooms 007 and 117
Provide 16mm plywood blocking

.9 Tilted Mirror
Model: Bobrick B-293 2436 – 24”x36”
Mounting height: Refer to Interior Elevations
Location: Universal Washrooms 007, 117and Barrier Free Bathrooms104

.10 Baby Change Table
Model: Bobrick KB310-SSWM
Mounting height: Refer to Washroom Drawings
Location: Universal Washrooms 007, 117and Barrier Free Bathrooms104
Provide 16mm plywood blocking

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide solid surfacing counter tops.

1.3 RELATED SECTIONS

.1. Section 01 3000 - Submittals.
.2. Section 01 7800 - Closeout Submittals.
.3. Section 05 5000 - Metal Fabrications.
.4 Section 06 1000 - Rough Carpentry.
.5 Section 06 6116 - Solid Surfacing Fabrications.
.6 Section 12 3623 - Plastic-Laminate-Clad Countertops.

1.4 REFERENCES

.1 ANSI Z124.3: American National Standard for Plastic Lavatories.
.2 ANSI Z124.6: American National Standard for Plastic Sinks.
.3 ASTM C 834: Standard Specification for Latex Sealants.
.4 ASTM C 920: Standard Specification for Elastomeric Joint Sealants.
.5 ASTM D 256: Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
.6 ASTM D 570: Standard Test Method for Water Absorption of Plastics.
.7 ASTM D 638: Standard Test Method for Tensile Properties of Plastics
.8 ASTM D 696: Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer.
.9 ASTM D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
.10 ASTM D 792: Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
.11 ASTM D 2583: Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
.12 ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials.
.13 ASTM G 21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
.14 ASTM G 22: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Bacteria.
.15 ASTM G 155: Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.
.16 NEMA LD-3: High Pressure Decorative Laminates.
.17 NSF/ANSI Standard 51: Food Equipment Materials.
.18 SCAQMD Rule 1168: Adhesive and Sealant Applications.
.19 UL 2818: GREENGUARD Certification Program for Chemical Emissions for Building Materials, Finishes and Furnishings.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Fabricator Qualifications: Minimum of three years documented experience in fabricating solid surfacing countertops similar in scope and complexity to this

Project. Currently certified by the manufacturer as an acceptable fabricator.

.2 Installer Qualifications: Minimum of three years documented installation experience for projects similar in scope and complexity to this Project, and currently certified by the manufacturer as an acceptable installer

.2 LEED 2009 rating system potential credits for solid surfacing:

.1 LEED-CI MR Credit 1.2 Building Reuse - Maintain Indoor Nonstructural Elements.

.2 . LEED-CI MR Credit 3.1 - Materials Reuse.

.3 LEED 2009 rating system potential credits for adhesives:

.4 LEED-CI IEQ Credit 4.1 Low-Emitting Materials - Adhesives and Sealants.

.5 Mock-Ups:

.1 Install at Project using acceptable products and manufacturer approved installation methods. Obtain Architect's acceptance of color, pattern, finish, fabrication, and installation standards.

.2 Mock-Up Size: 100cm by 100cm.

.3 Mock-Up Size: Indicated on Drawings.

.4 Mock-Up Location:

.5 Maintain mock-up during construction for fabrication and installation comparison. If required, remove and legally dispose of mock-up when no longer required.

.6 Incorporation: If permitted by Architect, mock-up may be incorporated into as part of the completed Work.

1.6 SUBMITTALS

.1 Submit under provisions of Section 01 3000 - Submittals.

.2 Product Data:

.1 Submit product data for each specified product. Include manufacturer's technical data sheets and published instruction instructions.

.2 Submit Material Safety Data Sheets (MSDS) for adhesives and sealants.

.3 Shop Drawings:

.1 Dimensioned shop drawings showing countertop layouts, joinery, terminating conditions, substrate construction, cutouts and holes.

.2 Show plumbing installation provisions. Include elevations, section details, and large scale details.

.4 Samples:

.1 Submit selection and verification samples for each color, pattern, and finish required.

.5 Quality Assurance Submittals:

.1 Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties, if required.

.2 LEED Submittals: Submit applicable LEED documentation for potential credits specified in this Section.

.3 Warranty: Specimen copy of specified warranty.

.6 Maintenance Data: Submit manufacturer's published maintenance manual with closeout submittals.

1.7 REGULATORY REQUIREMENTS

.1 Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board ADA-ABA Accessibility Guidelines for Buildings and Facilities.

.2 Adhesives, Sealants, and Sealant Primers:
.1 SCAQMD (South Coast Air Quality Management District) Rule 1168.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Delivery: Deliver sinks in original containers.

.2 Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Store sheet materials flat on pallets or similar rack-type storage to preclude damage.

1.9 PROJECT CONDITIONS

.1 Field Measurements: Verify actual measurements and openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

.2 Adhesive: Acclimatize adhesives to occupancy room temperatures with maximum temperature not to exceed 75 deg F.

1.10 WARRANTY

.1 Manufacturer's Limited Warranty: Provide manufacturer's standard 10 Year Commercial Limited Warranty against defects in solid surface sheet materials.

PART TWO – PRODUCTS

2.1 MANUFACTURERS

.1 Silestone by Constentino, (Quartz Surfacing) Concord ON.

.2 Corian (Solid Surfacing)

2.2 MATERIALS

.1 Quart Surfacing:
.1 QSUR-1: Blanco Maple 14, 711
.1 Silestone distributed by Constentino York (416) 247-9090
.2 Material Thickness: 20 mm (3/4 inch), nominal.

.2 Soild Surfacing
.1 SSUR-1: Glacier White.
.1 Corian
.2 Material Thickness: 12 mm (1/2 inch), nominal.

.3 Conformance Standards:

.1 UL 2818:
.1 GREENGUARD - Emission levels in UL 2818, Section 7.1 are applicable for furniture products.
.2 GREENGUARD Gold - Emission levels in UL 2818, Section 7.2 are applicable for building materials, finishes, and furnishings.

2.04 ACCESSORY MATERIALS

.1 Joint Adhesive: Methacrylate-based adhesive for chemically bonding solid surfacing seams. Color complementary to solid surfacing sheet material. UL 2818 GREENGUARD Gold certified and complies with SCAQMD Rule 1168.

.1 Product: “Wilsonart Hard Surface Adhesive.”

.2 Elastomeric Sealant: Mildew-resistant silicone sealant for filling gaps between countertops and terminating substrates in wet environment applications. Complies with ASTM C 920, Type S (single component), Grade NS (nonsag).

.1 Product: Acceptable to countertop manufacturer. Match countertop colour.

.3 Siliconized Acrylic Sealant: Siliconized acrylic latex sealant. For general applications to fill gaps between countertops and at terminating substrates. Complies with ASTM C 834, Type OP, Grade NF, and SCAQMD Rule 1168.

.1 Product: ”Wilsonart Color Matched Caulk”.

.4 Construction Adhesive: Countertop manufacturer’s recommended silicone-based construction adhesive for backsplashes, end splashes, and other applications according to manufacturer’s published fabrication instructions.

2.7 FABRICATION

.1 Fabricate components in shop, to greatest extent practicable, in sizes and shapes indicated according to approved shop drawings and Wilsonart published fabrication requirements.

.2 Form joint seams between solid surfacing components with specified seam adhesive. Completed joints inconspicuous in appearance and without voids. Provide joint reinforced if required by manufacturer for particular installation conditions.

.3 Provide holes and cutouts indicated on approved shop drawings. Rout cutouts and complete by sanding all edges smooth.

PART THREE – EXECUTION

3.1 EXAMINATION

.1 Examine substrates and conditions that could adversely affect the work of this Section.

.2 Substrates must be sound, flat, smooth, and free from dust or other surface contaminants.

.3 Commencement of work will constitute acceptance of substrates and conditions to receive the work.

3.02 COUNTERTOP INSTALLATION

.1 Install solid surfacing components plumb, level, and true according to approved shop drawings and manufacturer’s published installation instructions. Use woodworking and specialized fabrication tools acceptable to manufacturer.

.2 Form joint seams with specified seam adhesive. Seams to be inconspicuous in completed work. Seams in locations shown on approved shop drawings and acceptable to manufacturer. Promptly remove excess adhesive.

.3 Provide minimum 12mm (1/2 inch) radius for countertop inside corners.

.4 Fill gaps between countertop and terminating substrates with specified silicone sealant.

.5 Rout sink cutouts to manufacturer's template. Adhere solid surface cast sink units to countertops with specified adhesive.

.6 Install backsplashes and endsplashes where indicated on Drawings. Adhere to countertops with specified construction adhesive.

.7 Vanities: Secure front panels to solid substrate with specified construction adhesive. Maintain 1.5 mm (1/16 inch) gap between fixed and removable panels.

.1 ADA Vanities: Angled front panel to permit wheelchair access to comply with referenced accessibility standard. Section 12 3661 - 8, Solid Surfacing Countertops

3.03 REPAIRS

.1 If permissible to Architect, minor surface marring for solid surfacing components may be repaired according to manufacturer's published installation instructions.

.2 Remove and replace solid surfacing components that are damaged and cannot be satisfactorily repaired.

3.04 CLEANING AND PROTECTION

.1 Clean solid surfacing components according to manufacturer's published maintenance instructions. Completely remove excess adhesives and sealants from finished surfaces.

.2 Protect completed work from damage during remainder of construction period.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide recessed floor grilles follows:
  .1 Floor Grids & Frame Assemblies

1.3 RELATED SECTIONS

.1 Section 03 30 00 Cast-In-Place Concrete

1.4 REFERENCES

.1 Aluminum Association (AA); DAF-45, Designation System for Aluminum Finishes.
.2 ASTM B209-01; Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
.3 ASTM B221M-00; Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
.4 CAN3-S157-M83 (R2001); Strength Design in Aluminum.
.5 CSA W59.2-M1991 (R1998); Welded Aluminum Construction.
.6 ASTM D2047-99; Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine.
.7 ASTM E648-00; Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.

1.5 QUALITY ASSURANCE

.1 Installation
  .1 Work shall be performed in strict accordance with manufacturer's printed instructions, and in accordance with all warranty requirements.

.2 Pre-installation Meeting
  .1 Convene a pre-installation meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
    .1 Contractor (Site Superintendent & Project Manager),
    .2 Installation Subcontractor (Site Foreman & Project Manager),
    .3 Product Manufacturer and/or Distributor (Technical Representatives),
    .4 Related Subcontractors (ie. Mechanical and/or Electrical), and
    .5 Consultant.

1.6 SUBMITTALS

.1 General: Submit the following in accordance with Section 01 33 01.

.2 Product Data: for each type of floor grid and frame specified, including manufacturer's specifications and installation instructions.

.3 Shop Drawings: in sufficient detail showing layout of grid and frame specified including details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.

.4 Samples: Submit an assembled section of floor grid and frame members with selected tread insert showing each type of color for exposed floor grid, frame and accessories required.

.5 Maintenance Data: manufacturer's printed instructions for cleaning and maintaining floor grids.

1.7 PERFORMANCE REQUIREMENTS

.1 Flammability: Critical Radiant Flux minimum 0.45 watts/m2 Class I to ASTM E648.

.2 Slip Resistance: Coefficient of Friction, minimum 0.60 for accessible routes in accordance with ASTM D-2047-96.

.3 Standard rolling load performance is 227kg/wheel (load applied to a solid 127mm x 51mm wide polyurethane wheel, 1000 passes without damage).

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

1.9 PROJECT CONDITIONS

.1 Field measurements: Check actual openings for grids by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.

.2 Coordinate frame installation with concrete construction to ensure recess and frame anchorage are accurate and that the base is level and flat. Defer frame installation until building enclosure is complete and related interior finish work is in progress.

PART TWO – PRODUCTS

2.1 MANIUFACTURERS

.1 C/S Construction Specialties, Mississauga ON

2.2 PRODUCT

.1 Gridline G6, Stainless $teel #304.

2.3 FABRICATION

.1 Fabricate units square and true with maximum tolerance of plus or minus 1.5mm for units with a diagonal measurement of 1800mm or less and plus or minus 3mm for units with a diagonal measurement over 1800mm.

.2 Face dimensions detailed are maximum permissible sizes.

.3 Brace frames to maintain squareness and rigidity during shipment and installation.

.4 Provide all internal reinforcing as required for the proper structural design and support of the framing system.

.5 All joints shall be accurately machined, assembled and sealed to provide neat joints.

PART THREE – EXECUTION

3.1 EXAMINATION

.1 Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

.2 Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Manufacturer shall offer assistance and guidance to provide a template of irregular shaped grid assemblies to ensure a proper installation.

3.3 INSTALLATION

.1 Install the work of this section in strict accordance with the manufacturer's recommendations.

.2 Set grid type at height recommended by manufacturer for most effective cleaning action.

.3 Coordinate top of grid surfaces with bottom of doors that swing across to provide ample clearance between door and grid.

3.4 CLEANING

.1 Clean the tread surface and recessed well as frequently as possible to reduce the effects of accumulated soiling that may hinder performance and lifetime.

3.5 PROTECTION

.1 After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.

.2 Defer installation of floor grids until time of substantial completion of project.

END OF SECTION

PART ONE – GENERAL

1.1 GENERAL REQUIREMENTS

.1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section, and all related sections.

.2 The work of this section, and related work specified in other sections shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

.1 Provision of all labour, materials, equipment and incidental services necessary to provide a Lula roped hydraulic elevator passenger elevators, controls, passenger cab with doors and frames, hoistway entrance doors and frames, machines, controllers, hoistway equipment, and accessories.

1.3 RELATED SECTIONS

.1 Concrete for elevator foundation, pit and grouting thresholds Section 03 30 00

.2 Building-in and grouting door frames Section 04 22 00

.3 Overhead hoist beam Section 05 12 33

.4 Waterproofing of elevator pit Section 07 14 00

.5 Finish flooring for cab Section 09 65 00

.6 Pit drain Division 22

.7 Empty conduit to elevator equipment devices remote from elevator machine room or hoistways Division 26

.8 Fire and smoke detectors in hoistway Division 26

.9 Electrical service, lighting & convenience outlets for machine room, temporary power for installation and inspection Division 26

.10 Telephone service for elevator cab Division 26

.11 Fire alarm signal connections Division 26

1.4 REFERENCES

.1 ANSI/NFPA 80; Fire Doors and Windows.

.2 ASME A17.1; Safety Code for Elevators and Escalators.

.3 ANSI/UL 10B; Fire Tests of Door Assemblies.

.4 CSA-B44-07; Safety Code for Elevators.

.5 CSA W47.1-92 (R2001); Certification of Companies for Fusion Welding of Steel Structures.

.6 CSA W55.3-1965 (R1998); Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.

.7 CSA W59-1989 (R2001); Welded Steel Construction (Metal Arc Welding).

.8 CAN4-S104-80 (R1985); Fire tests of Door Assemblies.

.9 ADAAG - Accessibility Guidelines for Buildings and Facilities

1.5 SYSTEM DESCRIPTION

.1 **Passenger Elevator EL-1**; The specification is based on a Lula roped hydraulic elevator By Federal Elevator.

.1 Load Capacity: 1400 lbs (635kg)

.2 Rated Speed: 30fpm (0.15m/s)

.3 Power Supply: 208V/3 Phase /30A or, 600V/3 Phase/15A or 240V/1 Phase/50A.

.4 Drive System; 1:2 Roped Hydraulic

.5 Standard Cab Sizes: 36" x 60" (905 x 1525mm)

.6 Travel Distance: 4.0m.

.7 Cab Door Automatic 36" x 84" ,2-Speed, stainless steel

.8 Maximum Number of Stops:2 Inline

.9 Cab Height: 86" x 90"

.10 Pit Depth: 14" minimum (356mm)

.11 Overhead Clearance: 11' 2" minimum (3404mm)

.12 Control System: Automatic Push Button

.13 Floor Selection: As specified under Section 09 65 00 Resilient Flooring

.14 Flooring Material: Plywood (Floor to be finished by customer after elevator is installed)

.15 Control Panel Finish: Stainless Steel

.16 Hall Station Finish: Stainless Steel

.17 Motor: 4HP (3kW) (5HP [3.7kW] Optional)

.18 Cab Panel Finish Laminate: Oyster

.19 Lighting Supply: 120V/15A/60Hz

.20 Standard Features:
Stainless Steel Handrail
Automatic control UL/CSA listed
Arrival gongs in cab
Direction arrows in cab
ADA Phone
Auto cab lights
Instantaneous safety device
Emergency battery lowering
Car top Inspection Station
Over speed valve
Bufers
Final Limit Switch
Emergency stop and alarm at cab operating panel

1.6 SUBMITTALS

.1 Submit shop drawings indicating hoisting dimensions, cab dimensions, fixture location heights, door type, machine room locations, and controls locations, in accordance with Section 01300.

.2 Provide manufacturer's product data for signal and operating fixtures, operating panels, indicators, cab design and components, doors and frame details, in accordance with Section 01 31 01.

.3 Provide samples of cab wall panel finish, and ceiling panel finish, in accordance with Section 01 31 01.

1.7 OPERATION AND MAINTENANCE MANUALS

.1 Submit operation and maintenance data under provisions of Section 01 77 01.

.2 Include description of elevator system's method of operation and control including motor control system, door operation, signals, and special or non-standard features provided.

.3 Provide complete, legible, hard copy wiring schematics of all systems.

.4 Provide printed hardcopy, and electronic softcopy (CD) of all controller software.

.5 Provide parts catalogues with complete list of equipment replacement parts with equipment description and identifying numbers.

.6 Provide one copy of master schematic and lubrication chart.

1.8 QUALITY ASSURANCE

.1 Manufacturer: company specializing in manufacture and assembly of elevator equipment with ten years minimum documented experience.

.2 Installers: Directly employed by the elevator manufacturer, with employees and supervisor on payroll. Installers must have five years minimum documented experience.

.3 Pre-installation Meeting

.1 Convene a pre-installation meeting for the work specified in this section. Attendees must include, as a minimum, representatives of the following:
.1 Contractor (Site Superintendent & Project Manager),
.2 Installation Subcontractor (Site Foreman & Project Manager),
.3 Product Manufacturer and/or Distributor (Technical Representatives),
.4 Related Subcontractors (ie. Masonry, Concrete, Mechanical, Electrical, etc.), and
.5 Consultant.

1.9 REGULATORY REQUIREMENTS

.1 Conform to Appendix E of CSA-B44, provisions for the physically handicapped.

.2 Perform Work to CSA-B44, and as supplemented in this Section.

.3 Welding: conform to CSA W47.1 and CSA W55.3.

.4 Door and Frame Assemblies: Conform to CAN4-S104

1.10 TESTS BY REGULATORY AGENCIES

.1 Perform all tests required by regulatory agencies and authorities having jurisdiction. Costs of these tests shall be included in the cost of the work of this section.

.2 Obtain TSSA Inspection and Ontario Elevating Device Licenses for each car, from the Technical Standards and Safety Authority (Elevating Devices Branch). The Owner shall pay for cost of obtaining license at the time of inspection and testing by the authority.

1.11 WARRANTY

.1 Provide manufacturer's standard certificate in the name of the Owner warranting the elevator equipment, devices and its installation for a period of two (2) year from Date of Substantial Performance.

1.12 MAINTENANCE SERVICE

.1 Provide maintenance and call back service for a period of 12 months after substantial performance.

.2 Maintenance shall include for regular service visits, at intervals of no more than every 32 days (once a month per elevator, plus call back service whenever requested by the Owner. For callbacks originating from the campus Polices only, occurring outside of normal working times, emergency callbacks excepted, Owner will pay the overtime premium portion for labour, except for emergency call backs required for the release of trapped passengers.

.3 Emergency call back service, to release trapped passengers or in the event all elevator service within the Building is lost, shall be available 24 hours a day, 7 days a week, shall be furnished whenever requested by the Owner. For emergency callbacks, no additional cost premium or overtime shift bonus charge shall be charged to the Owner.

.4 Other call back service requests as relayed through appropriate Owner personnel shall be provided as requested.

.5 For calls occurring during regular working hours, these callbacks shall be performed without additional cost premium to the Owner.

.6 Maintenance coverage shall also include the following:

.1 Provision of burnt out signal indicators and bulbs shall be included.

.2 Replacement of burnt out car top lights and pit lights as required, with Owner furnishing replacement bulbs.

.3 Replacement of blown fuses in cab light and main power disconnects, with Owner furnishing replacement fuses.

.4 Replacements of cab lighting fixtures and ballasts, with Owner being responsible for supplying replacement bulbs and ballasts.

.5 Servicing, cleaning, repair, adjustment and replacement of cab ventilation fan.

.6 Drive motor and control sets shall be maintained in good working order. Bearings, rotors, motor windings, stators, connections and connectors shall all be periodically checked and reviewed for proper operation. Replacement of worn components shall be included under this maintenance service.

.7 Operation and control circuits shall be checked for proper operation. Specification performance settings shall be maintained, except when requested in writing by the Owner to change such performances.

.8 Replacement of all hoist ropes, governor ropes, as well as traveling cables and other hoistway conductors.

.9 Replacement of burnt out or defective elevator signal fixture bulbs.

.10 Adjustment of car operating performances, load weighing settings, door performances, leveling and all other system adjustments shall be periodically checked and readjusted to maintained specified performances.

.11 Maintain service log in machine room and record date and time of each service visit, along with brief record of corrective action undertaken during that visit. Maintenance personnel shall also record instances of call back service, including nature of problem and measures taken.

.7 Maintenance work shall include all data logging and testing certification recording as required under the latest Elevator Safety Code requirements in B44 Section 12, to latest edition and requirements.

.8 Furnish Owner, at intervals of not more than 3 months, with hard copies of all testing and certification records, where such data logging is carried out electronically.

.9 Maintain adequate stock of spare parts on site. Provide lockable metal cabinet within machine room, for storing spare parts, fuses, and other components and cleaning compounds. Alternatively, equip service vehicles with necessary spare parts to ensure equipment down time is not extended because of a lack of readily available replacements.

.10 Every six months, furnish Owner with a written review and summary of callbacks and passenger entrapments that have taken place during the preceding months. This report shall document not only the time and date of the call, but also reason for the call and actions taken to correct problem found. Call back review summary shall include all calls.

.11 Keep “as built” circuit diagrams up to date showing all changes and circuit modification. Make such notation on the drawings in red coloured ink.

.12 The Owner reserves the right to reassign full maintenance service work to another qualified elevator maintenance company in the even a professionally qualified third party deems the Contractor to be deficient in performance of its maintenance duties and has been found negligent in completing noted deficiency items within 30 days (or other mutually agreed upon time line) of receiving written notification of such deficiencies.

.13 All resulting and additional costs, as incurred by The Owner when maintenance services are reassigned, subject to an upset amount as determined by a qualified unbiased third party Elevating Devised Specialist Consultant, becoming the responsibility of the Contractor.

.14 Provide as required access to elevator pit and hoistway spaces for repairs, servings and testing of elevator pit drains and shaft fire alarm devices. Except for emergencies, access to pits and hoistways shall be scheduled to take place during regular scheduled elevator maintenance visits. At the time of each service visit, check pit space for water infiltration. Immediately advise The Owner of any water in this pit.

PART 2 PRODUCTS

2.1 MANUFACTURER

1. Provide Lula elevator subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:

    1. Basis of Design: Lula elevator, Serenus model, by Federal Elevator.

    2. Other acceptable machine room-less products: manufacturer with minimum 15 years experience in manufacturing, installing, and servicing elevators of the type required for the project.

2. Acceptable Manufactures are:

    1. Delta Elevator
    2. Otis Elevator
    3. Federal Elevator
    4. Vertechs

PART 3 EXECUTION

EXAMINATION

3.1

.1 Verify that hoistway, pit and machine room are ready for equipment installation.

.2 Verify shaft and openings are of correct size and within tolerances.

.3 Confirm electrical power is available and of correct characteristics.

.4 Report defects in writing to Consultant.

3.2 INSTALLATION

.1 Install in accordance with CSA-B44.

.2 Connect equipment to building utilities.

.3 Provide conduit, boxes, wiring, and accessories.

.4 Coordinate installation of hoistway wall construction.

.5 Install hoistway door sills, frames, and headers in hoistway walls.

.6 Balance car.

3.3 TOLERANCES

.1 Cab movement on Guide Rails: Smooth movement, with no perceptible lateral or oscillating movement or vibration.

.2 Guide Rail Alignment: Plumb and parallel to each other in accordance with CSA-B44.

3.4 FIELD QUALITY CONTROL

.1 Perform tests and meet results required by CSA-B44. Supply all required instruments and execute necessary tests.

3.5 ADJUSTMENTS

.1 Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort.

.2 Adjust automatic floor leveling feature at each floor to be within 3mm from flush.

3.6 CLEAN UP

.1 Remove protective coverings from finished surfaces. Clean surfaces and components ready for inspection.

3.7 PROTECTION OF FINISHED WORK

.1 Protect finished work under provisions of Section 01 11 01. Do not permit construction traffic within cab after cleaning.

.2 Install protection pads in cars indicated until time of final inspection by Consultant.

3.8 DEMONSTRATION OF SYSTEMS

.1 Demonstrate complete operation of elevators to Owner's representative, with representatives of the Contractor and the Consultant also present.

.2 Demonstration shall include instructions on access to emergency exits, operation of telephones, key switch functions, and all other operating features.

END OF SECTION

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BRUCE Fire Engineering

Bruce Fire Engineering Ltd.

400 Applewood Crescent, Suite 100
Vaughan, Ontario
L4K 0C3

Phone: 905 482 4678
Fax: 905 581 3203
Toll Free Phone/Fax: 1 800 260 0187

Email: artem@brucefire.ca

Professional Engineers Ontario

HYDRANT FLOW TEST REPORT

TEST DATE: **May 2, 2023.** **TIME:** **9:30 am**

LOCATION: **375 Colborne Lodge Dr. Toronto, ON M6R 2Z3**

TESTED BY: **Artem Matthew – Bruce Fire Engineering**

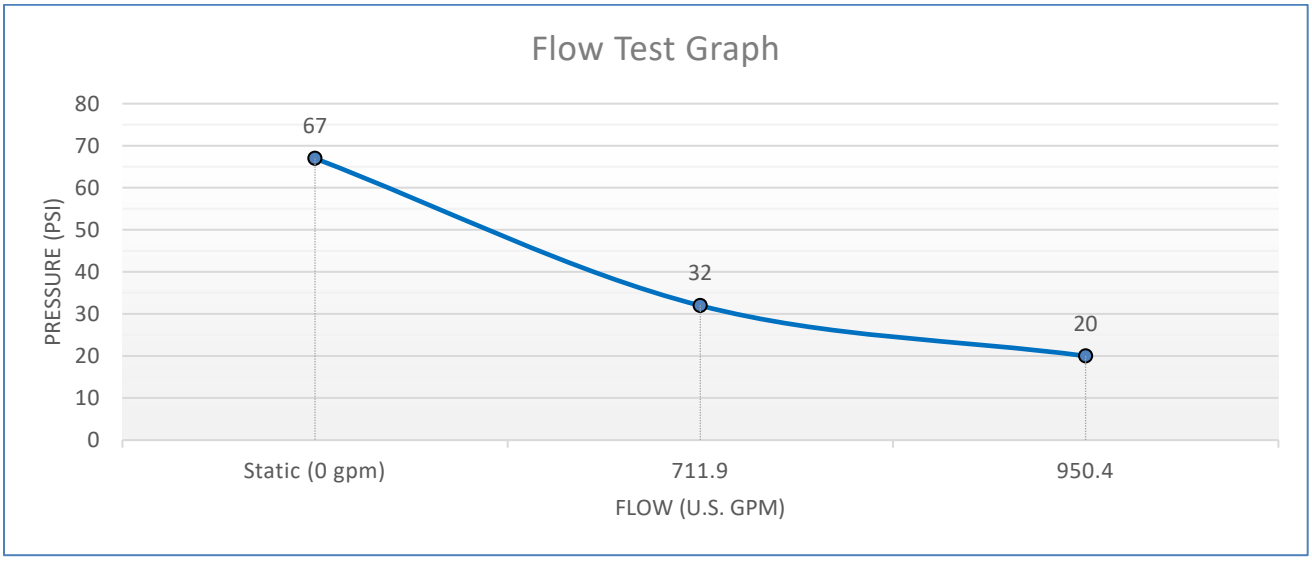
TEST RESULTS:

STATIC PRESSURE (psi)	67

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (inch)	DISCHARGE COEFFICIENT	RESIDUAL PRESSURE (psi)	PITOT PRESSURE (psi)	DISCHARGE (gpm)
1	1	2½"	0.9	32	18	711.9
2	2	2½"	0.9	20	8/8	950.4

Flow test done as per NFPA 291 recommendations.

Calculated Flow 950 gpm @ 20 psi



AREA MAP


Rogue Runners
Spring Rd
Spring Rd
Spring Rd
Spring Rd
FLOW HYDRANT
High Park Wading Pool, Splashpad and...
West Rd
Colborne Lodge Dr
High Park Nature Centre
Novem
High Park Trackless Train
High Park Tennis Courts
West Rd
STATIC AND RESIDUAL HYDRANT
High Park Rink
West Rd
High Park Outdoor Pool
Temporarily closed
Colborne Lodge Dr
High Park Baseball Association
Colborne Lodge Dr
West Rd

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Bruce Fire Engineering Ltd.

400 Applewood Crescent, Suite 100
Vaughan, Ontario
L4K 0C3

Phone: 905 482 4678
Fax: 905 581 3203
Toll Free Phone/Fax: 1 800 260 0187

Email: artem@brucefire.ca

Professional Engineers Ontario

HYDRANT FLOW TEST REPORT

TEST DATE: **May 2, 2023.** **TIME:** **9:00 am**

LOCATION: **1926 Bloor St W, Toronto, ON M6P 3K8**

TESTED BY: **Artem Matthew – Bruce Fire Engineering**

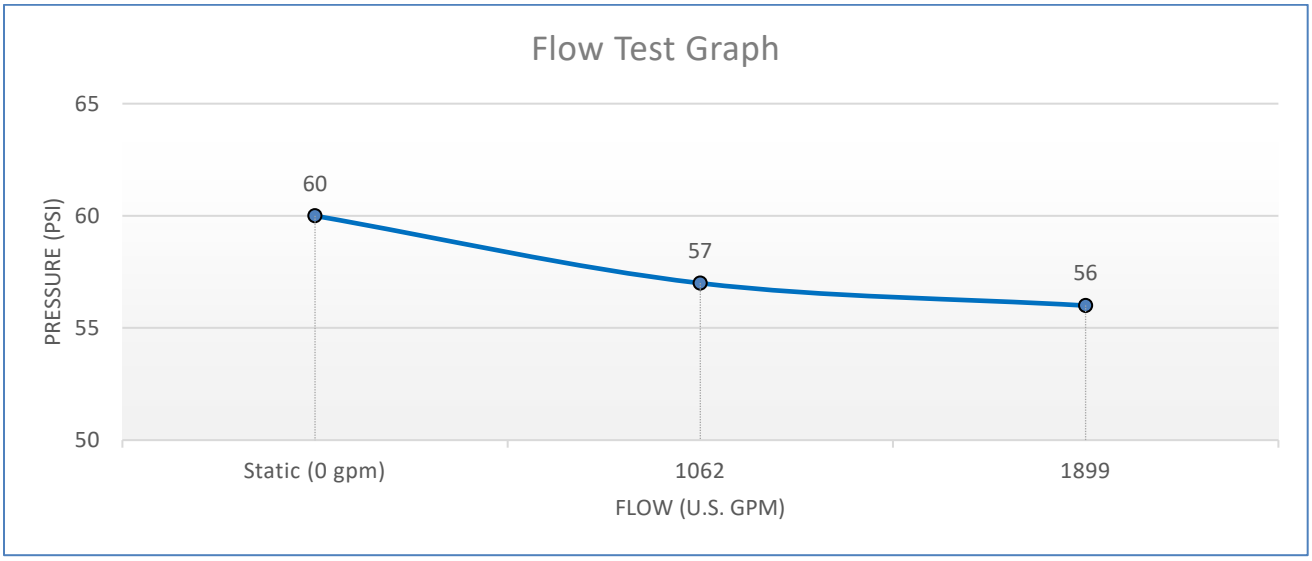
TEST RESULTS:

STATIC PRESSURE (psi)	60

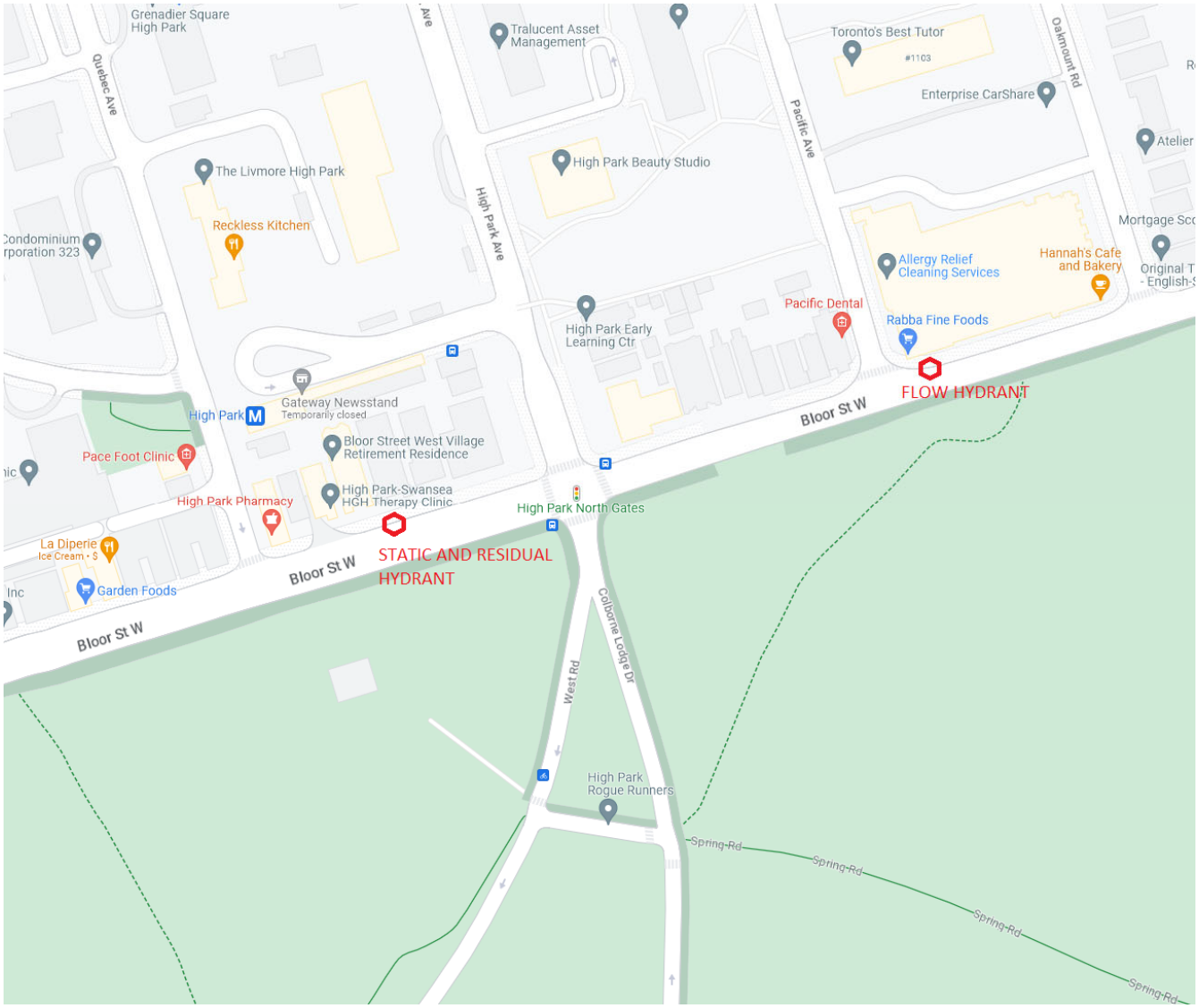
TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (inch)	DISCHARGE COEFFICIENT	RESIDUAL PRESSURE (psi)	PITOT PRESSURE (psi)	DISCHARGE (gpm)
1	1	2½"	0.9	57	40	1062
2	2	2½"	0.9	56	32/32	1899

Flow test done as per NFPA 291 recommendations.

Calculated Flow 6584 gpm @ 20 psi



AREA MAP


Grenadier Square
High Park
Quebec Ave
Tralucent Asset Management
Toronto's Best Tutor
#1103
Oakmount Rd
Enterprise CarShare
Pacific Ave
Atelier
The Livmore High Park
High Park Beauty Studio
High Park Ave
Reckless Kitchen
Mortgage Sc
Allergy Relief Cleaning Services
Hannah's Cafe and Bakery
Pacific Dental
High Park Early Learning Ctr
Rabba Fine Foods
FLOW HYDRANT
Bloor St W
Gateway Newsstand
Temporarily closed
High Park
Bloor Street West Village Retirement Residence
Pace Foot Clinic
High Park-Swansea HGH Therapy Clinic
High Park Pharmacy
High Park North Gates
STATIC AND RESIDUAL HYDRANT
La Diperie
Ice Cream
Garden Foods
Bloor St W
Colborne Lodge Dr
West Rd
High Park Rogue Runners
Spring Rd
Spring Rd
Spring Rd
Spring Rd

December 1, 2023

John Keen
Senior Project Coordinator,
Capital Projects Design & Delivery

Parks, Forestry & Recreation
City of Toronto

Re: Summary of Bulk Sample Analysis for Asbestos, 375 Colborne Lodge Drive, Toronto, ON

Dear Mr. Keen,

As requested, Fisher Engineering (Fisher) has collected and analyzed bulk samples of materials suspected to contain asbestos in the building located at High Park Nature Centre, 375 Colborne Lodge Drive, Toronto, Ontario (the "Site"). The purpose of the survey was to identify asbestos-containing building materials (including the collection of representative samples) at the Site to ensure regulatory compliance prior any renovation work. The assessment scope did not include the entire Site building. Rather, the assessment was limited to specific locations of concern as demonstrated to the Fisher on Site. The fieldwork was conducted on November 24, 2023.

Asbestos-Containing Materials

Sampling was conducted of the materials which were suspected to contain asbestos and expected to be impacted by planned renovation works. A total of nine (9) bulk samples were collected and submitted to Fisher Environmental Laboratories for Polarised Light Microscopy (PLM) analysis, as outlined in NIOSH Method 9002. The results of PLM analysis are summarized in Table 1, below.

Table 1 - Summary of Bulk Asbestos Sample Analysis (Polarised Light Microscopy)

Sample No.	Sample Location	Sample Description	Asbestos Content (% by Weight/Type)
23-2167- 1 to 3	**Under West Coat Room on Ground Floor, Basement**	**White Insulation on Duct**	**25-50% Chrysotile**
23-2167- 4, 5	**Under East Stair, Basement**	**Air-cell wrap on the insulated pipe**	**25-50% Chrysotile**
23-2167- 6	**Under East Stair, Basement**	**Air-cell on the pipe within the wrap**	**25-50% Chrysotile**
23-2167- 7 to 9	Under East Stair, Basement	Brown Insulation on the pipe within the Wrap	None Detected

Ontario Regulation 278/05 ("O. Reg. 278/05") defines an "asbestos-containing" material as that with an asbestos content equal to or greater than 0.5% by weight.

Based on the laboratory analysis by the PLM method, white insulation on the duct, and air-cell insulation in the Basement were found to contain 25-50% Chrysotile asbestos.

Please refer to Attachment A of this report for the laboratory analysis reports of bulk asbestos samples. Site photographs are included with this report as Attachment B.

In addition to the above findings, the following observations were noted during the assessment.

- No other materials suspected to contain asbestos were observed within inspected area.

Based on the observations and findings outlined above, Fisher recommends the following:

RECOMMENDATION

Based on the findings outlined above, Fisher recommends that abatement work to be completed within the inspected areas at the Site. Fisher's recommendations are as follows.

Asbestos:

- ❑ Removal of asbestos-containing air-cell wrap, and air-cell pipe insulation will require Type 2 glove bag asbestos abatement procedures as outlined in O. Reg. 278/05.

- ❑ Removal of asbestos-containing white insulation on the duct will require Type 2 glove bag asbestos abatement procedures as outlined in O. Reg. 278/05.

The presence of ACM should be presumed in locations not accessed during the assessment. It is possible that ACM is present at the Site that is not identified in this report. Should additional suspected ACM not outlined in this report be discovered, it should be presumed as ACM until sample analysis determines asbestos content. Due to the limited scope of work and the presence of solid building finishes (i.e., drywall walls.) in many locations throughout the Site, the full extent of potential ACM may not be confirmed. Precautions should be taken when dismantling solid wall or ceiling finishes, or any other building surfaces which may conceal potential ACM. Such precautions include, but are not limited to, isolation measures and appropriate personal protective equipment.

We trust you find the enclosed in order, however should you have any questions or concerns please do not hesitate to contact us.

Respectfully submitted,

Prepared by:

Iqbal Fattah, M.Sc.
Project Manager

Reviewed by:

Dave Fisher, P.Eng. C. Chem
Principal

Attachments: Attachment A – Laboratory Certificate Analysis
Attachment B - Site Photographs

Attachment A – Laboratory Analysis Report

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Facilities Management
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55 John Street, Toronto, ON
M5V 3C6
Tel.:
Attn:

F.E. Job #: 23-2167
Project Name: ACM Sampling
Project ID: FM-P 23-13513
Date Sampled:
Date Received: 24-Nov-2023
Date Reported: 29-Nov-2023
Location: 375 Colborne Lodge Drive

Certificate of Analysis

Analysis Requested:	Asbestos by PLM
Sample Description:	9 Bulk Sample(s) (***3 Days***)

Sample Matrix and Client Sample Description	Client Sample Location	Lab Sample ID	Asbestos Content and Fibre Type
1A - White Insulation	Basement, under West Coat Room on Ground Floor, Duct	23-2167-1	Chrysotile; 25-50%
1B - White Insulation	Basement, under West Coat Room on Ground Floor, Duct	23-2167-2	Chrysotile; 25-50%
1C - White Insulation	Basement, under West Coat Room on Ground Floor, Duct	23-2167-3	Chrysotile; 25-50%
2A - Air Cell	Basement under East Stair, Wrap on the Insulated Pipes	23-2167-4	Chrysotile; 25-50%
2B - Air Cell	Basement under East Stair, Wrap on the Insulated Pipes	23-2167-5	Chrysotile; 25-50%
2C - Air Cell	Basement under East Stair, Insulation on a Pipe within the Wrap	23-2167-6	Chrysotile; 25-50%

Results relate only to the items tested

Client: City of Toronto ***F.E. Job #:*** 23-2167

Certificate of Analysis

Analysis Requested:	Asbestos by PLM
Sample Description:	9 Bulk Sample(s) (3 Days)

Sample Matrix and Client Sample Description	Client Sample Location	Lab Sample ID	Asbestos Content and Fibre Type
3A - Brown Insulation	Basement under East Stair, Insulation on a Pipe within the Wrap	23-2167-7	Not Detected
3B - Brown Insulation	Basement under East Stair, Insulation on a Pipe within the Wrap	23-2167-8	Not Detected
3C - Brown Insulation	Basement under East Stair, Insulation on a Pipe within the Wrap	23-2167-9	Not Detected

Fisher Engineering Laboratories (Lab ID #: 2745) is accredited by CALA (Canadian Association for Laboratory Accreditation Inc.) for asbestos analysis by PLM.

ANALYTICAL METHOD:

Asbestos has been done in accordance with normal professional standard using the following Fisher Engineering Lab Method: Asbestos by PLM (Polarized Light Microscope) F-26, Rev.2.2.

Authorized by: _____

Roger Lin, Ph. D., C. Chem.
Laboratory Manager

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
Ronggen (Roger) Lin
CHEMIST

Results relate only to the items tested

Attachment B – Site Photographs

Photo 1:

View of the asbestos-containing white insulation on the duct in the basement under the West Coat Room on the Ground Floor

Photo 2:

View of the asbestos-containing white insulation on the duct in the basement under the West Coat Room on the Ground Floor

Photo 3:

View of the wrapped pipes which is about 12 feet in length in the basement under the east stairs.

Photo 4:

View of the asbestos-containing air-cell as wrap on the pipes in the basement under the east stair.

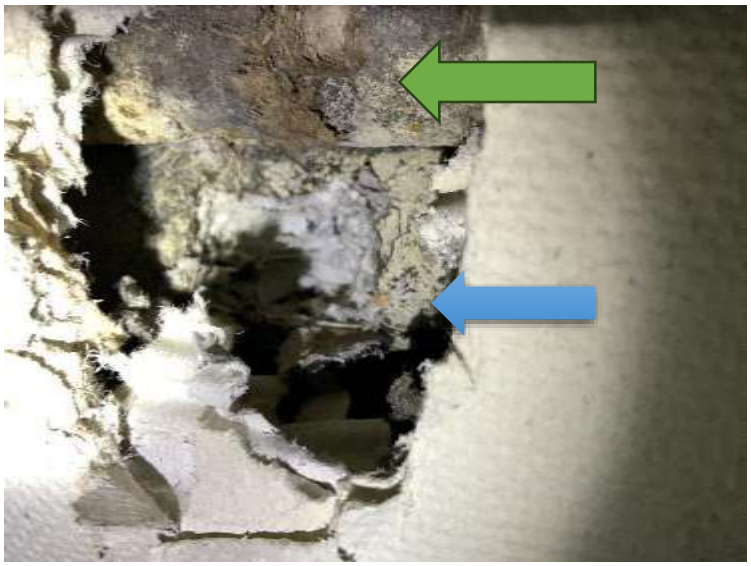

Photo 5:

View of the non-asbestos-containing brown insulation (indicated with green arrow) on a pipe and asbestos-containing air-cell insulation (indicated with blue arrow) on a pipe within the wrap in the basement under the east stair.

FISHER ENGINEERING

ENGINEERING

Professional Engineers Ontario

LABORATORY

CALA
Canadian Association for Laboratory Accreditation Inc.

DESIGNATED SUBSTANCE SURVEY

High Park Forestry School
375 Colborne Lodge Dr., Toronto, ON

Prepared for:
City of Toronto
Park, Forestry, Recreation Division
399 The West Mall, Toronto, ON

400 Esna Park Drive, Unit 15
Markham, ON
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Project No. FE 23-12830

April 17, 2023

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EXECUTIVE SUMMARY

Fisher Engineering Limited. ('Fisher') was retained by the City of Toronto, Park-Forestry-Recreation Division, to carry out a Designated Substances Survey (DSS) of the High Park Forestry School for the renovation project, located at 375 Colborne Lodge Drive, Toronto, Ontario (hereinafter referred to as the "Site").

The scope of the DSS consisted of a review of existing environmental reports (where available); visual inspection for the presence of Designated Substances within the scope of the work areas; collection and analysis of the materials suspected to contain hazardous building materials, particularly asbestos and lead; and to provide recommendations for the safe handling or abatement of these materials prior to any renovation work. The fieldwork was conducted by Mr. Muhammad Junayed, on March 2, 2023.

A summary of the Designated Substances identified during the survey is presented below:

Asbestos

- Asbestos-containing putty was found on the windows at the Site.
- Asbestos-containing insulation in the form of duct wrap was found on the ductwork within the Attic.
- Previously identified pipes with asbestos-containing straight pipe insulation and asbestos-containing pipe fittings were not observed at the Site during the current survey.

If work activities for the renovation project disturb the asbestos-containing materials, the material should be removed by following abatement operations:

- Removal of window putty will require Type 1 asbestos abatement procedures as outlined in O. Reg. 278/05.
- Removal of the duct insulation will require Type 1 asbestos abatement procedures as per O. Reg. 278/05.

Lead

- Elevated concentrations of lead-containing paint were found in the fourteen (14) paint samples collected from the Site. Refer to summary Table 4 for lead-containing paint of this report.
- Removal of any lead-containing materials shall be carried out in accordance with the following regulations and guidelines:
    - Guideline: Lead on Construction Projects (issued by Ontario Ministry of Labour);
    - Designated Substances Regulation, O. Reg. 490/09; and
    - Regulation for Construction Projects, O. Reg. 213/91.

Silica

- Crystalline silica is a constituent of all concrete and masonry products present at the Site.

- ❑ Renovation works that are likely to generate silica-containing dust shall be carried out in accordance with the following regulations and guidelines:
    - Guideline: Silica on Construction Projects (issued by Ontario Ministry of Labour);
    - Designated Substances Regulation, Ontario Reg. 490/09; and
    - Regulation for Construction Projects, Ontario Reg. 213/91.

Mercury

- ❑ Mercury is present as a vapour in fluorescent light bulbs.
    - No immediate recommendations are warranted with regard to mercury.
    - If work activities affect the fluorescent light bulbs, Fisher recommends that the presumed mercury-containing fluorescent light tubes and thermostats be removed and disposed of in accordance with O. Reg. 558/00.

Other Designated Substances

- ❑ The other designated substances (acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride) would not be expected to be present at the Site and were not observed during the current survey.
- ❑ No recommendations are warranted with regard to these other designated substances.

1.0. INTRODUCTION

Fisher Engineering Limited. ('Fisher') was retained by the City of Toronto, Park-Forestry-Recreation Division, to carry out a Designated Substances Survey (DSS) of the High Park Forestry School for the renovation project, located at 375 Colborne Lodge Drive, Toronto, Ontario (hereinafter referred to as the "Site").

The scope of the DSS consisted of a review of existing environmental reports (where available); visual inspection for the presence of Designated Substances within the scope of the work areas; collection and analysis of the materials suspected to contain hazardous building materials, particularly asbestos and lead; and to provide recommendations for the safe handling or abatement of these materials prior to any renovation work. The fieldwork was conducted by Mr. Muhammad Junayed, on March 2, 2023.

The following work areas were included in the current survey:

- ✓ The entire basement floor;
- ✓ The main floor;
- ✓ The outdoor theatre area, and storage/washrooms
- ✓ Roof

Designated Substance Survey (DSS) reports are required prior to any construction, demolition or restoration project that can take place in Ontario. As per Section 30 of the Ontario Occupational Health and Safety Act, Designated Substances and other potentially hazardous building materials must be identified prior to any work being done that may disturb these materials and result in unnecessary exposure of workers and building occupants.

The Designated Substances include:

Asbestos	Coke Oven Emissions	Mercury
Acrylonitrile	Ethylene Oxide	Silica
Arsenic	Isocyanates	Vinyl Chloride
Benzene	Lead	

2.0. METHODOLOGY

Fisher followed the protocols outlined in O. Reg. 278/05 for collecting and analyzing bulk samples of materials suspected to contain asbestos. Visual assessment of the material was the primary method of identification with occasional physical contact to collect bulk samples or examine for underlying layers.

Representative bulk samples were collected of materials suspected of containing asbestos. The tools used by the investigator to collect the bulk samples were cleaned after each sample was collected to avoid cross-contamination. Samples were placed in plastic sealable containers, marked with a unique sample number, and transported to an independent accredited laboratory for analysis.

Where applicable, samples of suspect materials were collected to establish asbestos or lead content. Samples were grouped according to the similarity of appearance ("homogeneous" materials). The frequency at which the samples were collected was sufficient to obtain a general representation of the presence of these materials at the Site. Samples collected are presumed to be representative of the respective building materials in place at the Site. However, due to potential past renovations, alterations, repairs, or phases of construction, individual materials may not be representative of the samples collected.

The laboratory certificate of analysis is included in Appendix A. Site plans to indicate the project scope of work areas, bulk sample locations and any areas of asbestos or lead abatement, are included in Appendix B. Representative photos of the Site conditions encountered at the time of the current survey are included in Appendix C.

3.0. DOCUMENT AND REPORT REVIEW

As part of this survey, the following report was reviewed:

- State of Good Repair Audit: Hazardous Substance Survey; Prepared by Kleninfeldth Consultants Limited; File No. 3025; Dated July 21, 2008.

The findings from the previous report are discussed in Section 4.0 of this report.

4.0. FINDINGS

Asbestos-Containing Materials

Sampling was conducted of building materials which were suspected to contain asbestos and expected to be impacted by planned construction activities. Fifty-five (55) bulk samples were collected and submitted to Fisher Environmental Laboratories for Polarised Light Microscopy (PLM) analysis, as outlined in NIOSH Method 9002. The results of the PLM analysis are summarized in Table 1, below.

Table 1 - Summary of Bulk Asbestos Sample Analysis (Polarised Light Microscopy)

Sample No.	Sample Location	Sample Description	Asbestos Content (% by Weight/Type)
23-9006-01 to 03 (01/A/B/C)	Floor, Location 1	Vinyl Sheet Flooring: White and Grey Pattern	None Detected
23-9006-04 to 06 (02/A/B/C)	Floor, Location 2	Vinyl Sheet Flooring: Yellow	None Detected

Sample No.	Sample Location	Sample Description	Asbestos Content (% by Weight/Type)
23-9006-07 to 09 (03/A/B/C)	Floor, Location 2	Vinyl Floor Tiles: 9" x 9", Brown	None Detected
23-9006-10 to 12 (04/A/B/C)	Ceiling, Location 2	Ceiling Tile-1, 4'x2', Pinholes with long Fissure.	None Detected
23-9006-13 to 15 (05/A/B/C)	Ceiling, Location 2	Ceiling Tile-2, 4'x2', White with Small Pinholes	None Detected
23-9006-16 to 22 (06/A/B/C/D/E/F/G)	Wall and Ceiling, Throughout the Site	Plaster	None Detected
23-9006-23 to 25 (07/A/B/C)	Basement, Location 5	Duct Wrap, Brown	None Detected
23-9006-26 to 28 (08/A/B/C)	Basement- Celling, Location 6	Cement Parging	None Detected
23-9006-29 to 31 (09/A/B/C)	**Basement- Windows, Location 6**	**Putty: Windows**	**0.5% – 5% Chrysotile**
23-9006-32 to 34 (10/A/B/C)	Basement- wall, Location 6	Drywall Joint Compound	None Detected
23-9006-35 to 37 (11/A/B/C)	Basement- wall, Location 6	Mortar	None Detected
23-9006-38 to 40 (12/A/B/C)	Floor, Location 6	Vinyl Flooring: Brown	None Detected
23-9006-41 to 43 (13/A/B/C)	Washroom, Main Floor	Grout between tiles	None Detected
23-9006-44 to 46 (14/A/B/C)	Roof: Shingles Roof	Roofing Material: Shingles Roof	None Detected
23-9006-47 to 49 (15/A/B/C)	Caulking: Brown	Roof	None Detected
23-9006-50 to 52 (16/A/B/C)	**Attic: Between Ceiling Joists**	**Duct Insulation (Wrap):**	**25% – 50% Chrysotile**
23-1041- 1 to 3 (17 A/B/C)	Flat Roof	Roofing Materials	None Detected

Ontario Regulation 278/05 ("O. Reg. 278/05") defines an "asbestos-containing" material as that with an asbestos content equal to or greater than 0.5% by weight.

Based on the laboratory analysis by the PLM method, asbestos was identified in the following building materials.

Table 2: Asbestos-containing building materials and locations

Asbestos – Containing Building Materials	Location
Window Putty	Observed between the glass panes majority of the windows throughout the Site. Refer to pictures 1 and 2 of Appendix C of this report.
Duct Insulation (Wrap)	A white duct wrap was identified on a ductwork within the Attic. The ductwork was observed in between the ceiling joist. Refer to pictures 3 and 4 of Appendix C of this report.

Based on the laboratory analysis by the PLM method, asbestos was not identified in the following building materials.

Table 3: Non-asbestos-containing building materials and locations

Asbestos – Containing Building Materials	Location
Vinyl Sheet Flooring: White and grey pattern	Central Classroom. Refer to picture 20 of Appendix C of this report.
Vinyl Sheet Flooring: Yellow	Kitchen/Staff Room. Refer to picture 21 of Appendix C of this report.
Vinyl Floor Tiles: 9” x 9”, Brown	Administration Office. Refer to picture 22 of Appendix C of this report.
Ceiling Tile-1, 4’x2’, Pinholes with long Fissure. Ceiling Tile-2, 4’x2’, White with Small Pinholes	Central Classroom. Refer to picture 23 of Appendix C of this report
Plaster	Wall and Ceiling, Throughout the Site. Refer to picture 24 of Appendix C of this report
Duct Wrap: Brown	On the ductwork throughout the basement. Refer to picture 25 of Appendix C of this report
Cement Parging	Basement ceiling, Refer to picture 26 of Appendix C of this report
Drywall joint compound	Basement wall and ceiling. Refer to picture 27 of Appendix C of this report
Mortar	Brick mortar throughout the Site

Vinyl Flooring: Brown	Staircase leading to the basement. Refer to picture 28 of Appendix C of this report
Grout	Between tiles
Roofing Material	Shingles goofing system.
Caulking: Brown	Around the Roof, roof joints, chimneys. Refer to picture 29 of Appendix C.

In addition to the above findings and after reviewing previous surveys report for the Site, the following observations were noted.

- ❑ Previously identified pipes with asbestos-containing straight pipe insulation and asbestos-containing pipe fittings were not observed during the current survey.
- ❑ Uninsulated or insulated with the fibreglass was observed on the pipes in the basement crawl space. Fibreglass insulation is non-asbestos-containing.
- ☐ PVC pipes were observed within specified work areas; this material does not contain asbestos.

Lead-Based Paint

Eighteen (18) bulk paint samples were collected and submitted to Fisher Environmental Laboratories for inductively coupled plasma (ICP) analysis, as outlined in NIOSH method 7300. The results of the sample analysis are summarized in Table 2, below.

Table 4 - Summary of Lead Paint Sample Analysis

Sample No.	Sample Location	Sample Description	Lead Content (ppm and % by Weight)
23-9006-53 LP 101	Floor, Washroom, Main Floor, Loc. 2	Grey Paint	316 ppm (0.0316%)
23-9006-54 LP102	**Celling, Main Floor, Loc. 2**	**White Paint with Yellow Layer**	**4,061 ppm (0.4061%)**
23-9006-55 LP103	**Door, Main Floor, Loc. 2**	**Blue Paint**	**40840 ppm (4.0840%)**
23-9006-56 LP104	**Door, Main Floor, Loc. 2**	**Green Paint**	**3684 ppm (0.3684%)**
23-9006-57 LP105	Wall, Mian Floor, Loc. 2	Brown Paint	641 ppm (0.0641%)
23-9006-58 LP106	**Wall, Main Floor, Loc. 2**	**Yellow Paint**	**3419 ppm (0.3419%)**

23-9006-59 LP107	**Wall, Main Floor, Loc. 3**	**Brown Paint**	**7913 ppm (0.7913%)**
23-9006-60 LP108	**Wall, Main Floor, Loc. 1**	**Dark Grey Paint**	**4865 ppm (0.4865%)**
23-9006-61 LP109	**Door Frames, Main Floor, Loc. 1**	**White Paint**	**6171 ppm (0.6171%)**
23-9006-62 LP110	**Structural Frames, Main Floor, Loc. 1**	**White**	**10580 ppm (1.0580%)**
23-9006-63 LP111	Brick	Mortar	14 ppm (0.0014%)
23-9006-64 LP112	Wall, Loc. 6	Yellow	998 ppm (0.0998%)
23-9006-65 LP113	**Floor, Location 6**	**Dark Grey Paint**	**2956 ppm (0.2956%)**
23-9006-66 LP114	**Wall, Basement, Loc. 6**	**Light Grey**	**5376 ppm (0.5376%)**
23-9006-67 LP115	**Wall, Basement, Loc. 6**	**White and Yellow Paint**	**2338 ppm (0.2338%)**
23-9006-68 LP116	**Hand Rail, Exterior**	**Green Paint**	**41740 ppm (4.1740%)**
23-9006-69 LP117	**Soffit, Exterior**	**White Paint**	**35590 ppm (3.5590%)**
23-9006-70 LP118	**Interior Wall, Loc. 3**	**Light Green Paint**	**5865 ppm (0.5865%)**

The Ontario Ministry of Labour (MOL) has not prescribed criteria defining “lead-containing” materials. Further, the MOL has not established a lower limit for concentrations of lead in paint, below which precautions do not need to be considered during construction projects. However, except for aggressive disturbance of painted finishes, (e.g., abrasive blasting, torch cutting, or grinding), Fisher believes that a lead content below 0.1% by weight (1,000 ug/g or 1000 ppm) represents a concentration in which lead content is not the limiting hazard for construction hygiene purposes.

An elevated concentration of lead (greater than 0.1% lead) was detected in the eighteen (18) paint sample submitted for analysis.

Other Designated Substances

Mercury

During the survey, no sampling for mercury was conducted. However, fluorescent light tubes (known to contain mercury) were observed at the Site. No other building materials or components suspected to contain mercury were noted during the building survey.

Silica

Crystalline silica is a constituent of all concrete and masonry products present at the Site. While the cutting, grinding, or demolition of materials containing silica is not anticipated at the Site, these activities should be completed in accordance with the Ontario Ministry of Labour Guidelines for Silica on Construction projects. Specifically, the Guideline prescribes respiratory protection, site isolation, and the use of wetting to control dust emissions during the cutting, grinding, drilling, or demolition of silica-containing materials. Please refer to the Guideline for details concerning Silica on Construction Projects.

Acrylonitrile

During the survey, no materials suspected to contain acrylonitrile were found at the Site.

Arsenic

During the survey, no materials suspected to contain arsenic were found at the Site.

Benzene

During the survey, no materials suspected to contain benzene were found at the Site.

Coke Oven Emissions

During the survey, no materials suspected to contain Coke Oven Emission were found at the Site.

Ethylene Oxide

During the survey, no materials suspected to contain ethylene oxide were found at the Site.

Isocyanates

During the survey, no materials suspected to contain isocyanates were found at the Site.

Vinyl Chloride

During the survey, no materials suspected to contain vinyl chloride were found at the Site.

No other Designated Substances or other potentially hazardous building materials were identified in the proposed project scope areas. If additional suspected Designated Substances or other potentially hazardous building materials not identified in this report pertaining to the Site are discovered, work should be stopped and the material(s) in question should be sampled for determination of content.

5.0. RECOMMENDATIONS

Based on the observations and findings outlined above, Fisher recommends are as follows:

Asbestos:

- ❑ Removal of window putty will require Type 1 asbestos abatement procedures as outlined in O. Reg. 278/05.
- ❑ Removal of the duct insulation will require Type 1 asbestos abatement procedures as per O. Reg. 278/05.

Lead:

- ❑ Removal of lead-containing materials shall be carried out in accordance with the following regulations and guidelines:
    - Guideline: Lead on Construction Projects (issued by Ontario Ministry of Labour);
    - Designated Substances Regulation, O. Reg. 490/09; and
    - Regulation for Construction Projects, O. Reg. 213/91.

Mercury:

- ❑ No immediate recommendations are warranted with regard to mercury.
- ❑ However, if the disturbance of the identified fluorescent light tubes presumed to contain mercury is planned as part of the anticipated construction activities, Fisher recommends that these items be removed and disposed of in accordance with O. Reg. 558/00.

Silica:

- ❑ Renovations and/or demolition operations that are likely to generate silica-containing dust shall be carried out in accordance with the following requirements:
    - Guideline: Silica on Construction Projects (issued by Ontario Ministry of Labour);
    - Designated Substances Regulation, O. Reg. 490/09; and
    - Regulation for Construction Projects, O. Reg. 213/91.

6.0. LIMITATIONS

Fisher Environmental Ltd. accepts responsibility for the competent performance of its duties in executing this assignment within the normal standards of the profession, but disclaims responsibility for consequential damages, if any.

The scope of the survey is based on prior agreement with the client, and the rationale given in this report. The building survey findings rely on the professional interpretation of selective sampling and analysis. Sample analysis results have been applied to homogenous materials in unsampled locations; it was not within the scope of work to carry out an exhaustive sampling and analysis program.

This report was prepared for the City of Toronto, Park-Forestry-Recreation Division. The scope of services performed may not be appropriate for the purposes of other users, and any use or reuse of this document or its findings or recommendations represented herein is at the sole risk of any other user.

We trust that the information provided in the report meets your current requirements. If you have any questions or concerns, please do not hesitate to contact the undersigned.

Prepared by:

Reviewed by:

Muhammad Junayed, B.Sc., EP.
Project Manager

Dave Fisher, P.Eng. C. Chem
Principal

Attachment A - Laboratory Analysis Report
Attachment B - Site Photographs
Attachment C - Site Plans

APPENDIX A – LABORATORY CERTIFICATE OF ANALYSIS

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Park, Forestry & Recreation
Address: 24th Floor, Metro Hall
55 John Street, Toronto ON
M5V 3C6
Tel.: 416-395-7898
Attn: John Keen

F.E. Job #: 23-1041
Project Name: DSS
Project ID: FM-P 23-12830
Date Sampled: 11-Apr-2023
Date Received: 11-Apr-2023
Date Reported: 14-Apr-2023
Location: 375 Colborne Lodge Drive
St Thomas, ON

Certificate of Analysis

Analysis Requested:	Asbestos by PLM
Sample Description:	3 Bulk Sample(s) (***3 Days***)

Sample Matrix and Client Sample Description	Client Sample Location	Lab Sample ID	Asbestos Content and Fibre Type
1A - Roofing Material	Flat Roof	23-1041-1	Not Detected
1B - Roofing Material	Flat Roof	23-1041-2	Not Detected
1C - Roofing Material	Flat Roof	23-1041-3	Not Detected

Fisher Environmental Laboratories (Lab ID #: 2745) is accredited by CALA (Canadian Association for Laboratory Accreditation Inc.) for asbestos analysis by PLM.

ANALYTICAL METHOD:

Asbestos has been done in accordance with normal professional standard using the following Fisher Environmental Lab Method: Asbestos by PLM (Polarized Light Microscope) F-26, Rev.2.2.

Authorized by:

Roger Lin, Ph. D., C. Chem.
Laboratory Manager

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
Ronggen (Roger) Lin
CHEMIST

Results relate only to the items tested

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Park, Forestry & Recreation
Address: 24th Floor, Metro Hall
55 John Street, Toronto ON
M5V 3C6
Tel.: 416-395-7898
Attn: John Keen

F.E. Job #: 23-9906
Project Name: Pre-Reno DSS
Project ID: FM-P 23-12830
Date Sampled: 2-Mar-2023
Date Received: 9-Mar-2023
Date Reported: 16-Mar-2023
Location: 375 Colborne Lodge Drive

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (***Stop Positive***)

Client Sample ID	Lab Sample ID	Sample Matrix	Fibre Type	Asbestos Content
1A - VSF-1, White & Grey Pattern, Loc 1, Floor	23-9906-1	Vinyl Sheet Flooring		Not Detected
1B - VSF-1, White & Grey Pattern, Loc 1, Floor	23-9906-2	Vinyl Sheet Flooring		Not Detected
1C - VSF-1, White & Grey Pattern, Loc 1, Floor	23-9906-3	Vinyl Sheet Flooring		Not Detected
2A - VSF-2, Yellow, Loc 2, Floor	23-9906-4	Vinyl Sheet Flooring		Not Detected
2B - VSF-2, Yellow, Loc 2, Floor	23-9906-5	Vinyl Sheet Flooring		Not Detected
2C - VSF-2, Yellow, Loc 2, Floor	23-9906-6	Vinyl Sheet Flooring		Not Detected
3A - VFT-1, 9x9 Brown, Loc 2, Floor	23-9906-7	Vinyl Tile		Not Detected
3B - VFT-1, 9x9 Brown, Loc 2, Floor	23-9906-8	Vinyl Tile		Not Detected
3C - VFT-1, 9x9 Brown, Loc 2, Floor	23-9906-9	Vinyl Tile		Not Detected

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (Stop Positive)

Client Sample ID	Lab Sample ID	Sample Matrix	Fibre Type	Asbestos Content
4A - CT-1, 4x2, Pinholes with Long Fissure, Loc 1	23-9906-10	Ceiling Tile		Not Detected
4B - CT-1, 4x2, Pinholes with Long Fissure, Loc 1	23-9906-11	Ceiling Tile		Not Detected
4C - CT-1, 4x2, Pinholes with Long Fissure, Loc 1	23-9906-12	Ceiling Tile		Not Detected
5A - CT-2, 4x2, White with Small Holes, Loc 1	23-9906-13	Ceiling Tile		Not Detected
5B - CT-2, 4x2, White with Small Holes, Loc 1	23-9906-14	Ceiling Tile		Not Detected
5C - CT-2, 4x2, White with Small Holes, Loc 1	23-9906-15	Ceiling Tile		Not Detected
6A - Plaster, Loc 1, Wall	23-9906-16	Plaster		Not Detected
6B - Plaster, Loc 2, Wall	23-9906-17	Plaster		Not Detected
6C - Plaster, Loc 2, Ceiling	23-9906-18	Plaster		Not Detected
6D - Plaster, Loc 1, Wall	23-9906-19	Plaster		Not Detected
6E - Plaster, Loc 4, Wall	23-9906-20	Plaster		Not Detected
6F - Plaster, Loc 3, Wall	23-9906-21	Plaster		Not Detected
6G - Plaster, Loc 4, Ceiling	23-9906-22	Plaster		Not Detected

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (Stop Positive)

Client Sample ID	Lab Sample ID	Sample Matrix	Fibre Type	Asbestos Content
7A - Duct Wrap, Brown, Loc 5, Duct Work	23-9906-23	Duct Wrap		Not Detected
7B - Duct Wrap, Brown, Loc 5, Duct Work	23-9906-24	Duct Wrap		Not Detected
7C - Duct Wrap, Brown, Loc 5, Duct Work	23-9906-25	Duct Wrap		Not Detected
8A - Cement Parging, Loc 6, Ceiling	23-9906-26	Cement Parging		Not Detected
8B - Cement Parging, Loc 6, Ceiling	23-9906-27	Cement Parging		Not Detected
8C - Cement Parging, Loc 6, Ceiling	23-9906-28	Cement Parging		Not Detected
9A - Window Putty, Loc 6, Windows	23-9906-29	Putty	Chrysotile	0.5-5%
9B - Window Putty, Loc 6, Windows	23-9906-30	Putty		Stop Positive
9C - Window Putty, Loc 6, Windows	23-9906-31	Putty		Stop Positive
10A - Drywall Joint Compound, Loc 6, Wall	23-9906-32	DJC		Not Detected
10B - Drywall Joint Compound, Loc 6, Wall	23-9906-33	DJC		Not Detected
10C - Drywall Joint Compound, Loc 6, Wall	23-9906-34	DJC		Not Detected

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (Stop Positive)

Client Sample ID	Lab Sample ID	Sample Matrix	Fibre Type	Asbestos Content
11A - Mortar, Loc 6, Wall	23-9906-35	Mortar		Not Detected
11B - Mortar, Loc 6, Wall	23-9906-36	Mortar		Not Detected
11C - Mortar, Loc 6, Wall	23-9906-37	Mortar		Not Detected
12A - Vinyl Flooring, Brown, Loc 6, Floor	23-9906-38	Vinyl Tile		Not Detected
12B - Vinyl Flooring, Brown, Loc 6, Floor	23-9906-39	Vinyl Tile		Not Detected
12C - Vinyl Flooring, Brown, Loc 6, Floor	23-9906-40	Vinyl Tile		Not Detected
13A - Grout, Loc 6, Washroom Stall	23-9906-41	Grout		Not Detected
13B - Grout, Loc 6, Washroom Stall	23-9906-42	Grout		Not Detected
13C - Grout, Loc 6, Washroom Stall	23-9906-43	Grout		Not Detected
14A - Roofing Material, Roof	23-9906-44	Roofing		Not Detected
14B - Roofing Material, Roof	23-9906-45	Roofing		Not Detected
14C - Roofing Material, Roof	23-9906-46	Roofing		Not Detected

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (Stop Positive)

Client Sample ID	Lab Sample ID	Sample Matrix	Fibre Type	Asbestos Content
15A - Caulking, Roof, Brown, Roof	23-9906-47	Caulking		Not Detected
15B - Caulking, Roof, Brown, Roof	23-9906-48	Caulking		Not Detected
15C - Caulking, Roof, Brown, Roof	23-9906-49	Caulking		Not Detected
16A - Duct Insulation, Attic	23-9906-50	Insulation	Chrysotile	25-50%
16B - Duct Insulation, Attic	23-9906-51	Insulation		Stop Positive
16C - Duct Insulation, Attic	23-9906-52	Insulation		Stop Positive

Fisher Environmental Laboratories (Lab ID #: 2745) is accredited by CALA (Canadian Association for Laboratory Accreditation Inc.) for asbestos analysis by PLM.

ANALYTICAL METHOD:

Asbestos has been done in accordance with normal professional standard using the following Fisher Environmental Lab Method: Asbestos by PLM (Polarized Light Microscope) F-26, Rev.2.2.

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (Stop Positive)

Client Sample ID	Lab Sample ID	Sample Matrix	Lead (ppm)	Comments
LP101 - Paint, Grey, Loc 2, Floor	23-9906-53	Paint	316	
LP102 - Paint, White with Yellow, Loc 2, Ceiling	23-9906-54	Paint	4061	
LP103 - Paint, Blue, Loc 2, Door	23-9906-55	Paint	40840	
LP104 - Paint, Green, Loc 2, Door	23-9906-56	Paint	3684	
LP105 - Paint, Brown, Loc 1, Wall	23-9906-57	Paint	641	
LP106 - Paint, Yellow, Loc 2, Wall	23-9906-58	Paint	3419	
LP107 - Paint, Brown, Loc 3, Wall	23-9906-59	Paint	7913	
LP108 - Paint, Dark Grey, Loc 1, Wall	23-9906-60	Paint	4865	
LP109 - Paint, White, Loc 1, Door Frame	23-9906-61	Paint	6171	
LP110 - Paint, White, Loc 1, Structural Frame	23-9906-62	Paint	15080	
LP111 - Mortar for Paint, Wall	23-9906-63	Paint	14	
LP112 - Paint, Yellow, Loc 6, Wall	23-9906-64	Paint	998	
LP113 - Paint, Dark Grey, Loc 6, Floor	23-9906-65	Paint	2956	
LP114 - Paint, Light Grey, Loc 6, Wall	23-9906-66	Paint	5376	

< result obtained was below RL (Reporting Limit).

Certificate of Analysis

Analysis Requested:	Asbestos, Lead
Sample Description:	70 Bulk Sample(s) (Stop Positive)

Client Sample ID	Lab Sample ID	Sample Matrix	Lead (ppm)	Comments
LP115 - Paint, White & Yellow, Loc 6, Wall	23-9906-67	Paint	2338	
LP116 - Paint, Green, Exterior	23-9906-68	Paint	41740	
LP117 - Paint, White, Exterior Soffit	23-9906-69	Paint	35590	
LP118 - Paint, Light Green, Wall	23-9906-70	Paint	5865	

< result obtained was below RL (Reporting Limit).

QA/QC Report

Parameter	Blank (ppm)		LCS (%)		CRM (%)	
	Result	RL	Recovery	AR	Recovery	AR
Lead	<10	10	100	80-120	87	70-130

Parameter	Duplicate (%)					
	RPD	AR				
Lead	3.1	0-30				

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
AR - Acceptable Range
RPD - Relative Percent Difference

ANALYTICAL METHODS:

Metals (Lead) - Method # F-1, Rev. 4.5, Standard Operation Procedure for determination of Metals by the Inductively Coupled Plasma- Optical. Method used by Fisher Environmental Lab complies with the Standard Methods for the Examination of Water and Wastewater, 20th Ed 3120-B.

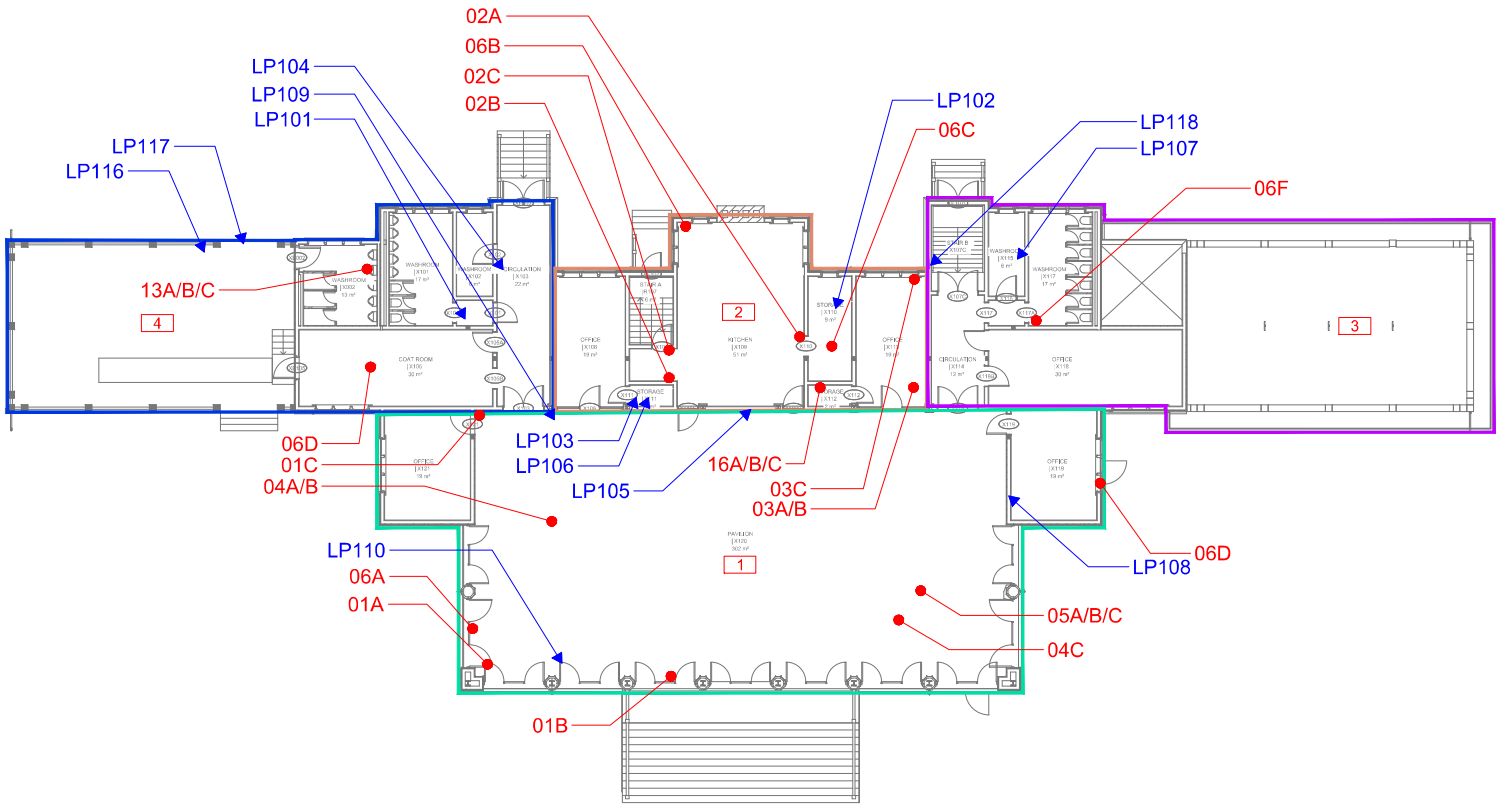
Authorized by: _____

Roger Lin, Ph. D., C. Chem.
Laboratory Manager

ASSOCIATION OF THE CHEMICAL PROFESSION OF ONTARIO
CHARTERED
Ronggen (Roger) Lin
CHEMIST

Results relate only to the items tested

APPENDIX B – SITE PLANS



Legend

- Asbestos Sample Location
- Lead Sample Location
- 1 — Location Number

Figure 1

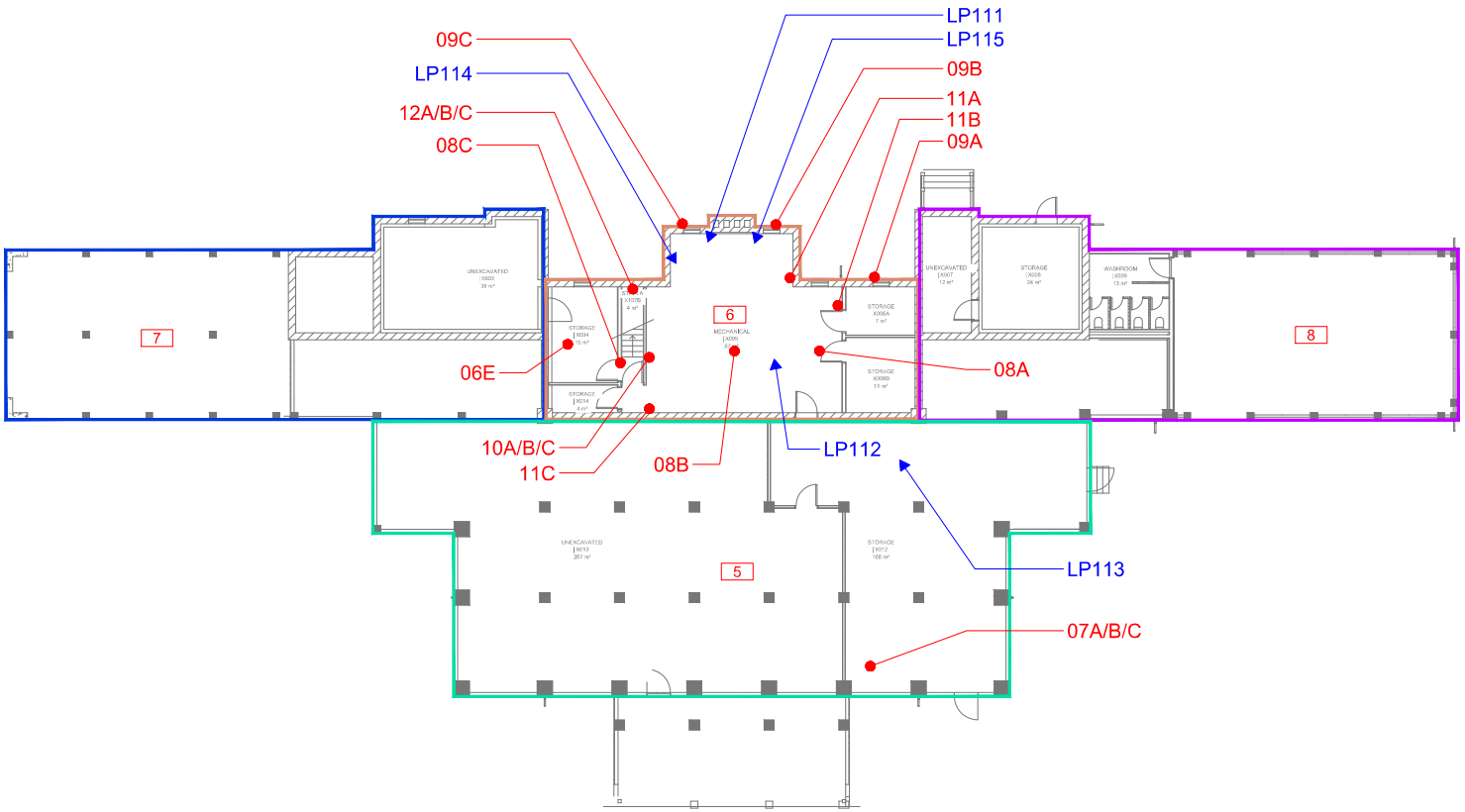
LOCATION:
375 Colborne Lodge Dr,
Toronto, Ontario

BUILDING NAME:
High Park Forest School

Main Floor Plan
Asbestos and Lead Sample Locations

CLIENT:	City of Toronto		
PROJECT NUMBER: FE-P 23-12830	DATE: April 2023	DRW BY: DC	
CAD FILE: FIG1	SCALE: Not to Scale	CHK BY: MJ	

TORONTO



Legend

- Asbestos Sample Location
- Lead Sample Location
- 1 — Location Number

Figure 2

LOCATION:
375 Colborne Lodge Dr,
Toronto, Ontario

BUILDING NAME:
High Park Forest School

Lower Floor Plan
Asbestos and Lead Sample Locations

CLIENT:	City of Toronto		
PROJECT NUMBER: FE-P 23-12830	DATE: April 2023	DRW BY: DC	
CAD FILE: FIG2	SCALE: Not to Scale	CHK BY: MJ	

TORONTO

Legend

Asbestos Sample Location

Figure 3

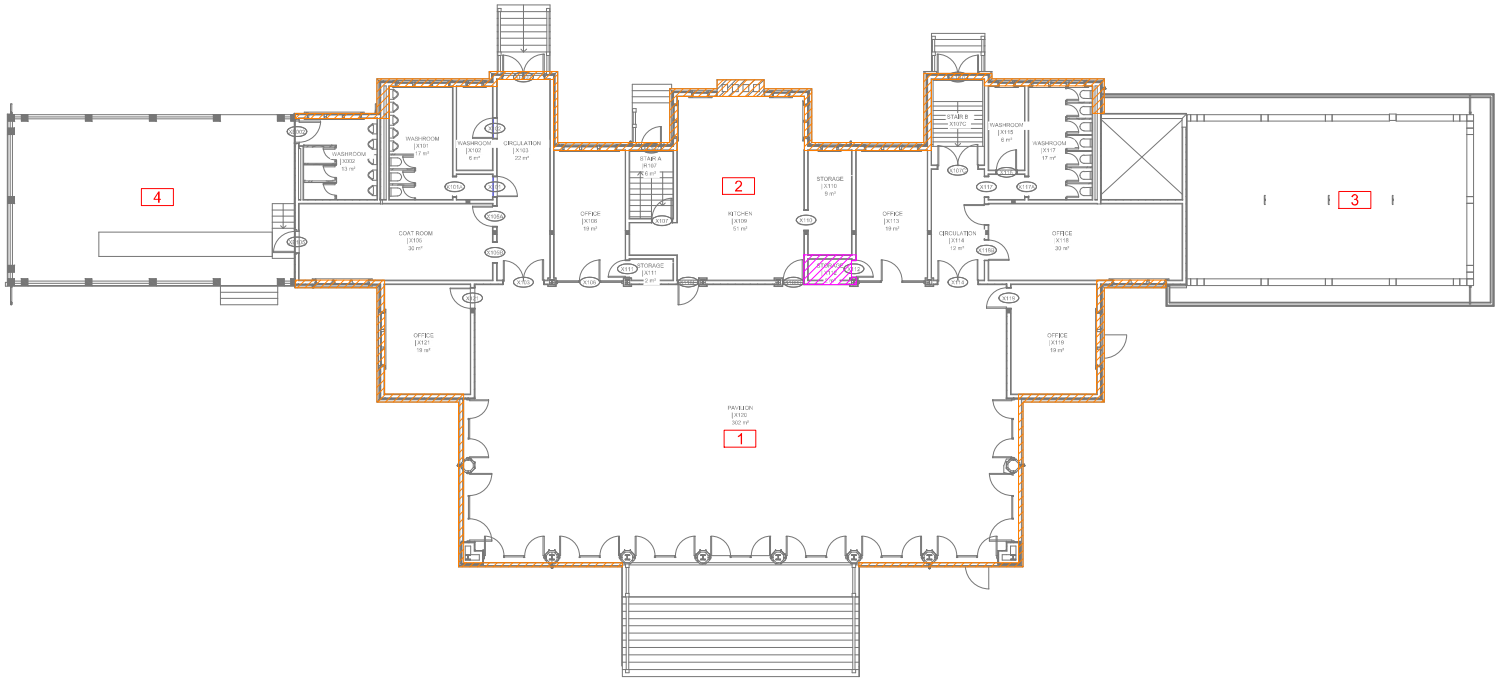
LOCATION:
375 Colborne Lodge Dr,
Toronto, Ontario

BUILDING NAME:
High Park Forest School

Roof Plan
Asbestos Sample Location

CLIENT:	City of Toronto		
PROJECT NUMBER: FE-P 23-12830	DATE: April 2023	DRW BY: DC	
CAD FILE: FIG3	SCALE: Not to Scale	CHK BY: MJ	

TORONTO



Legend

Asbestos-Containing Duct Wrap

Asbestos-Containing Window Putty

Figure 4

LOCATION:

375 Colborne Lodge Dr,
Toronto, Ontario

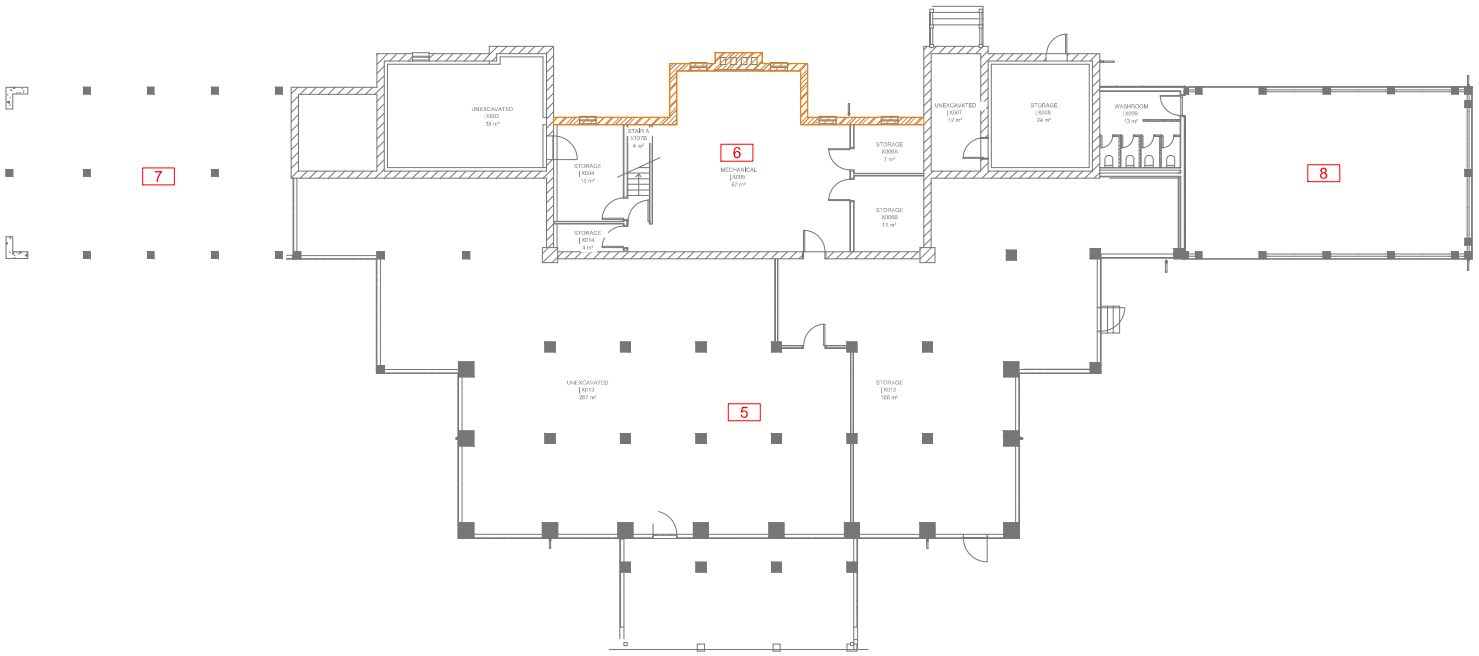
BUILDING NAME:

High Park Forest School

Main Floor Plan
Asbestos-Containing Material Locations

CLIENT:	City of Toronto		
PROJECT NUMBER: FE-P 23-12830	DATE: April 2023	DRW BY: DC	
CAD FILE: FIG4	SCALE: Not to Scale	CHK BY: MJ	

TORONTO



Legend

Asbestos-Containing Window Putty

Figure 5

LOCATION:
375 Colborne Lodge Dr,
Toronto, Ontario

BUILDING NAME:
High Park Forest School

Lower Floor Plan
Asbestos-Containing Material Locations

CLIENT:	City of Toronto		
PROJECT NUMBER: FE-P 23-12830	DATE: April 2023	DRW BY: DC
CAD FILE: FIG5	SCALE: Not to Scale	CHK BY: MJ

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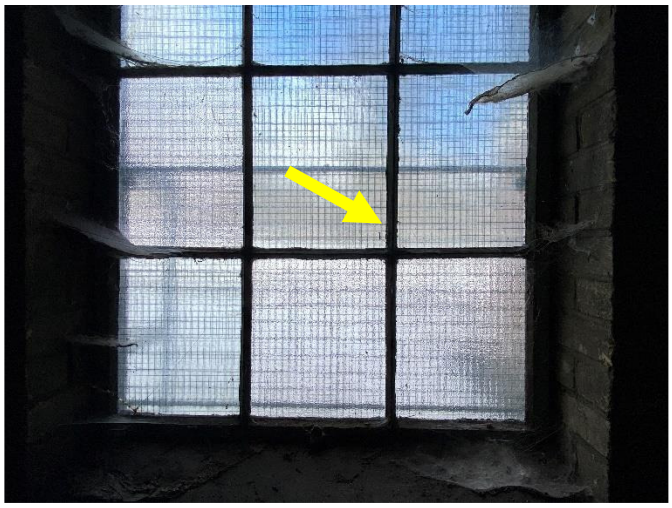
APPENDIX C – SITE PHOTOGRAPHS

Picture 1: A view of the window with asbestos-containing window putty around the window panes.



Picture 2: Another view of a window with asbestos-containing window putty around the window panes.

Picture 3: Asbestos-containing insulation on a ductwork in the attic.

Picture 4: Another view of the asbestos-containing insulation (white) on a ductwork in the attic.

Picture 5: Elevated level of lead-containing white paint on the ceiling of the Storage Room**.**

Picture 6: Elevated level of lead-containing blue paint on the door at the Site.

Picture 7: Elevated level of lead-containing green paint on the door at the Site**.**

Picture 8: Elevated level of lead-containing yellow paint on the wall inside a closet.

Picture 9: Elevated level of lead-containing dark grey paint on the wall.

Picture 10: Elevated level of lead-containing brown paint on a wall in the washroom.

Picture 11: Elevated level of lead-containing white paint on the door and door frames at the Site.

Picture 12: Elevated level of lead-containing white paint on the structural frames at the Site.

Picture 13: Elevated level of lead-containing yellow paint on a basement wall.

Picture 14: Elevated level of lead-containing dark grey paint on the concrete floor of washroom.

Picture 15: Elevated level of lead-containing light grey paint on the concrete floor of basement.

Picture 16: Elevated level of lead-containing white paint with yellow back layer on the basement wall.

Picture 17: Elevated level of lead-containing green paint on the exterior structure.

Picture 18: Elevated level of lead-containing white paint on the soffit.

Picture 19: Elevated level of lead-containing light green paint on the wall.

Picture 20: A view of the non-asbestos-containing vinyl sheet flooring.

Picture 21: A view of the non-asbestos-containing yellow vinyl sheet flooring.

Picture 22: A view of the non-asbestos-containing Vinyl Floor Tiles: 9” x 9”, Brown.

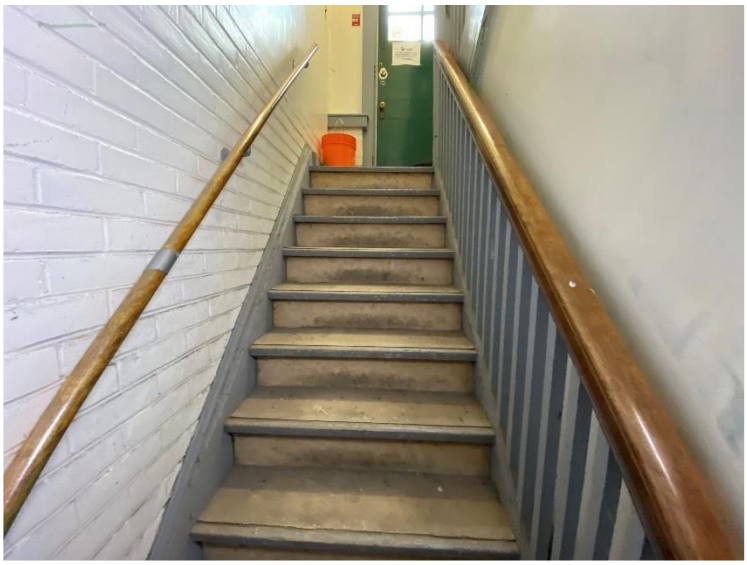
Picture 23: A view of the non-asbestos-containing Ceiling Tile-1, 4’x2’, Pinholes with long Fissure and Ceiling Tile-2, 4’x2’, White with Small Pinholes.

Picture 24: Non-asbestos-containing wall plaster.

Picture 25: Non-asbestos-containing brown duct wrap.

Picture 26: Non-asbestos-containing cement parging in the basement.

Picture 27: Non-asbestos-containing drywall with drywall joint compound at the Site.



Picture 28: Non-asbestos-containing vinyl flooring at the Site.

Picture 29: A view of non insulated pipe within the crawl space.

Section Cover Page

Designated Substance Abatement
2023-04-21

Use this Section to specify removal of and disposal of asbestos-containing building materials and lead-containing paint.

This Technical Specification Section contains:

1 This Cover Page
2 Site Drawings
3 Specification Section Text:

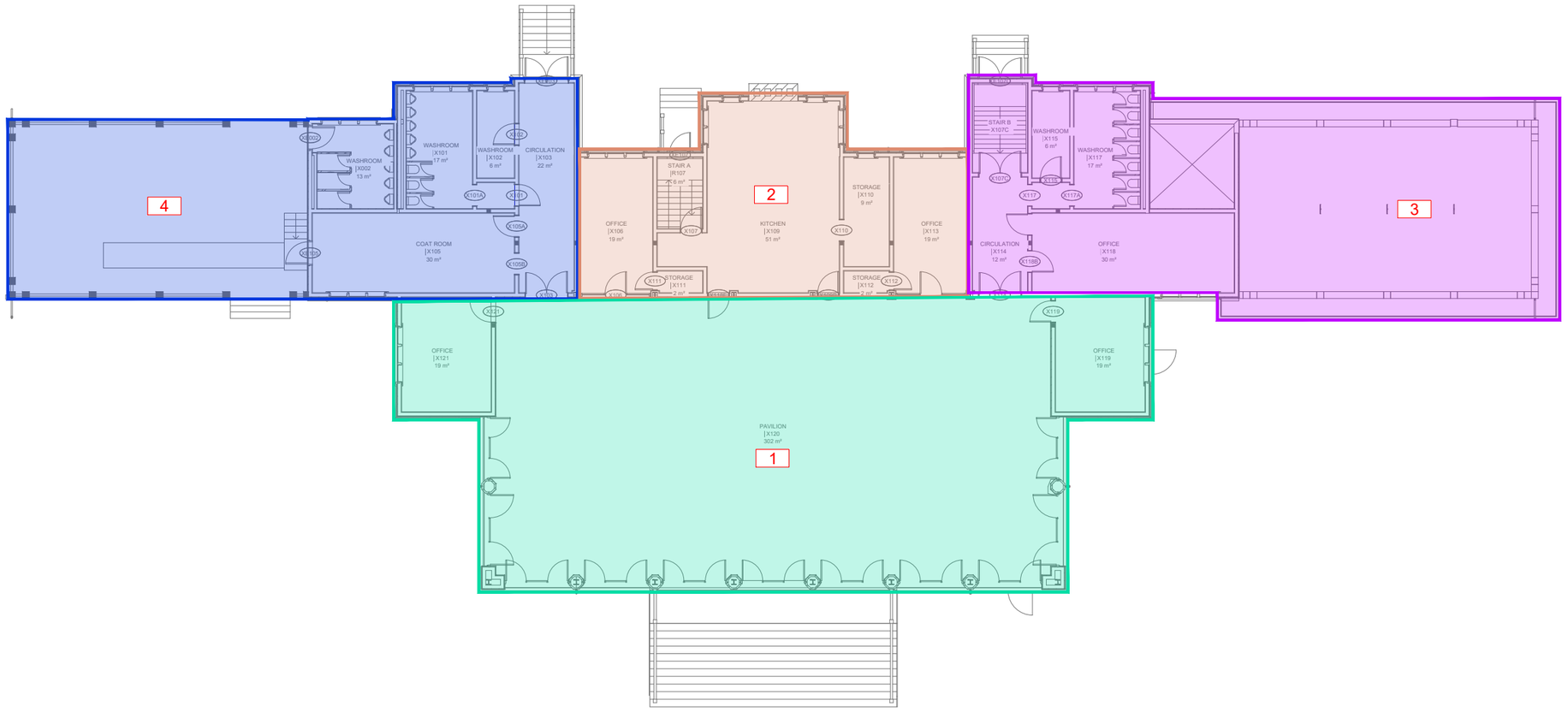
A. General

1.1 General Conditions and Related Work
1.2 Description of Work
1.3 Definition
1.4 Work Schedule
1.5 Submittals
1.6 Quality Assurance
1.7 Regulation
1.8 Proscriptions
1.9 Worker and Visitor Protection
1.10 Inspections
1.11 Air Monitoring
1.12 Waste Transport and Disposal

B. Facilities and Products

C. Execution

3.0 Lead-containing Paint Abatement Procedure
4.0 Asbestos-abatement procedure



Legend

- Work Area 1
- Work Area 2
- Work Area 3
- Work Area 4

Figure 1

LOCATION:

375 Colborne Lodge Dr,
Toronto, Ontario

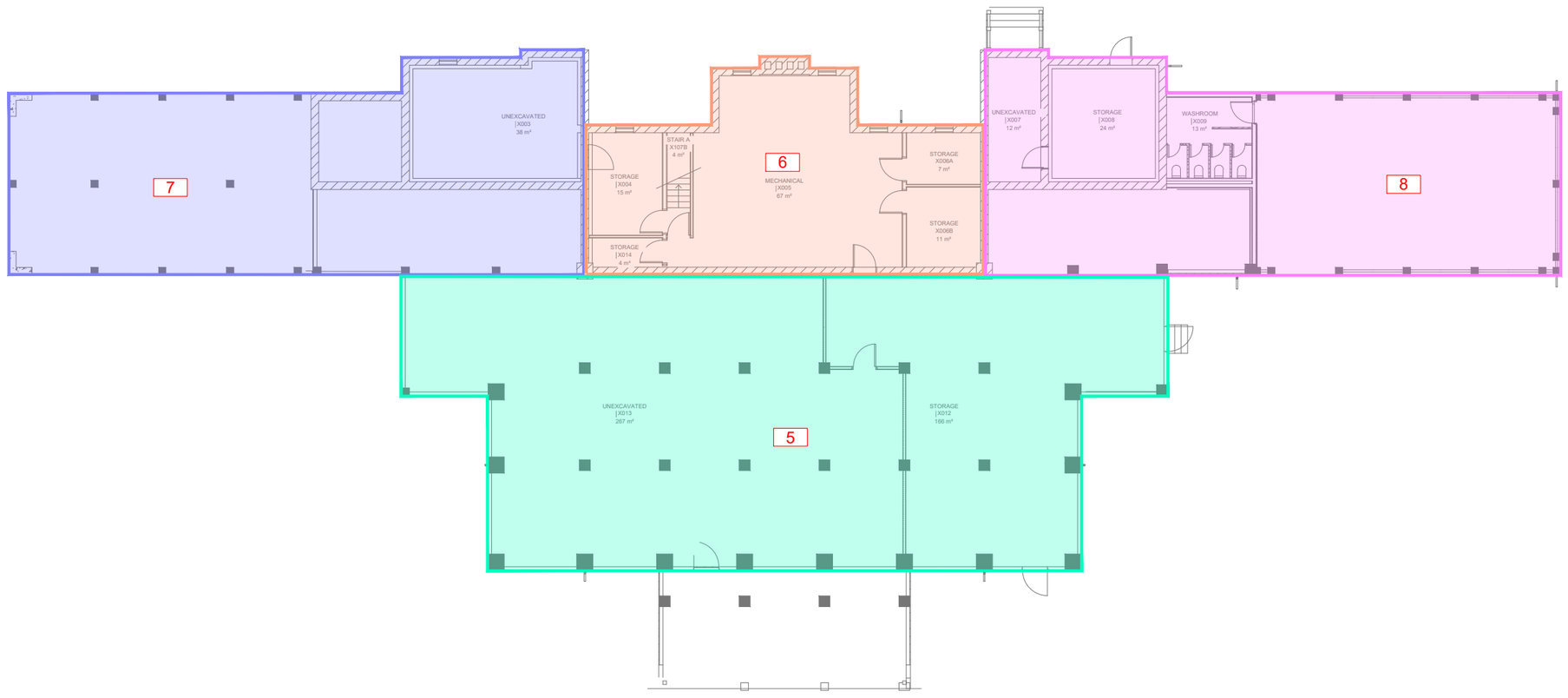
BUILDING NAME:

High Park Forest School

Main Floor Plan
Asbestos Abatement Work Area

CLIENT:	City of Toronto		
PROJECT NUMBER: FE-P 23-12830	**DATE:** April 2023	**DRW BY:** DC	
CAD FILE: FIG1	**SCALE:** Not to Scale	**CHK BY:** MJ	

TORONTO



Legend

- Work Area 5
- Work Area 6
- Work Area 7
- Work Area 8

Figure 2

LOCATION:

375 Colborne Lodge Dr,
Toronto, Ontario

BUILDING NAME:

High Park Forest School

Lower Floor Plan
Asbestos Abatement Work Area

CLIENT: City of Toronto			
PROJECT NUMBER: FE-P 23-12830	**DATE:** April 2023	**DRW BY:** DC
CAD FILE: FIG2	**SCALE:** Not to Scale	**CHK BY:** MJ

TORONTO

PART A – GENERAL

1.1 General Conditions and Related Work

1.1.1 **Before commencing the abatement activities, verify the locations of all identified asbestos and lead-containing materials.**

1.1.2 This section forms a part of the Contract Document and should be read in conjunction with all other Sections and Divisions in order to comply with the requirements of the General Conditions of the Contract.

1.1.3 It is the intent that work performed as outlined in this section will result in the complete removal and disposal of all asbestos-containing and lead-containing materials, and materials that become contaminated by asbestos and lead as a result of the work specified by this Section.

1.1.4 Dispose of all waste as specified in applicable sections of the specifications document.

1.1.5 **Asbestos-containing window putty was identified around the window panes (interior and exterior) of Location 1, 2, 3, 4, 6 and 8 at the site.**

1.1.6 **Asbestos-containing duct wrap was identified on a ductwork within the attic.**

1.1.7 **Lead-containing white paint with yellow layer was identified on the wall and ceiling of Location 2, 3, and 4 at the Site.**

1.1.8 **Lead-containing blue and green paints were identified on the door and door frames of Location 1, 2 ,3 and 4, 5 at the Site.**

1.1.9 **Lead-containing yellow paint was identified on the wall of Location 2, 5 at the Site.**

1.1.10 **Lead-containing brown paint was identified on the wall of Location 3 at the Site.**

1.1.11 **Lead-containing grey paint was identified on the wall of Location 1 at the Site.**

1.1.12 **Lead-containing white paint was identified on the door frames of Location 1, 2, 3, and 4 at the Site.**

1.1.13 **Lead-containing white paint was identified on the structural frames of Location 1 at the Site.**

1.1.14 **Lead-containing dark grey paint was identified on the floor of Location 3 and 4 at the Site.**

1.1.15 **Lead-containing light green paint was identified on the wall of Location 5 and 6 at the Site.**

1.1.16 **Lead-containing white and yellow paint was identified on the wall of Location 6 at the Site.**

1.1.17 **Lead-containing green paint was identified on the rails of Location 3 and 4 at the Site.**

1.1.18 **Lead-containing white paint was identified on the soffit at the Site.**

1.1.19 **Lead-containing light grey paint was identified on the floor of Location 5 and 6 at the Site.**

1.1.20 The Environmental Consultant may perform area and personal air monitoring to verify effectiveness of dust suppression methods and adequacy of the respirators used by the Contractor. Contractor's personnel shall co-operate with the Environmental Consultant in collecting air samples.

1.1.21 This project and all work associated with it is regulated by The Occupational Health and Safety Act, the Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations, Ontario Regulation 278/05; the Designated Substances Regulation, Ontario Regulation 490/09; the Regulation for Construction Projects-Ontario

Regulation 213/91; "Lead on Construction Projects" (Issued by the Ontario Ministry of Labour), and other applicable regulations.

1.1.22 In cases of conflict between procedures outlined in this document, the more stringent requirement will apply.

1.2 Description of Work

1.2.1 **Before submitting a bid, confirm the scope of work of the project by visiting the site and reading the entire survey report and specification documents. The estimated quantity and other information presented in this document should not be used as the only basis for submitting a bid. It is the abatement contractor's responsibility to confirm all quantities and measurements during the site meeting.**

1.2.2 **Work Procedure - Asbestos Abatement:**

1.2.3 **Asbestos-containing window putty was identified around the window panes (interior and exterior) of Location 1, 2, 3, 4, 6 and 8 at the site.**

1.2.4 **Asbestos-containing duct wrap was identified on a ductwork within the attic.**

1.2.5 Abatement should follow the Type 1 Asbestos Abatement Procedures, as outlines in Ontario Regulation 278/05 as follows:

1.2.5.1 Pre-clean and protect all unaffected surfaces in the immediate vicinity of the work area by HEPA vacuuming and the use of poly sheeting respectively. This includes securing a poly drop sheet to the floor directly below the work area.

1.2.5.2 For the Type 1 operation, signs should be posted in sufficient numbers to warn of the asbestos operations. There should be a sign, at least, at each entrance to the work area. The signs should display the following information in large, clearly visible letters:

a) Caution: Asbestos Exposure
b) Access to the work area is restricted to authorized persons; and
c) Respirators must be worn in the work area.

1.2.5.3 Workers are not permitted to eat, drink, chew gum or smoke in the work area.

1.2.5.4 The spread of dust from the work area shall be controlled by measures appropriate to the work to be done, including the use of drop sheets of polyethylene or other suitable material that is impervious to asbestos.

1.2.5.5 Protective clothing shall be provided by the employer and worn by every worker who enters the work area, and the protective clothing,

- shall be made of a material that does not readily retain nor permit penetration of asbestos fibres,
- shall consist of head covering and full body covering those fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing,
- shall include suitable footwear, and
- shall be repaired or replaced if torn.

1.2.5.6 The material shall be wet before and kept wet during the work to control the spread of dust or fibres unless wetting would create a hazard or cause damage.

1.2.5.7 A wetting agent shall be added to the water that is to be used to control the spread of dust and fibres.

1.2.5.8 Dust and waste shall be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste bag.

1.2.5.9 Compressed air shall not be used to clean up and remove dust from any surface.

1.2.5.10 Remove all waste generated by the abatement work, including, but not limited to, building debris, disposable coveralls, respirator cartridges, and plastic sheeting. Seal all waste into 6 mil nominal disposal bags. Wet wipe or clean the bags with a HEPA vacuum and finally double-bag in a second clean 6 mil nominal bag or suitable sealed container.

1.2.5.11 Clean all equipment used in the abatement work (e.g., vacuum cleaner, knives, saws) using a HEPA vacuum and wet wiping. Equipment that cannot be readily cleaned (e.g. vacuum hose or wire brushes) shall be HEPA vacuumed and sealed in 6 mil polyethylene bags or a suitable sealed container before removal from the work area.

1.2.5.12 Dispose of the waste materials in compliance with local, provincial, and federal regulations.

1.2.5.13 Wash face and hands, and clean and maintain respirator after completion of asbestos abatement. Contractors will be required to provide any water for washing and cleaning hands and face for workers leaving the work area.

1.2.5.14 All the waste generated in the Work Area shall be double bagged using asbestos labelled yellow bags and disposed of as asbestos waste.

1.2.5.15 The abatement Contractor shall be responsible for the disposal of all waste generated as part of the project. This includes the costs related to the procurement of waste bins and the associated handling, transportation, and disposal fees.

1.2.6 **Work Procedure – Lead Containing Paint Abatement:**

1.2.7 **Lead-containing white paint with yellow layer was identified on the wall and ceiling of Location 2, 3, and 4 at the Site.**

1.2.8 **Lead-containing blue and green paints were identified on the door and door frames of Location 1, 2 ,3 and 4, 5 at the Site.**

1.2.9 **Lead-containing yellow paint was identified on the wall of Location 2, 5 at the Site.**

1.2.10 **Lead-containing brown paint was identified on the wall of Location 3 at the Site.**

1.2.11 **Lead-containing grey paint was identified on the wall of Location 1 at the Site.**

1.2.12 **Lead-containing white paint was identified on the door frames of Location 1, 2, 3, and 4 at the Site.**

1.2.13 **Lead-containing white paint was identified on the structural frames of Location 1 at the Site.**

1.2.14 **Lead-containing dark grey paint was identified on the floor of Location 3 and 4 at the Site.**

1.2.15 **Lead-containing light green paint was identified on the wall of Location 5 and 6 at the Site.**

1.2.16 **Lead-containing white and yellow paint was identified on the wall of Location 6 at the Site.**

1.2.17 **Lead-containing green paint was identified on the rails of Location 3 and 4 at the Site.**

1.2.18 **Lead-containing white paint was identified on the soffit at the Site.**

1.2.19 **Lead-containing light grey paint was identified on the floor of Location 5 and 6 at the Site.**

1.2.20 Abatement work for lead-containing paint should follow the Type 2a procedures as detailed in the Guideline: “Lead on Construction Projects”.

1.2.20.1 Ensure that the work area is separated from the rest of the building by using two (2) layers of overlapping rip-proof poly sheeting.

1.2.20.2 Pre-clean and remove all moveable objects and items present in the work area.

1.2.20.3 Protect the floors and walls in the immediate vicinity of the Work Area using rip-proof poly drop-sheets.

1.2.20.4 For the Type 2a operation, signs should be posted in sufficient numbers to warn of the asbestos operations. There should be a sign, at least, at each entrance to the work area. The signs should display the following information in large, clearly visible letters:

d) Caution: Lead Exposure
e) Access to the work area is restricted to authorized persons; and
f) Respirators must be worn in the work area.

1.2.20.5 Workers are not permitted to eat, drink, chew gum or smoke in the work area.

1.2.20.6 The spread of dust from the work area shall be controlled by measures appropriate to the work to be done, including the use of drop sheets of polyethylene or other suitable material that is impervious to asbestos.

1.2.20.7 Protective clothing shall be provided by the employer and worn by every worker who enters the work area, and the protective clothing,

- shall be made of a material that does not readily retain nor permit penetration of asbestos fibres,
- shall consist of head covering and full body covering those fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing,
- shall include suitable footwear, and
- shall be repaired or replaced if torn.

1.2.20.8 Dust and waste shall be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste bag.

1.2.20.9 Compressed air shall not be used to clean up and remove dust from any surface.

1.2.20.10 Remove all waste generated by the abatement work, including, but not limited to, building debris, disposable coveralls, respirator cartridges, and plastic sheeting. Seal all waste into 6 mil nominal disposal bags. Wet wipe or clean the bags with a HEPA vacuum and finally double-bag in a second clean 6 mil nominal bag or suitable sealed container.

1.2.20.11 Clean all equipment used in the abatement work (e.g., vacuum cleaner, knives, saws) using a HEPA vacuum and wet wiping. Equipment that cannot be readily cleaned (e.g., vacuum hose or wire brushes) shall be HEPA vacuumed and sealed in 6 mil polyethylene bags or a suitable sealed container before removal from the work area.

1.2.20.12 Dispose of the waste materials in compliance with local, provincial, and federal regulations.

1.2.20.13 Wash face and hands, and clean and maintain respirator after completion of asbestos abatement. Contractors will be required to provide any water for washing and cleaning hands and face for workers leaving the work area.

1.2.20.14 All the waste generated in the Work Area shall be double bagged using asbestos labelled yellow bags and disposed of as asbestos waste.

1.2.20.15 The abatement Contractor shall be responsible for the disposal of all waste generated as part of the project. This includes the costs related to the procurement of waste bins and the associated handling, transportation, and disposal fees.

1.3 Definitions

1.3.1 Abatement: Procedures to control fibre release from asbestos containing building materials. Includes encapsulation, enclosure, and removal.

1.3.2 Amended Water: Water containing a wetting agent or surfactant that is added for the purpose of reducing water surface tension to allow proper wetting of asbestos material.

1.3.3 Asbestos: The term includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite, and any of these that have been chemically treated and/or altered.

1.3.4 Airlock: A system for ingress or egress without permitting air movement between a contaminated area and an uncontaminated area, consisting of two curtained doorways at least 6 feet apart.

1.3.5 Area Monitoring: Sampling of asbestos fibre concentrations within the asbestos control area and outside the asbestos control area which is representative of the airborne concentrations of asbestos fibers which may reach the breathing zone.

1.3.6 Asbestos Work/Control Area: An area where asbestos removal operations are performed which is isolated by physical boundaries to prevent the spread of asbestos dust, fibers, or debris.

1.3.7 Air Monitoring: The process of measuring the asbestos fibre content of a specific volume of air in a stated period of time.

1.3.8 Asbestos Containing Material (ACM): Any material analyzed and found to contain 0.1 percent more asbestos either alone or mixed with other fibrous or non-fibrous materials.

1.3.9 Asbestos Fibers: For this specification, asbestos fibers are those fibers 5 microns or longer having an aspect ratio of at least 3:1.

1.3.10 Authorized Visitor: The building Owner or his representative, persons of any regulatory or other agency having jurisdiction over the project and the asbestos abatement Consultant or his representative.

1.3.11 Barrier: Any surface that closes up the work area to prevent the movement of fibres.

1.3.12 Critical Barrier: One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area form migrating to an adjacent area.

1.3.13 Chemical Stripping Agent Neutralizer: Chemical stripping agent neutralizers may be used on exterior surfaces only. Neutralizers shall be compatible with and not harmful to the substrate that they are applied to and the stripping agent that has been applied to the surface substrate.

1.3.14 Chemical Stripping Removers: Chemical removers shall contain no methylene chloride products and shall be compatible with and not harmful to the substrate that they are applied to.

1.3.15 Contractor/Supervisor: An individual who supervises asbestos abatement work and has the proper qualifications and training as specified in this document.

1.3.16 Control Area: An area which is considered uncontaminated and is suitable for regular occupancy.

1.3.17 Disposal: Procedures necessary to transport and deposit the asbestos contaminated material stripped and removed from the building, piping, and equipment in an approved waste disposal site in compliance with the applicable environmental regulations.

1.3.18 Demolition: The razing, removing or wrecking of any building component, assembly or system together with any associated handling operations.

1.3.19 Decontamination Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the

decontamination of workers, materials, and equipment that are contaminated with asbestos.

1.3.20 Dioctylphthalate (DOP) Test: A test method that uses Dioctyphthalate aerosol to challenge a HEPA filter-equipped negative pressure unit to determine its integrity and effectiveness to filter out asbestos fibres.

1.3.21 Dirty Room: A contaminated area or room which is part of the worker decontamination enclosure system, with storage for contaminated clothing and equipment.

1.3.22 Emery 3004 – a compound (a poly-alpha olefin) that may be substituted for DOP in HEPA filter testing.

1.3.23 Encapsulant: A liquid material which can be applied to asbestos containing material and which controls the possible release of asbestos fibers from the material either by creating a membrane over the surface (bridging encapsulant) or by penetrating into the material and binding its components together (penetrating encapsulant). A third type of encapsulant (removal encapsulant) is a penetrating encapsulant and is designed to be applied during the removal of asbestos-containing materials to minimize the release of fibres.

1.3.24 Disposal Bag: A 0.15 mm 6 mil thick, leak-tight plastic bag, pre-labeled as containing asbestos waste and used for transporting asbestos waste from containment to disposal site.

1.3.25 Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM.

1.3.26 Encapsulation: Procedures necessary to coat all asbestos-containing materials with an encapsulant to control the possible release of asbestos fibers into the ambient air.

1.3.27 Enclosure: All herein specified procedures necessary to complete enclosure of all hazardous materials behind airtight, impermeable, permanent barriers.

1.3.28 Equipment Room: A contaminated area or room which is part of the worker decontamination enclosure system, with storage for contaminated clothing and equipment.

1.3.29 Friable Asbestos Material: Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes material that is crumbled, pulverized or powdered.

1.3.30 Filtration System for Water: A multistage system for filtering water from the decontamination shower and wastewater. The system is usually manufactured with two filters: a primary filter and a secondary filter. The primary filter collects and retains particles that are 20 microns or larger and the secondary filter removes particles that are 5 microns or larger.

1.3.31 Glove Bag System: A portable asbestos abatement system designed for the isolation of an object from which materials containing asbestos are to be removed.

1.3.32 HEPA Filter Equipment: High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining asbestos fibers. Filters shall be capable of trapping and retaining at least 99.97 percent of 0.3 micrometer diameter particles.

1.3.33 Lead: The term includes elemental lead, and/or inorganic and organic lead compounds derived from chemically treated and/or altered elements (i.e. paints, plastics, pigments, glasses, and rubber compounds).

1.3.34 Lead Cleaning Agent: A cleaning agent suitable for lead dust. Acceptable detergents include products with a high phosphate content (containing at least 5% trisodium phosphate) and/or phosphate-free lead dissolving agents such as Ledisolv™ or similar product.

1.3.35 Lead Lechate Material: Any material analyzed and found to have a concentration equal to or greater than 5.0 milligrams per litre (mg/l) or 100 milligrams per kilogram (mg/kg)/

micrograms per gram (µg/g) as per the Regulation Respecting Hazardous Materials (R.S.Q., c.Q-2, r.32).

1.3.36 Lead Surface Contamination: Any surfaces analyzed and found to have a concentration equal to or greater than 40 micrograms per square feet (µg/ft2) or 4 micrograms per 100 square centimetres (µg/cm2) for floors, 250 µg/ft2 (25 µg/cm2) for window sills, and 400 µg/ft2 (40 µg/cm2) for window troughs as per the U.S. Environmental Protection Agency (EPA) Lead, Identification of Dangerous Levels of Lead, Final Rule, January 2001 (40 CFR Part 74).

1.3.37 Lead Waste Container: An impermeable container acceptable to a disposal site and Ministry of Sustainable Development, Environment, and Parks. It shall be labelled as required by the Ministry of Sustainable Development, Environment, and Parks and Transport Canada.

1.3.38 Lead Work Area: An area where lead removal operations are performed which is isolated by physical boundaries to prevent the spread of lead dust or debris.

1.3.39 Negative Pressure Fan System: An air purifying fan system located within or outside the isolated work area, which draws air out of the work area through a HEPA filter and discharges this air directly to the exterior of the building, thus keeping the static air pressure in the work area lower than in adjacent areas and preventing infiltration of contaminated air from work area to adjacent areas. This system shall be equipped with an alarm to warn of system breakdown, shall maintain a minimum pressure differential of 0.02" water gauge relative to adjacent areas outside of work areas and shall be equipped with an instrument to continuously monitor and automatically record pressure differences.

1.3.40 Non-friable Asbestos Material: Material that contains asbestos in which the fibers have been locked in by a bonding agent, coating, binder, or other material so that the asbestos is well bound and will not release fibers during any appropriate use, handling, demolition, storage, transportation, processing, or disposal.

1.3.41 Negative Pressure Respirator: A respirator in which the air inside the respiratory inlet covering is negative during inhalation in relation to the air pressure of the outside atmosphere and positive during exhalation in relation to the air pressure of the outside atmosphere.

1.3.42 Powered Air Purifying Respirator (PAPR): A full-face mask into which filtered air is pumped at approximately 100 – 150 litres per minute (4 – 6 cubic feet per minute). The PAPR consists of a full-face mask, a battery pack, an air pump, high efficiency filter and hoses.

1.3.43 Personal Monitoring: Sampling of asbestos fibre concentrations within the breathing zone (within 12 inches of the mouth) of an employee.

1.3.44 Personnel: Supervisors, Contractor employees, subcontractor employees.

1.3.45 Positive Pressure Respirator: A respirator that maintains a positive pressure inside the face piece during inhalation and exhalation in relation to the atmospheric pressure.

1.3.46 Work: Includes all labour, supervision, materials and equipment required for the complete execution of the project as specified in the contract.

1.4 Work Schedule

1.4.1 It is the responsibility of the contactor to provide the necessary manpower and work shifts to meet the schedule.

1.4.1.1 The start date for the project is to be determined by the Owner (City of Toronto)

1.4.2 The Contractor shall, at no extra cost to the Owner, be responsible for the completion of work required or scheduled to be performed on weekends, holidays and after regular hours and shall be carried out as required to meet the schedule specified.

1.5 Submittals

1.5.1 The Contractor shall submit the following:

1.5.2 Proof that the Contractor has made arrangement for the transport and disposal of asbestos waste. The proof shall be satisfactory to the Consultant.

1.5.3 Proof satisfactory to the Consultant that each Supervisor scheduled to work on the project has successfully completed an approved asbestos abatement course and can provide an up-to-date training certificate issued by a competent entity.

1.5.4 One supervisor shall remain on site while asbestos removal or cleanup is being carried out.

1.5.5 Copies of Insurance certificates and Workplace Safety and Insurance Board status.

1.5.6 D.O.P test results and performance data for negative air unit systems.

1.5.7 Proposed work schedule.

1.5.8 Work force expected to be present on site daily or according to the schedule.

1.5.9 Proposed number of shifts.

1.5.10 Layouts of proposed platforms and hoardings for the Consultant's review and approval.

1.5.11 Layout of proposed waste and worker decontamination facilities and asbestos work area enclosures.

1.5.12 Proof that all workers have received Workplace Hazardous Material Information System (WHMIS) training.

1.6 Quality Assurance

1.6.1 Ensure that work progresses according to schedule.

1.6.2 Ensure that work complies with all the requirements of the applicable regulations, guidelines and manuals.

1.6.3 Ensure that no water runoff or airborne asbestos material contaminates areas outside the asbestos removal work area enclosures. The Consultant has been given authorization by the City of Toronto to stop any work where contamination of areas outside enclosures are suspected. The Contractor shall be responsible for all costs to rectify the problem.

1.6.4 Only the asbestos abatement Contractor, and never the Consultant, is responsible for the following:

1.6.4.1 Safety programs and precautions required by applicable regulations for the work being performed.

1.6.4.2 Control over the acts and omissions of the Contractor's workers, agents, subcontractors and other employees of the Contractor required to perform work on the project.

1.6.4.3 Control over construction techniques, methods, means or procedures.

1.7 Regulations

1.7.1 The Contractor shall comply with all local, provincial and federal requirements relating to asbestos, hazardous building materials, and other work being carried out.

1.7.2 In case of conflict among the above-mentioned requirements or with these specifications, the more stringent requirements shall apply.

1.7.3 Perform work following the requirements of the various regulations in effect at the time the work is being carried out.

1.7.4 The regulations shall include, but are not limited to:

1.7.4.1 Ontario Occupational Health and Safety Act.

1.7.4.2 Ontario Regulation 278/05, Regulation Respecting Asbestos on Construction Projects and in Building and Repair Operations.

1.7.4.3 The Designated Substances Regulation, Ontario Regulation 490/09.

1.7.4.4 Ontario Ministry of Environment Regulation 347 (as amended) for the disposal of asbestos waste made under the Environmental Protection Act.

1.7.4.5 Health and Safety Guideline: Lead on Construction Projects, Published by the Ministry of Labour.

1.7.4.6 Health and Safety Guideline: Silica on Construction Projects, Published by the Ministry of Labour.

1.7.4.7 Standard Construction Document, Canadian Construction Association, CCA 82 - 2004.

1.7.4.8 Regulations respecting the Handling, Offering for Transport and Transportation of Dangerous Goods.

1.7.4.9 WHMIS Regulations.

1.8 Proscriptions

1.8.1 The use of compressed air for removal or clean up of asbestos dust and debris from any surface is not allowed.

1.8.2 Smoking, eating, drinking or chewing is not allowed in the work area.

1.8.3 Unauthorized persons or persons not using proper personal protective equipment shall not be allowed to enter the work area.

1.8.4 No entry into the work area shall be permitted to any person who has facial hair growth that prevents the establishment of a proper seal between the respirator and the skin.

1.8.5 The use of torches, propane-fired heaters and other open flames shall not be permitted in the abatement work area.

1.9 Worker and Visitor Protection

1.9.1 Instruct all personnel (workers and visitors) in all aspects of work procedures and protective equipment before allowing entry into the asbestos abatement work areas.

1.9.2 A competent person (as defined by An Act Respecting Occupational Health and Safety, shall provide all the training and instructions.

1.9.3 Instructions and training shall include, but shall not be limited to, the following:

1.9.3.1 Entry and exit from asbestos abatement work areas.

1.9.3.2 Work practices and personal hygiene.

1.9.3.3 The use, cleaning and care of respirators and protective clothing.

1.9.3.4 Protective measures and work procedures.

1.9.4 Asbestos work area entry and exit procedures shall be posted in the clean room of the decontamination unit.

1.9.5 Respiratory Protection

1.9.5.1 All personnel required to wear respirators shall be fit tested either by a qualitative or quantitative fit testing method.

1.9.5.2 Each worker or visitor required to enter an asbestos abatement work area shall be provided with a personally issued respirator that is:

1.9.5.2.1 Appropriate for the work that is being carried out.

1.9.5.2.2 The worker shall be responsible for wearing a respirator that is issued by the Contractor.

1.9.5.2.3 The following criteria, as outlined in Table 1 and Table 2, shall be followed when selecting an appropriate respirator:

Table 1: Respirators – Asbestos

Column 1		**Column 2**
Work Category		**Required respirator**
Type 1 Operations		
Worker requests that the employer provide a respirator to be used by the worker, as described in paragraph 12 of section 14		Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter
Type 2 Operations		
Work described in paragraph 1 of subsection 12 (3)		One of the following: - Air purifying full-facepiece respirator with N-100, R-100 or P-100 particulate filter - Powered air purifying respirator equipped with a tight-fitting facepiece (half or full-facepiece) and a high efficiency filter or N-100, P-100 or R-100 particulate filter - Negative pressure (demand) supplied air respirator equipped with a full-facepiece - Continuous flow supplied air respirator equipped with a tight fitting facepiece (half or full-facepiece)
Work described in paragraphs 2 to 7 and 9 to 11 of subsection 12 (3)		Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter
Type 3 Operations		
Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable material containing asbestos by means of power tools, if the tool is attached to a dust collecting device equipped with a HEPA filter as described in paragraph 8 of subsection 12 (3)	Material is not wetted	One of the following: - Air purifying full-facepiece respirator with N-100, R-100 or P-100 particulate filter - Powered air purifying respirator equipped with a tight-fitting facepiece (half or full-facepiece) and a high efficiency filter or N-100, P-100 or R-100 particulate filter - Negative pressure (demand) supplied air respirator equipped with a full-facepiece - Continuous flow supplied air respirator equipped with a tight fitting facepiece (half or full-facepiece)
	Material is wetted to control spread of fibre	Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter
Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable material containing	Material is not wetted	Pressure demand supplied air respirator equipped with a half mask

Table 1: Respirators – Asbestos (continued)

Column 1		**Column 2**
Work Category		**Required respirator**
Type 3 Operations		
asbestos by means of power tools, if the tool is not attached to a dust collecting device equipped with a HEPA filter as described in paragraph 5 of subsection 12 (4)	Material is wetted to control spread of fibre	One of the following: - Air purifying full-facepiece respirator with N-100, R-100 or P-100 particulate filter - Powered air purifying respirator equipped with a tight-fitting facepiece (half or full-facepiece) and a high efficiency filter or N-100, P-100 or R-100 particulate filter - Negative pressure (demand) supplied air respirator equipped with a full-facepiece
		- Continuous flow supplied air respirator equipped with a tight fitting facepiece (half or full-facepiece)
Work with friable material containing asbestos, as described in paragraphs 1 to 4 and 6 of subsection 12 (4)	Material is not wetted	Pressure demand supplied air respirator equipped with a full facepiece
Work with friable material, as described in paragraphs 1 to 4 and 6 of subsection 12 (4), that contains a type of asbestos other than chrysotile	Material was applied or installed by spraying, and is wetted to control spread of fibre	Pressure demand supplied air respirator equipped with a half mask
Work with friable material, as described in paragraphs 1 to 4 and 6 of subsection 12 (4), that contains only chrysotile asbestos		One of the following: - Air purifying full-facepiece respirator with N-100, R-100 or P-100 particulate filter - Powered air purifying respirator equipped with a tight-fitting facepiece (half or full-facepiece) and a high efficiency filter or N-100, P-100 or R-100 particulate filter - Negative pressure (demand) supplied air respirator equipped with a full-facepiece - Continuous flow supplied air respirator equipped with a tight fitting facepiece (half or full-facepiece)
Work with friable material containing asbestos, as described in paragraphs 1 to 4 and 6 of subsection 12 (4)	Material was not applied or installed by spraying, and is wetted to control spread of fibre	One of the following: - Air purifying full-facepiece respirator with N-100, R-100 or P-100 particulate filter - Powered air purifying respirator equipped with a tight-fitting facepiece (half or full-facepiece) and a high efficiency filter or N-100, P-100 or R-100 particulate filter - Negative pressure (demand) supplied air respirator equipped with a full-facepiece - Continuous flow supplied air respirator equipped with a tight fitting facepiece (half or full-facepiece)

1.9.5.3 Respirator shall be stored in a clean location such as the clean room of the decontamination unit. This room can also be used for charging PAPR batteries.

1.9.5.4 The procedures specified by the equipment manufacturer shall be followed while using and maintaining the respirators.

1.9.5.5 Respirators shall be cleaned and inspected at the end of each shift. All damaged and deteriorated parts found during the inspection shall be replaced before the respirator is used again.

1.9.5.6 Appropriate combination cartridges shall be used if substances other than asbestos are to be handled inside the asbestos removal work area.

1.9.5.7 Used filters shall be tested and replaced as specified by the manufacturer or as specified below. The more stringent testing and replacement protocol shall be followed.

1.9.5.8 Cartridges for negative pressure respirators should be replaced every 16 hours of actual usage

1.9.5.9 Cartridges for PAPRs should be replaced every 8 hours.

1.9.5.10 Cartridges shall be treated as asbestos waste and shall be disposed of accordingly after usage inside an asbestos removal work area.

1.9.6 Protective Clothing

1.9.6.1 The Contractor shall provide every worker and authorized visitor with full body disposable coveralls.

1.9.6.2 All personnel shall wear the protective coveralls before they are allowed to enter into the asbestos removal work area.

1.9.6.3 Coveralls shall be equipped with head covering (hood), foot covering and tight fitting cuffs at the neck, ankles and wrists.

1.9.6.4 The disposable coveralls shall be made up of materials that does not readily permit the penetration of asbestos fibers.

1.9.6.5 Disposable coveralls shall be immediately repaired (using duct tape) or replaced once torn.

1.9.6.6 Coveralls shall be disposed of as asbestos waste once they are worn inside an asbestos abatement area.

1.9.6.7 Workers are allowed to wear reusable protective clothing provided that the clothing is left in the equipment room until the end of the asbestos abatement project. The clothing shall then be disposed of as asbestos waste.

1.9.6.8 Safety shoes, hard hats and additional body protection equipment shall be used as necessary to meet the requirements of applicable safety regulations.

1.10 Inspections

1.10.1 The Environmental Consultant will be present on site to carry out quality control inspections for the entire duration of the project. The inspections will be performed inside and outside the work areas.

1.10.2 The purpose of the inspections is to ensure that the work is being carried out following the requirements and procedures outlined in the specifications documents and applicable regulations.

1.10.3 The Consultant will issue written instructions to the asbestos abatement Contractor throughout the duration of the project. The instructions will authorize the Contractor to proceed to next work area. The general phases of work will consist of the following: Pre-cleaning, set-up and preparation of the work area, removal of specified materials, clean-up of work area and tear down of containment.

1.10.4 The Contractor shall not proceed to the next phase of work without obtaining authorization form the Consultant.

1.10.5 In all non-controlled areas where it is determined by the Consultant (through visual inspection or air monitoring) that contamination has leaked, the Contractor shall be responsible to the complete isolation and cleaning of such areas under the direction of the Consultant and at no extra charge to the Owner.

1.10.6 The Contractor shall ensure that all equipment and materials to be used on the project are acceptable to the Consultant. Unacceptable materials and equipment shall be replaced by the Contractor at no additional charge to the Owner.

1.10.7 The Contractor shall be responsible for all additional inspection charges which are carried out as a result of a failure by the Contractor to meet set criteria relating to schedule, health and safety and quality.

1.11 Air Monitoring

1.11.1 Air samples will be collected by the Environmental Consultant (on behalf of the owner) from the start of work until the completion of the tear down operations, both inside and/or outside the controlled work areas.

1.11.2 The objective of air monitoring is to detect defects in the containment of controlled areas and to ensure that any contamination of building spaces beyond the controlled areas is discovered and rectified immediately.

1.11.3 Any contamination of areas outside the limits of the controlled work areas (as determined by air monitoring) shall be contained and shall be thoroughly cleaned to the Consultant's satisfaction. The Contractor shall be responsible for all additional charges associated with such work.

1.11.4 Air monitoring will be carried out following procedures specified in the latest edition of the National Institute for Occupational Safety and Health (NIOSH) method 7400A. The samples will be analyzed by the Phase Contrast Microscopy (PCM) technique as specified in NIOSH method 7400A. A Fibrous Aerosol Monitor (FAM) may also be used.

1.11.5 Air monitoring may also be carried out according to either, or both NIOSH methods described below:

1.11.6 The latest edition of the National Institute for Occupational Safety and Health (NIOSH) Method 7082. The samples will be analyzed by the Flame Atomic Absorption Spectrophotometer technique as specified in the above noted NIOSH method.

1.11.7 The latest edition of the National Institute for Occupational Safety and Health (NIOSH) Method 7702. The samples will be analyzed by the X-Ray Fluorescence (XRF) portable technique as specified in the above NIOSH method.

1.11.8 The Contractor shall cooperate with the Environmental Consultant during air monitoring and shall:

1.11.9 Provide workers to wear the sampling equipment for up to the duration of an entire shift.

1.11.10 Ensure that the workers exercise care and avoid damaging the Consultant's equipment.

1.11.11 Ensure that the samples and equipment are not tampered with.

1.11.12 The Contractor shall be responsible for charges associated with re-sampling due to tampering with the air samples.

1.11.13 The Contractor shall be responsible for repair or replacement charges of testing equipment that become damaged due to the actions of the Contractor forces.

1.11.14 The maximum allowable concentration of airborne fibres outside an asbestos work area is 0.05 fibres per cubic centimetre (fibre/cc).

1.11.15 PCM or FAM results equal to or greater than the specified level will indicate asbestos contamination of these perimeter areas.

1.11.16 The maximum allowable concentration of airborne lead concentrations outside a lead work area is 0.025 mg/m3 or 25µg/m3.

1.11.17 Results equal to or greater than the specified level will indicate lead contamination of these adjacent areas and respiratory protection is required.

1.11.18 The contaminated areas shall be isolated, contained and cleaned to the satisfaction of the Consultant in the same manner as the lead work area at no additional cost to the Owner. The airborne lead concentration shall be below 0.025 mg/m3 or 25µg/m3 after cleaning.

1.11.19 The contaminated areas shall be isolated, contained and cleaned to the satisfaction of the Consultant.

1.11.20 The maximum allowable concentration of airborne fibres inside an asbestos work area is 0.04 fibres/cc.

1.11.21 Clearance air samples will be collected inside the work area after it is visually inspected by the Consultant, authorization is given to spray a lock-down agent and the lock-down agent is allowed to completely dry-up.

1.11.22 Air samples will be analyzed by the PCM method. The area will be considered clean and clear for public occupancy only if the fibre levels are less than 0.01 fibres/cc.

1.11.23 In case the fibre levels are equal to or greater than 0.01 fibres/cc, the Contractor shall be responsible for re-cleaning the asbestos work area and re-applying the lock-down agent. This process will have to be repeated until the fibre levels are below the specified limit.

1.11.24 Re-occupancy air samples may be collected and analyzed by NIOSH method 7082 or 77032. The area will be considered clean and clear for public occupancy only if the airborne concentrations levels are less than 0.005 mg/m3 (5 µg/m3).

1.11.25 In case the concentration levels are equal to or greater than 0.005 mg/m3 (5 µg/m3), the Contractor shall be responsible for re-cleaning the lead work area. This process will have to be repeated until the concentration levels are below the specified limit.

1.12 Waste Transport and Disposal

1.12.1 All asbestos-containing and asbestos-contaminated materials shall be disposed following the Safety Code for the Construction Industry and the Regulation Respecting the Quality of the Work Environment under the Act Respecting Occupational Health and Safety, as well as the Regulations Respecting the Handling and Offering for Transport and Transporting of Dangerous Goods, as amended. All wash water generated from decontamination activities shall be treated as asbestos waste and shall be disposed of accordingly.

1.12.2 All non-asbestos containing waste generated during abatement activities inside an asbestos work area shall be treated as asbestos waste.

1.12.3 Non-porous materials that can be washed and properly cleaned can be disposed of as clean waste.

1.12.4 The waste must be stored and transported in an enclosed, lockable waste bin.

1.12.5 Every vehicle used for the transportation of asbestos waste shall display a Class 9 Label.

1.12.6 Both sides of the vehicle used for the transportation of asbestos waste and every waste bag and container shall display the word CAUTION in letters not less than 10 cm in height and the words:

CONTAINS ASBESTOS FIBRES

Avoid Creating Dust

Asbestos May Be Harmful to Your Health

Wear Approved Protective Equipment

1.12.7 The transport vehicle must be properly equipped to deal with asbestos waste spills. Equipment shall include, but not limited to, respiratory protective equipment, disposable protective clothing, 6 mil polyethylene bags, shovel and broom and wetting agent.

1.12.8 For asbestos waste of unknown material or an asbestos type other than Chrysotile, the words Asbestos, Blue, Product Identification Number 2212 must be displayed on every waste container.

1.12.9 For Chrysotile asbestos, the words Asbestos, White, Product Identification Number 2590 must be displayed on every waste container.

1.12.10 The Contractor shall submit to the Consultant a copy of the shipping document and weight receipt for every shipment of asbestos waste.

PART B - FACILITIES AND PRODUCTS

2.1 Equipment

2.1.1 Provide equipment that is suitable for intended use as specified by the proper standards. All equipment used on the project shall be clean and in good state of repair.

2.1.2 *Airless Sprayer:* Equipment used for the application of amended water to saturate asbestos-containing materials before removal.

2.1.3 *Electrical Components and Equipment:* supplied by the Contractor for performance of work on this project shall meet the requirements of the Canadian Standards Association (CSA) for use as installed.

2.1.4 *Electrical Power Cords:* Use single length power cords. If single length will not reach work area, use waterproof connectors to connect separate lengths. Use heavy duty cords in high traffic areas or in areas where abrasion of cords is expected. Only grounded electrical cords will be allowed.

2.1.5 *Ground Fault Panel:* use an electrical panel that is installed by a licensed electrician and is equipped with the following:

2.1.5.1 Ground fault circuit interrupts (breaker type) of sufficient capacity to supply all lights and equipment to be used in the work area.

2.1.5.2 Breakers shall have 5mA ground fault protection.

2.1.5.3 Main switch disconnect, test buttons and reset switches and circuit breaker lights.

2.1.5.4 Proper enclosure to prevent the penetration of moisture, dust and debris.

2.1.6 *Temporary Lighting:* Provide illumination as required in all work areas to perform the work safely and adequately. Illumination can be achieved by the use incandescent or fluorescent lamps. All lamps shall be protected by grounded guard cages or tempered glass enclosures.

2.1.7 *Fine Atomizing Spray Nozzle:* an airless sprayer nozzle that is designed to deliver no less than 1 gallon per minute of fine spray of water or lock-down agent.

2.1.8 *Flexible Ducting:* Tubing used for the exhaust of negative air units. The tubing is made up of plastic with metal reinforcement and is of a diameter that is equal to the exhaust port of a negative air unit.

2.1.9 *Garden Sprayer:* a metal or plastic pressure-can hand pump equipped with a hose and a metal wand. The pump is used to spray a fine mist of liquid on surfaces in a work area.

2.1.10 *Glove Bag:* In Ontario, the glove bag shall meet the following requirements:

2.1.10.1 Shall be a Safety-T-Strip trade product with a configuration suitable to fit the work at hand.

2.1.10.2 Shall have an internal ziplock feature for sealing the waste at the bottom of the bag.

2.1.10.3 Shall be secured around the material being removed using the securing device supplied with the bag. The securing device consists of a 1 inch reusable nylon straps with a metal tightening buckle for sealing the ends of the bag.

2.1.10.4 Shall be made of polyvinyl chloride (10 mil) minimum thickness with integral gloves and valve ports.

2.1.10.5 Shall be equipped with reversible double pull zipper with protective flaps to facilitate installation and progressive movement on pipes.

2.1.10.6 In other provinces, the glove bag shall meet the following requirements:

2.1.10.6.1 Shall be made of polyvinyl chloride or equivalent plastic bag with a minimum thickness of 6 mil.

2.1.10.6.2 Shall be equipped with two gloves projecting inward and valves for attaching a vacuum hose or a metal wand.

2.1.10.6.3 Shall have a pouch for storing tools and enough space to accommodate the storage of removed materials and to allow for proper sealing of the bag. The bag shall also be labelled with warning signs to identify the content of the bag.

2.1.11 *HEPA Filtered Negative Air Unit:* A portable air handling system which is used to create negative air pressure differential by the extracting the air directly from the work area and discharging it to the exterior of the area. The unit shall be equipped as follows: Fan, HEPA filter, pre-filters, pressure differential gauge, cabinet, high/low switch, on/off switch.

2.1.11.1 The fan shall have a capacity of 1500 cubic feet per minute. The fan shall be considered to have 80% of the rated of air flow unless tested and certified by a company specializing in such measurements and subject to the approval of the Consultant.

2.1.11.2 Each unit shall have a HEPA filter installed as a final filter in the unit. A tight seal shall be established between the filter and the filter housing through the use of a rubber gasket. Each filter shall be clearly marked with the serial number, direction of air flow, efficiency, air flow rating, name of manufacturer and resistance and shall bear UL586 label.

2.1.11.3 Each unit shall have an on/off switched located on the exterior of the cabinet. The unit shall also be equipped with overload protection and components such as cabinet, fan, motor, etc shall be grounded.

2.1.11.4 Each unit shall have a pressure differential gauge to monitor the filter loading and to indicate when the filters needs to be changed. The unit shall also have a time meter to indicate the total accumulated hours of operation.

2.1.11.5 Each unit shall have the following warning and safety devices: a means for preventing the unit from operating without a HEPA filter; auto shutoff system to stop the fan in case of HEPA filter failure such as rupture of the filter of blockage of air flow through the filter.

2.1.11.6 Provide units with pre and intermediate filters installed at the intake of the unit and secured in place with clamps or special filter housings. Two pre-filters are required: the first pre-filter shall be of the low efficiency type and shall be 98% efficient for particles 100 microns and larger; the second pre-filter shall be of the medium efficiency type and shall be 95% efficient for particles down to 5 microns.

2.1.11.7 The cabinet of the unit shall be constructed of durable material able to withstand rough handling during removal work. The cabinet shall have wheels and shall be designed to allow access to the inside of the unit from the intake side for maintenance and replacement of filters. The unit shall be factory sealed to prevent the escape of dust and debris during transport and use.

2.1.12 *HEPA Vacuum:* A vacuum unit equipped with HEPA filter and designed so that all discharged air passes through the filter. Shall be equipped with all attachments, tools and fittings to facilitate the performance of the work.

2.1.13 *Pressure Differential Monitoring Unit:* An instrument designed to measure the difference in pressure between the interior and exterior of a work area. As a minimum, the instrument shall consist of the following: a continuous recoding wheel chart or tape; a gauge with a range from 0 to 0.1 inches water; sensor tubing and wall clamps; wall mounting devices, low limit and high limit audible alarm; and auto reset.

2.1.14 *Power Washer*: A piece of equipment capable of delivering an airless stream of liquid (water) at a pressure between 1200 and 2500 psi. Typically used for cleaning of work area surfaces and equipment and for saturating materials scheduled for removal before work start to reduce the creation of dust.

2.1.15 *Scaffolding*: Select, erect and use scaffolding in a manner that is in compliance with all applicable occupational health and safety regulations.

2.1.15.1 Types of scaffolding allowed consist of suspension or standing types such as cantilever, metal tube and coupler, pole or outrigger or tubular welded frame.

2.1.15.2 Provide non-skid surfaces and/or foot boards on all scaffolds where foot traffic is anticipated.

2.1.15.3 Provide an abrasive non-slip surfaces on rungs of metal ladders.

2.1.16 *Water Service Components and Equipment:* supplied by the Contractor for performance of work on this project shall be temperature and pressure rated for operation of the temperature and pressure encountered.

2.1.16.1 Hot water heater to be used for supplying water to the shower shall be:

2.1.16.1.1 ULC rated electric hot water heater.

2.1.16.1.2 Appropriately sized for the project.

2.1.16.1.3 Powered from the ground fault panel.

2.1.16.1.4 Equipped with a relief valve that is piped to a drip pan secured to the water heater.

2.1.16.2 Supply water to each working area and decontamination unit using pipes having a pressure rating greater than the pressure of the water distribution system. Provide fittings as necessary to allow connecting to existing systems and other temporary facilities.

2.1.16.3 The shower provided for the decontamination facility shall be of the walk through type. The shower pan shall be a waterproof, one piece pan constructed from stainless or galvanized steel with welded seams, copper or lead with soldered seams or fibreglass reinforced with wood. The shower head shall be adjustable for spray size and intensity. The shower shall be supplied with separate hot and cold water. The control for water temperature, flow and shut off shall be located inside the shower.

2.1.16.4 Multi-stage cascade filter units shall be provided on drain lines from any water source carrying asbestos-contaminated water from the work area including the shower. The units shall be provided with a primary and a secondary disposal filter elements. The primary filter shall allow the passage of particles that are 20 microns and smaller. The secondary shall allow the passage of particles that are 5 microns and smaller. The units shall be connected so that the water passes the primary filter first and the discharge of the primary filter passes through the secondary filter.

2.2 Materials

2.2.1 Materials destined for use on this project shall be undamaged, shall comply with the requirements of the contract and specifications and shall be unused at the time of installation unless otherwise indicated.

2.2.2 *Asbestos Waste Container:* An impermeable container that is dust-tight and impervious to asbestos waste. Shall be made of new material only and shall be labelled as required by applicable regulations with a pre-printed cautionary asbestos warning label. The container shall (depending on the nature of the waste material) be comprised of the following:

2.2.2.1 A 6 mil thick leak-tight polyethylene bag labelled as required and placed inside another 6 mil sealed polyethylene bag (in case the waste does not contain any sharp objects).

2.2.2.2 A 6 mil sealed polyethylene bag positioned inside or outside a heavy duty leak tight solid sealed container of sufficient strength to prevent perforation of the container during handling (in case the waste contains sharp objects).

2.2.3 *Caulking:* Acrylic polymer sealant that is non-staining.

2.2.4 *Drop Sheets:* Sheets made up of polyethylene of size and type appropriate to the work. To be placed under an area where work is being carried out.

2.2.5 *Encapsulant:* Type 1 penetrating Class A water based encapsulant conforming to CGSB 1-GP-205M and approved by the Fire Marshall and having a flame spread and smoke development ratings both less than fifty.

2.2.6 *Felts:* 1/16” thick and 36” to 72” wide non-coated, standard cellulose building felt.

2.2.7 *Rip-Proof (Fibre Re-enforced) Polyethylene Sheeting:* 8 mil fibre re-enforced fabric (bonded on both sides with polyethylene sheeting) made up from 5 mil weave and 2 layers of 1.5 mil poly laminate. Provide new material only in maximum size sheets (to fit work) to minimize joints.

2.2.8 *Fire Extinguisher:* Provide type "ABC" dry chemical fire extinguishers of a combination of extinguishers suitable for the type of exposure in each case.

2.2.9 *First Aid Supplies:* Provide and maintain first aid supplies on the project site as required by applicable regulations and construction industry recommendations.

2.2.10 *Flame Resistant Polyethylene Sheeting:* a layer of polyethylene sheeting that conforms to the requirements of the NFPA Standard 701, Small Scale Fire Test for Flame-Resistant Textiles and Films. Provide new material only in 6 mil thickness and in maximum size sheets (to fit work) to minimize joints.

2.2.11 *Foam:* Polyurethane expanding foam of low density.

2.2.12 *Lock Down Sealant:* a clear, non-staining, water dispersible type, slow drying sealant that is used for the purpose of trapping residual dust. The sealer shall remain sticky on the surface for an 8 hour period as a minimum. The product shall have flame spread and smoke development ratings of less than 50 for both. The sealant shall be compatible with replacement insulation or fireproofing and shall be capable of withstanding service temperature of substrate.

2.2.13 *Polyethylene Sheeting:* A 6 mil minimum (unless otherwise specified) thickness polyethylene film in maximum sheet size to minimize seems and black, frosted or clear as required to meet specifications.

2.2.14 *Protective Coveralls:* Full body coveralls complete with hoods and shoe coverings, made up of a material which does not permit penetration of asbestos fibres and is disposable.

2.2.15 *Spray Cement:* Specifically formulated spray adhesive in spray cans devised to stick to polyethylene sheets.

2.2.16 *Tape:* 2" to 3" widths reinforced tape (cloth or fibreglass reinforced) appropriate for sealing polyethylene sheets under dry and wet conditions.

2.2.17 *Wetting Agent:* A mixture of water and a surfactant used for wetting asbestos-containing materials before removal to minimize the release of fibres during disturbance of the material.

PART C - EXECUTION

LEAD

3.1 Type 1 Removal Operations

3.1.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

3.1.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

3.1.1.2 The Contractor is responsible for moving materials and objects which are present in the work areas.

3.1.1.3 Prevent the spread of dust from the work area using measures appropriate to the work to be done.

3.1.1.3.1 Shut off, lock out and seal all ventilation duct vents with the application of one layer of 6 mil (0.15mm) thick clear polyethylene sheet sealed with tape.

3.1.1.3.2 Use FR polyethylene drop sheets over all flooring in work areas where dust, chips, or debris may be produced and where contamination cannot otherwise be thoroughly cleaned.

3.1.1.3.3 Separate parts of the building required to remain in use from the work area by polyethylene drop sheets at the perimeter of the work area.

3.1.1.3.4 Separate the work area with clearly visible warning signs advising of the hazards of lead dust and that entry is restricted to authorized trained personnel wearing personal protective equipment.

3.1.1.3.5 Erect scaffolding or platforms where necessary to perform the removal work. All platforms that exceed 25 feet in height will require the submission of a shop drawing stamped by a professional engineer for approval by the inspector within a minimum of 5 days prior to commencing the work. Guard rails shall be provided around all platforms or scaffolding where practicable. Cover the floor area of the scaffold or platform with one layer of FR polyethylene. Extend the floor of scaffolding or platform under an item being removed to act as a receptacle. Polyethylene sheeting shall be suitably braced and/or restrained so that billowing or failure of the polyethylene sheeting or taped joints does not occur.

3.1.2 Entry and Exit Procedures from Lead Removal Work Areas: the following general procedures shall be adhered to when entering into and exiting from lead abatement work areas:

3.1.2.1 Work Area Entry Procedures:

3.1.2.1.1 Every worker and visitor planning to enter the work area should remove all street clothing and should store them in a designated clean change room.

3.1.2.1.2 The person shall then put on disposal coverall with head covering, respirators with clean filters and foot covering and shall proceed to the work area.

3.1.2.2 Work Area Exit Procedures:

3.1.2.2.1 Each worker shall decontaminate their protective clothing, boots and respirator by first HEPA vacuuming and then by damp wiping using soap and water.

3.1.2.2.2 The removed disposable coveralls shall be disposed of as lead waste in a 0.15 mm (6 mil) labelled waste bag. Respirator filter inlets shall be sealed in tape or disposed of as lead waste.

3.1.3 Lead Removal Procedures

3.1.3.1 Lead removal shall not commence until:

3.1.3.1.1 The work area is effectively separated from clean areas of the building.

3.1.3.1.2 Warning signs are posted outside the removal work areas.

3.1.3.1.3 All surfaces which are not possible to clean are sealed with polyethylene sheeting and tape.

3.1.3.1.4 Arrangements have been made for waste disposal, landfill site operator has been contacted and storage bin is on site.

3.1.3.1.5 Tools equipment and materials are on hand and in the work area.

3.1.3.1.6 Facilities for the washing of hands and face are available for workers leaving the work area.

3.1.3.2 Before beginning work remove visible dust from surfaces in the work area where dust is likely to be disturbed during the course of the work. Use HEPA vacuums, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air or dry sweeping to clean up or remove dust from any surface.

3.1.3.3 Wet materials containing lead to be cut, ground, abraded, drilled, or otherwise disturbed with amended water. Use garden type low velocity fine mist sprayer. Perform work in a manner to reduce dust creation to lowest levels practicable. Spray lead material repeatedly during the work process to minimize airborne lead dust.

3.1.4 Final Clean

3.1.4.1 When removal is complete, clean the entire work area by HEPA vacuuming and wet wiping.

3.1.4.2 The work area shall be deemed clean by the Inspector when there is no visible residue, dust, dirt, film, stain, or discolouration resulting from either lead removal or cleaning activities.

3.1.4.3 After completion of the initial cleaning and after the Inspector has passed the visual inspection, spray sealant on all surfaces in the work area, including, but not limited to:

3.1.4.3.1 where lead material has been removed.

3.1.4.3.2 polyethylene sheeting used on walls, floors and ceilings.

3.1.4.4 Sealant should be sprayed using a garden reservoir type low velocity fine mist sprayer. The sprayer cannot be used if the nozzle is partially obstructed, or if a uniform fine mist spray cannot be obtained.

3.1.4.5 After the area is declared clean and written approval to proceed has been received from the Inspector:

3.1.4.5.1 Dismantle boundaries and isolating barriers as lead waste. Drop sheets shall be wetted and folded to contain dust and then placed in waste bags.

3.1.4.5.2 Immediately before their removal from the work area, and disposal, clean each filled labelled waste bag using damp cloths or HEPA vacuum and place in second clean clear polyethylene waste bag.

3.1.4.5.3 Dispose of waste as per procedures specified in subsection 1.16 Waste Transport and Disposal.

3.1.4.6 Repair or replace objects damaged in the course of the work. Re-establish objects moved to temporary locations in the course of the work, in their proper positions. Re-secure mounted objects removed in the course of the work in their former positions.

3.2 Type 2a and 2b Removal Operations

3.2.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

3.2.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

3.2.1.2 The Contractor is responsible for moving materials which are present in the work area.

3.2.1.3 Prevent the spread of dust from the work area using measures appropriate to the work to be done.

3.2.1.3.1 Shut off, lock out and seal all ventilation duct vents with the application of one layer of 6 mil (0.15 mm) thick clear polyethylene sheet sealed with tape.

3.2.1.3.2 Clean all moveable objects within proposed work area using a HEPA vacuum.

3.2.1.3.3 Clean fixed casework and equipment within proposed work area, using a HEPA vacuum and cover with polyethylene sheeting sealed with tape.

3.2.1.3.4 Clean proposed work areas using, where practicable, HEPA vacuum cleaning equipment. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA filter-equipped vacuums.

3.2.1.3.5 Cover and seal airtight light fixtures, duct openings and other suspended ceiling objects using clear 6 mil polyethylene sheeting and tape.

3.2.1.3.6 Erect scaffolding or platforms necessary to perform the removal work. All platforms that exceed 25 feet in height will require the submission of a shop drawing stamped by a professional engineer for approval by the inspector within a minimum of 5 days prior to commencing the work. Guard rails shall be provided around all platforms or scaffolding where practicable.

3.2.1.3.6.1 Cover floor area of scaffold or platform with one layer of FR polyethylene.

3.2.1.3.6.2 Extend scaffolding or platform under the item being removed to prevent material from falling.

3.2.1.3.7 Separate parts of the building required to remain in use from the work area by polyethylene drop sheets at the perimeter of the work area.

3.2.1.3.8 Set up an airtight enclosure around the work area where the work on lead-containing material is to be carried out. Enclosure should be set up using 1 layer of FR polyethylene sheeting to cover the floors, and 1 layer of 6 mil (0.15 mm) thick clear polyethylene sheeting to cover the walls. Two layers of FR polyethylene sheeting should be used to cover carpeted floors. Polyethylene on the walls should be made to overlap with the polyethylene on the floor a minimum of 300 mm.

3.2.1.3.9 Polyethylene sheeting shall be suitably braced and/or restrained so that excessive billowing or failure of the polyethylene sheeting or taped joints does not occur as a result of the negative pressure differential created by the vacuums.

3.2.1.3.10 Erect a temporary structure made of wooden studs to support polyethylene sheeting where necessary.

3.2.1.3.11 Insert a hose of a HEPA filter equipped vacuum into the enclosure to provide negative air pressure inside the enclosure.

3.2.1.3.12 Entrance to the enclosure should be covered with two pieces of overlapping polyethylene sheeting.

3.2.1.3.13 The Contractor shall separate the work area and place warning signs at all access points leading to the contained work area. The signs shall be posted at the curtained door ways and shall read:

CAUTION
LEAD DUST, FUME, or MIST HAZARD AREA
NO UNAUTHORIZED ENTRY
WEAR ASSIGNED PROTECTIVE EQUIPMENT
BREATHING LEAD DUST MAY CAUSE SERIOUS BODILY HARM

3.2.2 Entry and Exit Procedures from Lead Removal Work Areas: the following general procedures shall be adhered to when entering into and exiting from lead abatement work areas:

3.2.2.1 Work Area Entry Procedures:

3.2.2.1.1 Every worker and visitor planning to enter the work area should remove all street clothing and should store them in a designated clean change room.

3.2.2.1.2 The person shall then put on disposable coveralls with head covering, respirators with clean filters and foot covering and shall proceed to the work area through the flaps covering the entrance to the enclosure.

3.2.2.2 Work Area Exit Procedures:

3.2.2.2.1 Each worker shall decontaminate their protective clothing, boots and respirator by first HEPA vacuuming and then by damp wiping using soap and water.

3.2.2.2.2 The removed disposable coveralls shall be disposed of as lead waste in a 0.15 mm (6 mil) labelled waste bag. Respirator filter inlets shall be sealed in tape or disposed of as lead waste.

3.2.3 Lead Removal Procedures

3.2.3.1 Lead removal shall not commence until:

3.2.3.1.1 The work area is effectively separated from clean areas of the building.

3.2.3.1.2 Warning signs are posted outside the removal work areas.

3.2.3.1.3 All surfaces which are not possible to clean are sealed with polyethylene sheeting and tape.

3.2.3.1.4 Arrangements have been made for waste disposal, landfill site operator has been contacted and storage bin is on site.

3.2.3.1.5 Tools, equipment and materials are on hand and in the work area.

3.2.3.1.6 Facilities for the washing of hands and face are available for workers leaving the work area.

3.2.3.2 Before beginning the work, remove visible dust from the surfaces in the work area. Use HEPA vacuums, or damp cloths where damp cleaning is considered more appropriate. Do not use compressed air or dry sweeping to clean up or remove dust from any surface.

3.2.3.3 Wet materials containing lead to be removed, disturbed, or sealed with amended water. Garden reservoir type low velocity fine mist sprayer may be used. Perform work in a manner to reduce dust creation to lowest levels practicable. Spray lead material repeatedly during the work process to minimize airborne lead dust.

3.2.3.4 Removed material has to be placed directly in waste bags. Wherever possible, lead-containing material should be removed in sections as intact as possible.

3.2.3.5 Areas that used to be covered with the lead-containing material should be cleaned after the material is removed, using brushes, steel wool, or any other tools suitable.

3.2.3.6 Frequently during the work and immediately after completion of the work, clean up dust and waste containing lead using a HEPA vacuum or by damp wiping.

3.2.3.7 All labelled waste bags should be placed in clean clear 6 mil poly bags before they are taken out of the enclosure.

3.2.4 Final Clean

3.2.4.1 When removal is complete, clean the entire work area by HEPA vacuuming and wet wiping.

3.2.4.2 All tools and equipment used in the removal process such as knives, extension cords, scrapers, wire brushes, garden sprayers etc., should be washed and cleaned and placed in 6 mil polyethylene bags.

3.2.4.3 The work area shall be deemed clean by the Inspector when there is no visible residue, dust, dirt, film, stain, or discolouration resulting from either lead removal or cleaning activities.

3.2.4.4 The enclosure should be left standing until wipe sample(s) are taken inside the enclosure, and the lead concentration level is below 40 µg/ft^2 for floors and/or 250 µg/ft^2 for window sills, and/or 400 µg/ft^2 for window sills.

3.2.4.5 After the area is declared clean and written approval to proceed has been received from the Inspector:

3.2.4.5.1 Dismantle boundaries and isolating barriers and treat as lead waste. Drop sheets shall be wetted and folded to contain dust and then placed in waste bags.

3.2.4.5.2 Immediately before their removal from the work area, and disposal, clean each filled labelled waste bag using damp cloths or HEPA vacuum and place in second clean clear polyethylene waste bag.

3.2.4.5.3 Dispose of waste as per procedures specified in subsection 1.16 Waste Transport and Disposal.

3.2.4.6 Repair or replace objects damaged in the course of the work. Re-establish objects moved to temporary locations in the course of the work, in their proper positions. Re-secure mounted objects removed in the course of the work in their former positions.

3.3 Type 3a and 3b Removal Operations

3.3.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

3.3.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

3.3.1.2 The Contractor is responsible for moving materials and objects which are present in the work areas.

3.3.1.3 Separate the lead removal work areas from other areas in the building required to remain in use by erecting floor to ceiling rip-proof polyethylene sheeting supported on wood framing.

3.3.1.4 All surfaces, equipment and objects located in the work areas and not scheduled for removal shall be pre-cleaned by HEPA vacuuming or wet wiping and shall be protected by one layer of rip proof poly sheeting unless otherwise specified. Dry sweeping or vacuuming with units not equipped with HEPA filters shall not be allowed.

3.3.1.5 All equipment, objects and articles scheduled for removal shall be taken out of the work area only if its removal will not disturb any lead-containing materials.

3.3.1.6 Ensure that smoke detectors, fire alarms, heat detectors and other life safety equipment remain active and operating as installed.

3.3.1.7 All specified clean demolition work can be carried out before the Type 3 enclosure is set up on condition that the demolition work does not disturb any lead-containing materials.

3.3.1.8 Construct the decontamination enclosure systems for workers and for equipment and materials as specified.

3.3.1.9 Independently seal off all openings leading to the work area using polyethylene sheeting and duct tape. Such openings include, but are not limited to, windows, doorways, corridors, skylights, diffusers, grills and air ducts. Also seal all floor openings

independently before covering the entire floor with polyethylene sheeting. Ensure that the individual seals are air tight and water tight.

3.3.1.10 Cover floors with two independently sealed layers of polyethylene sheeting and seal with duct tape. The first layer immediately above the floor shall be 6 mil poly. The other layer shall be rip proof poly. Poly on the floor shall extend a minimum of 30 cm up all vertical surfaces located in the work area.

3.3.1.11 Cover walls with two independently sealed layers of 6 mil clear polyethylene sheeting. Overlap floor poly with wall poly by a minimum of 30 cm at each layer. The layers of wall poly shall always overlap the layers of the floor poly.

3.3.1.12 Ensure that adjoining sheets of poly used on walls and floors overlap by at least 30 cm.

3.3.1.13 Ensure that poly sheets are properly supported to avoid excessive billowing and failure of the enclosure as a result of applying negative pressure differential. Brace the poly in case of excessive billowing using 1”x2” straps or any other measures and means as required.

3.3.1.14 Use flame resistant polyethylene sheeting near heat sources.

3.3.1.15 Create negative pressure in the work area using HEPA-filtered negative air unit distributed evenly (horizontally and vertically) within the work area. Supply any necessary platforms as required to elevate the negative air unit.

3.3.1.16 Provide enough negative air units to be able to exchange the air volume of the work area at least once every 20 minutes (three air changes per hour) and to maintain a minimum of 0.02” water gauge differential.

3.3.1.17 The pressure differential shall be continuously monitored using an automatic recorder as specified. Place the monitor outside the contaminated work area. A backup negative air unit shall be set up and ready for operation in case one of the original units fail.

3.3.1.18 Operate the negative air units from the start of the preparation and isolation phase until completion of the final clean up work and air testing.

3.3.1.19 Ensure that the necessary make up air is supplied to the work area through flaps installed in the perimeter seal.

3.3.1.20 Replace pre-filters and HEPA filters as necessary to maintain the proper flow rate and to ensure that the unit continues to function properly.

3.3.1.21 Contaminated air from the work area shall be exhausted directly to the outside through sealed ducts. Where necessary, remove existing windows and replace with a plywood panel. Secure the panel in place and make weather tight using caulking. Install appropriately sized openings for exhaust (typically 12”). Replace windows upon completion of work.

3.3.1.22 All negative air units which are set up to discharge inside the building shall be leak tested in place using the DOP method.

3.3.1.23 The Contractor is allowed to connect to the owner’s existing water supply for use in the lead work areas and in the temporary shower and decontamination facilities. The Contractor shall be responsible for making all the connections using vacuum breakers and other backflow preventers.

3.3.1.24 The Contractor shall use copper pipes and fittings and high pressure hoses when making connections to the main water supply. The Contractor shall also install a main shut-off valve on the clean side of the decontamination enclosure. All connections shall be made down stream form the main shut-off valve. Ensure that the pressure in the temporary water distribution system is relieved if the system is to be left unattended. Ensure that no leaks are present around hose pipe connections. Minimize the possibility of water damage through spills or leaks by providing drip pans of suitable size and by ensuring that the drip pans are drained regularly.

3.3.1.25 Ensure that all water from the drainage facilities installed on the shower and other decontamination enclosures is passed through filtration systems as specified.

3.3.1.26 Test all temporary piping installed during this project and ensure that they are watertight. All temporary pipe installation shall remain water tight for the duration of the project. Pipes shall be installed parallel to walls and shall be temporarily secured to existing structures. Ensure that all piping is removed upon completion of work. Avoid damaging or altering the owner's existing water equipment and piping.

3.3.1.27 All electrical work shall be performed by a licensed electrician in compliance with all applicable regulations. Isolate, disconnect and lockout all power supplying or passing through the work area. Ensure that power supply to the remaining areas of the building is not disrupted during work in lead contaminated areas.

3.3.1.28 Unless specified, the use of the existing power and lighting circuits shall not be allowed. Use temporary electrical panels to provide power and lighting to the decontamination facilities and the work area. One electrical panel shall be provided for every 5000 square feet of contained lead work areas. Electrical panels shall be equipped and sized to handle all electrical equipment required for the completion of the project. The Contractor shall also be required to provide other additional electrical equipment such as temporary lighting, circuit breakers, panels, transformers and switch gears.

3.3.1.29 The contactor shall be responsible for establishing and maintaining fire and emergency exits from the work area that are acceptable to the Provincial Fire Marshall and other authorities having jurisdiction. The emergency exits shall be sealed in a manner that will not hinder the use of the doors during an evacuation and shall be clearly marked by using proper exit signs.

3.3.1.30 Battery powered emergency lighting shall be installed by the Contractor to provide general lighting throughout the work area in case of loss of power supply to the ground fault panel and to ensure that the emergency exits and the exit routes remain lit during the power failure.

3.3.1.31 Ensure that fire extinguishers are installed throughout the lead work area at each of the emergency exits and on both sides of the decontamination facilities. All fire extinguishers installed inside the work area shall be protected by clear polyethylene sheets and shall be easily accessible in case of an emergency.

3.3.1.32 The Contractor shall place warning signs at all access points leading to the contained work area. The signs shall be posted at the curtained door ways and shall read:

CAUTION
LEAD DUST, FUME, or MIST HAZARD AREA
NO UNAUTHORIZED ENTRY
WEAR ASSIGNED PROTECTIVE EQUIPMENT
BREATHING LEAD DUST MAY CAUSE SERIOUS BODILY HARM

3.3.1.33 Once the initial clean preparation and isolation of the work area is completed, the Contractor shall request an inspection from the Consultant before proceeding to next phase. Notify the Consultant 24 hours before the inspection is needed.

3.3.1.34 Once authorization is obtained from the Consultant, proceed to setting up critical seals that become accessible once removal operations commence.

3.3.1.35 Shut off and lock out the HVAC system serving the subject work area. Ensure that all work requiring the complete shut down of the HVAC system is carried out during the time when the building is not occupied.

3.3.1.36 Unless otherwise specified, all electrical systems scheduled to remain inside the work area during lead removal activities shall be sealed using duct tape and poly sheets. Examples of such systems include speakers, wiring, smoke and heat detectors, alarm equipment, communication systems, PA systems, junction boxes, etc.

3.3.1.37 Once all the preparation work is complete, the contactor shall ensure that the work area is maintained neat and organized. All the enclosures shall be inspected by the supervisor before and after the completion of each work shift to ensure that the hoarding walls, polyethylene barriers and enclosures are intact. Any damaged discovered during the inspection shall be repaired immediately. Maintain an inspection log book on site to document when (date and time) the inspection was carried out and by who (name and signature of the person). Summarize any problems encountered during the inspection.

3.3.1.38 Ensure that the negative air units and the associated ducting and exhaust openings are regularly inspected during the work shift. The pressure differential monitoring unit shall be also inspected regularly during the work shift to ensure that the specified negative pressure inside the work area is maintained.

3.3.2 Entry and Exit Procedures from Lead Removal Work Areas: the following general procedures shall be adhered to when entering into and exiting from lead abatement work areas:

3.3.2.1 *Work Area Entry Procedures:*

3.3.2.1.1 Every worker and visitor planning to enter the work area shall remove all street clothing including undergarments and shall store them in the clean change room.

3.3.2.1.2 All uncontaminated articles such as clothing, footwear, towels, personal effects, etc. shall be store in the clean room of the decontamination facility.

3.3.2.1.3 The person shall then put on disposal coverall with head covering, respirators with clean filters and foot covering and shall proceed to the work areas through the shower and then the equipment and access room.

3.3.2.2 Work Area Exit Procedures:

3.3.2.2.1 Using HEPA vacuuming or wet wiping, remove all gross contamination from personal protective equipment (disposable coveralls, boots, hard hats, safety glasses, exterior of respirator, etc.) in the work area and then proceed to the equipment and access room.

3.3.2.2.2 In the equipment and access room, remove all protective clothing except the respirator and proceed to the shower. All disposal contaminated clothing shall be placed in lead disposal bags. Reusable items shall be stored neatly in the equipment and access room for use during the next shift.

3.3.2.2.3 Proceed naked to the shower while still wearing the respirator. While showering, clean the outside of the respirator with soap and water. Seal the openings in the filter as per the manufacturer's instruction or using duct tape. Alternatively, the filters can be disposed of as lead waste. Continue showering by thoroughly wetting and washing the body and the head. Wet and clean the inside of the respirator. Filters shall not be allowed in the clean room if not properly sealed.

3.3.2.2.4 Upon completion of showering and drying off, proceed to the clean room and dress in street clothing.

3.3.3 Lead Removal Procedures

3.3.3.1 Lead removal work shall not commence until the following requirements have been met:

3.3.3.2 All work areas have been and contained as specified, decontamination enclosure systems have been set up and occupied areas of the building have been properly isolated.

3.3.3.2.1 All required notifications have been made.

3.3.3.2.2 Warnings signs have been displayed at all potential access points into the work area.

3.3.3.2.3 All arrangements have been made with the waste disposal facility.

3.3.3.2.4 All equipment, materials and tools needed inside the work area are available and in working condition.

3.3.3.2.5 Appropriate negative pressure differential have been established inside the work area with proper allowance for make up air.

3.3.3.2.6 All building security arrangements have been made.

3.3.3.2.7 Written authorization has been obtained from the Consultant to commence lead removal work.

3.3.3.3 Using an airless sprayer, spray the lead-containing material with water mixed with a wetting agent. Apply enough amended water to ensure that the material is wet.

3.3.3.4 Remove the wet lead-containing materials in layers and/or small sections. Spray the material regularly throughout the removal work to maintain saturation and to minimize the generation and dispersion of dust. Ensure that the wet material does not dry out.

3.3.3.5 Ensure that the removed material and other waste generated during the removal process is collected and bagged immediately. Place the material in 6 mil bags. Ensure that the waste water is also collected regularly. Avoid pooling of water. Dispose of the waste water in labelled 6 mil polyethylene bags (or other suitable rigid containers) or pump it straight into the sanitary sewer after passing it through proper filters. Refer to Section 3.3.4 for specific procedures for handling of materials and waste.

3.3.3.6 Mist the air during the removal process using an airless sprayer capable of producing a fine mist and amended water to keep the airborne dust levels as low as possible. Monitor the air inside and outside of the work area during removal.

3.3.3.7 Remove deck mounted objects and other obstructions as necessary to facilitate the removal of the lead-containing materials. Ensure that the removal work includes all lead-contaminated materials specified for removal.

3.3.4 Final Clean

3.3.4.1 After completion of gross lead removal work, perform a more thorough cleaning of all surfaces that used to be covered by lead to remove all visible residue and dust-containing materials. Cleaning shall be carried out using wire brushing, wet sponging, wet sweeping and/or wet shovelling and HEPA vacuuming. Ensure that the surfaces remain wet during the performance of this work.

3.3.4.2 All tools and equipment used in the removal process such as hook knives, extension cords, scrapers, wire brushes, garden sprayers etc, should be washed and cleaned and placed in 6 mil polyethylene bags.

3.3.4.3 Notify the Consultant in cases where leads-containing materials is encountered which cannot be properly removed without demolishing building structural members or removing major service elements. The Consultant will advise the Contractor in writing regarding the next course of action.

3.3.4.4 Continue with the wet thorough cleaning activities and include other surfaces in the work area including, but not limited to, decontamination facilities, polyethylene sheeting, walls and floor surfaces, equipment, containers, piping, ducts, conduits and poly surfaces used in the equipment and access room and the equipment decontamination facilities. Pre-filters used on the negative air units shall be removed and shall be disposed of as lead waste.

3.3.4.5 The work area shall be deemed clean by the Consultant when there is no visible residue, dust, dirt, film, stain, or discolouration resulting from either lead removal or cleaning activities.

3.3.4.6 The work area shall be considered acceptable for public occupancy only if the lead concentrations inside the work area are below 40 µg/ft^2 for floors and/or 250 µg/ft^2 for window sills, and/or 400 µg/ft^2 for window sills. Levels above the clearance standards requires that the entire area be re-cleaned and another coat of lock-down agent be applied by the Contractor on all surfaces in the work area. Re-sampling will be carried out and the entire process shall be repeated until the fibres levels are below the clearance standards.

3.3.4.7 The Contractor shall be responsible for all charges associated with re-cleaning work and other associated requirements as specified.

3.3.5 Procedures for Work Area Teardown and Dismantling

3.3.5.1 Proceed with the teardown of the work area only after obtaining written authorization from the Consultant. Ensure that Type 3 procedures remain in effect during this phase of work. The worker and equipment and material decontamination units shall remain fully operational. The negative air units shall continue to operate throughout the duration of the teardown work.

3.3.5.2 Start by removing polyethylene sheeting by carefully folding it away from the walls to the centre of the work area making sure that any loose debris is trapped within the poly. Also remove all enclosures, duct tape, caulking, polyurethane foam and other materials used in setting up the enclosure. Polyethylene and other materials used in setting up enclosures shall be disposed of as lead-contaminated waste.

3.3.5.3 Clean all vacuum units, fittings, hoses and other small tools used during the removal work inside the work area, seal in 6 mil poly bags and remove from the work area through the equipment and materials decontamination unit. Wash down and clean other equipment used during the work and remove from the work area.

3.3.5.4 Clean up the lead work area including all surfaces and all decontamination enclosures. Remove negative air units pre-filters and dispose of as lead waste. Seal the exterior of the unit on all sides with poly and remove from the work area.

3.3.5.5 Remove all waste bags containing polyethylene sheets and other materials used to set up the enclosures and dispose of as specified.

3.3.5.6 Remove all hoarding walls separating the work area from occupied areas except in locations where the walls are set up adjacent to other areas that still contain lead. Obtain approval of Consultant before dismantling hoarding walls.

3.3.5.7 Dismantle the remainder of the enclosure including scaffolding, platforms, decontamination facilities, tunnels, etc. Final clean the work area using HEPA vacuuming and wet wiping. Clean and remove all ground fault panels and temporary lighting.

3.3.6 Procedures for Re-Establishment of Objects and Systems

3.3.6.1 Re-establish mechanical and HVAC systems and install new clean air filters where previously removed. Re-establish all electrical system and return to as found condition unless otherwise specified.

3.3.6.2 Repair, replace and make good on all damages not identified during the per-removal survey.

3.3.6.3 Unless otherwise specified, all items and objects removed during the initial preparation phase of the work shall be returned to their original position and shall be properly mounted and secured.

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3.4 Type 1 Removal Operation

4.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

4.1.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

4.1.1.2 The Contractor is responsible for moving materials and objects which are present in the work areas.

4.1.1.3 Prevent the spread of dust from the work area using measures appropriate to the work to be done.

4.1.1.3.1 Shut off, lock out and seal all ventilation duct vents with the application of one layer of 6 mil (0.15mm) thick clear polyethylene sheet sealed with tape.

4.1.1.3.2 Use FR polyethylene drop sheets over all flooring in work areas where dust and contamination cannot otherwise be thoroughly cleaned. This does not apply if work involves the removal of asbestos-containing floor tiles.

4.1.1.3.3 Use one layer of 6 mil (0.15 mm) thick clear polyethylene sheets to cover walls.

4.1.1.3.4 Separate parts of the building required to remain in use from the work area by polyethylene drop sheets at the perimeter of the work area.

4.1.1.3.5 Separate the work area with clearly visible warning signs advising of the hazards of asbestos dust and that entry is restricted to authorized trained personnel wearing personal protective equipment.

4.1.1.3.6 Erect scaffolding or platforms where necessary to perform the removal work. All platforms that exceed 25 feet in height will require the submission of a shop drawing stamped by a professional engineer for approval by the inspector within a minimum of 5 days prior to commencing the work. Guard rails shall be provided around all platforms or scaffolding where practicable. Cover the floor area of the scaffold or platform with one layer of FR polyethylene. Extend the floor of scaffolding or platform under an item being removed to act as a receptacle. Polyethylene sheeting shall be suitably braced and/or restrained so that billowing or failure of the polyethylene sheeting or taped joints does not occur.

4.1.2 Entry and Exit Procedures from Asbestos Removal Work Areas: the following general procedures shall be adhered to when entering into and exiting from asbestos abatement work areas:

4.1.2.1 Work Area Entry Procedures:

4.1.2.1.1 Every worker and visitor planning to enter the work area should remove all street clothing and should store them in a designated clean change room.

4.1.2.1.2 The person shall then put on disposal coverall with head covering, respirators with clean filters and foot covering and shall proceed to the work area.

4.1.2.2 Work Area Exit Procedures:

4.1.2.2.1 Each worker shall decontaminate their protective clothing, boots and respirator by first HEPA vacuuming and then by damp wiping using soap and water.

4.1.2.2.2 The removed disposable coveralls shall be disposed of as asbestos waste in a 0.15 mm (6 mil) labelled waste bag. Respirator filter inlets shall be sealed in tape or disposed of as asbestos waste.

4.1.3 Asbestos Removal Procedures

4.1.3.1 Asbestos Removal shall not commence until:

4.1.3.1.1 The work area is effectively separated from clean areas of the building.

4.1.3.1.2 Warning signs are posted outside the removal work areas.

4.1.3.1.3 All surfaces which are not possible to clean are sealed with polyethylene sheeting and tape.

4.1.3.1.4 Arrangements have been made for waste disposal, landfill site operator has been contacted and storage bin is on site.

4.1.3.1.5 Tools equipment and materials are on hand and in the work area.

4.1.3.1.6 Facilities for the washing of hands and face are available for workers leaving the work area.

4.1.3.2 Before beginning work remove visible dust from surfaces in the work area where dust is likely to be disturbed during the course of the work. Use HEPA vacuum, or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air to clean up or remove dust from any surface.

4.1.3.3 Wet materials containing asbestos to be cut, ground, abraded, drilled, or otherwise disturbed with amended water. Use garden type low velocity fine mist sprayer. Perform work in a manner to reduce dust creation to lowest levels practicable. Spray asbestos material repeatedly during the work process to minimize asbestos fibre release.

4.1.3.4 Additional cement board removal procedures.

4.1.3.4.1 Cement board shall be removed intact where possible.

4.1.3.4.2 When not possible to remove intact, the board shall be cut with hand saws where necessary and dust shall be collected with a HEPA vacuum cleaner nozzle held under the cut area.

4.1.3.4.3 Drop sheets shall be used no more than 0.5 metres below the cutting location and shall be constructed in such a manner that any dust not removed by the HEPA vacuum is collected.

4.1.3.5 Remove material in sections as intact as possible.

4.1.3.6 Frequently during the work and immediately after completion of the work, clean up dust and waste containing asbestos using a HEPA vacuum or by damp wiping.

4.1.4 <u>Final Clean</u>

4.1.4.1 When removal is complete, clean the entire work area by HEPA vacuuming and wet wiping.

4.1.4.2 The work area shall be deemed clean by the Inspector when there is no visible residue, dirt, film, stain, or discolouration resulting from either asbestos removal or cleaning activities.

4.1.4.3 After completion of the initial cleaning and after the Inspector has passed the visual inspection, spray sealant on all surfaces in the work area, including, but not limited to:

4.1.4.3.1 Where asbestos material has been removed.

4.1.4.3.2 Polyethylene sheeting used on walls, floors and ceilings.

4.1.4.4 Sealant should be sprayed using a garden reservoir type low velocity fine mist sprayer. The sprayer cannot be used if the nozzle is partially obstructed, or if a uniform fine mist spray cannot be obtained.

4.1.4.5 After the area is declared clean and written approval to proceed has been received from the Inspector:

4.1.4.5.1 Dismantle boundaries and isolating barriers as asbestos waste. Drop sheets shall be wetted and folded to contain dust and then placed in waste bags.

4.1.4.5.2 Immediately before their removal from the work area, and disposal, clean each filled labelled waste bag using damp cloths or HEPA vacuum and place in second clean clear polyethylene waste bag.

4.1.4.5.3 Dispose of waste as per procedures specified in subsection 1.15 Waste Transport and Disposal.

4.1.4.6 Repair or replace objects damaged in the course of the work. Re-establish objects moved to temporary locations in the course of the work, in their proper positions. Re-secure mounted objects removed in the course of the work in their former positions.

4.2 Type 2 Removal Operation: For Work In Enclosures

4.2.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

4.2.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

4.2.1.2 The Contractor is responsible for moving materials which are present in the work.

4.2.1.3 Prevent the spread of dust from the work area using measures appropriate to the work to be done.

4.2.1.3.1 Shut off, lock out and seal all ventilation duct vents with the application of one layer of 6 mil (0.15 mm) thick clear polyethylene sheet sealed with tape.

4.2.1.3.2 Clean all moveable objects within proposed work area using a HEPA vacuum.

4.2.1.3.3 Clean fixed casework, plant, and equipment within proposed work area, using a HEPA vacuum and cover with polyethylene sheeting sealed with tape.

4.2.1.3.4 Clean proposed work areas using, where practicable, HEPA vacuum cleaning equipment. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA filter-equipped vacuums.

4.2.1.3.5 Cover and seal airtight light fixtures, duct openings and other suspended ceiling objects using clear 6 mil polyethylene sheeting and tape.

4.2.1.3.6 Erect scaffolding or platforms necessary to perform the removal work. All platforms that exceed 25 feet in height will require the submission of a shop drawing stamped by a professional engineer for approval by the inspector within a minimum of 5 days prior to commencing the work. Guard rails shall be provided around all platforms or scaffolding where practicable.

4.2.1.3.7 Cover floor area of scaffold or platform with one layer of FR polyethylene.

4.2.1.3.8 Extend scaffolding or platform under the item being removed to prevent material from falling.

4.2.1.3.9 Separate parts of the building required to remain in use from the work area by polyethylene drop sheets at the perimeter of the work area.

4.2.1.3.10 Set up an airtight enclosure around the work area where the work on friable asbestos-containing material is to be carried out. Enclosure should be set up using 1 layer of FR polyethylene sheeting to cover the floors, and 1 layer of 6 mil (0.15 mm) thick clear polyethylene sheeting to cover the walls. Two layers of FR polyethylene sheeting should be used to cover carpeted floors. Polyethylene on the walls should be made to overlap with the polyethylene on the floor a minimum of 300 mm.

4.2.1.3.11 Polyethylene sheeting shall be suitably braced and/or restrained so that excessive billowing or failure of the polyethylene sheeting or taped joints does not occur as a result of the negative pressure differential created by the vacuums.

4.2.1.3.12 Erect a temporary structure made of wooden studs to support polyethylene sheeting where necessary.

4.2.1.3.13 Insert a hose of a HEPA filter equipped vacuum into the enclosure to provide negative air pressure inside the enclosure.

4.2.1.3.14 Entrance to the enclosure should be covered with two pieces of overlapping polyethylene sheeting.

4.2.1.3.15 Separate the work area with clearly visible warning signs advising of the hazards of asbestos dust and that entry is restricted to authorized trained personnel wearing personal protective equipment.

4.2.2 Entry and Exit Procedures from Asbestos Removal Work Areas: the following general procedures shall be adhered to when entering into and exiting from asbestos abatement work areas:

4.2.2.1 Work Area Entry Procedures:

4.2.2.1.1 Every worker and visitor planning to enter the work area should remove all street clothing and should store them in a designated clean change room.

4.2.2.1.2 The person shall then put on disposal coverall with head covering, respirators with clean filters and foot covering and shall proceed to the work area through the flaps covering the entrance to the enclosure.

4.2.2.2 Work Area Exit Procedures:

4.2.2.2.1 Each worker shall decontaminate their protective clothing, boots and respirator by first HEPA vacuuming and then by damp wiping using soap and water.

4.2.2.2.2 The removed disposable coveralls shall be disposed of as asbestos waste in a 0.15 mm (6 mil) labelled waste bag. Respirator filter inlets shall be sealed in tape or disposed of as asbestos waste.

4.2.3 Asbestos Removal Procedures

4.2.3.1 Asbestos Removal shall not commence until:

4.2.3.1.1 The work area is effectively separated from clean areas of the building.

4.2.3.1.2 Warning signs are posted outside the removal work areas.

4.2.3.1.3 All surfaces which are not possible to clean are sealed with polyethylene sheeting and tape.

4.2.3.1.4 Arrangements have been made for waste disposal, landfill site operator has been contacted and storage bin is on site.

4.2.3.1.5 Tools equipment and materials are on hand and in the work area.

4.2.3.1.6 Facilities for the washing of hands and face are available for workers leaving the work area.

4.2.3.2 Before beginning the work remove visible dust from surfaces in the work area. Use HEPA vacuum, or damp cloths where damp cleaning is considered more appropriate. Do not use compressed air to clean up or remove dust from any surface.

4.2.3.3 Wet materials containing asbestos to be removed, disturbed, or sealed with amended water. Garden reservoir type low velocity fine mist sprayer may be used. Perform work in a manner to reduce dust creation to lowest levels practicable. Spray asbestos material repeatedly during the work process to minimize asbestos fibre dispersion.

4.2.3.4 Removed material has to be placed directly in waste bags. Wherever possible, asbestos-containing material should be removed in sections as intact as possible.

4.2.3.5 Areas that used to be covered with the asbestos-containing material should be cleaned after the material is removed, using brushes, steel wool, or any other tools suitable.

4.2.3.6 Frequently during the work and immediately after completion of the work, clean up dust and waste containing asbestos using a HEPA vacuum or by damp wiping.

4.2.3.7 All labelled waste bags should be placed in clean clear 6 mil poly bags before they are taken out of the enclosure.

4.2.4 Final Clean

4.2.4.1 When removal is complete, clean the entire work area by HEPA vacuuming and wet wiping.

4.2.4.2 All tools and equipment used in the removal process such as hook knives, extension cords, scrapers, wire brushes, garden sprayers etc, should be washed and cleaned and placed in 6 mil polyethylene bags.

4.2.4.3 The work area shall be deemed clean by the Inspector when there is no visible residue, dirt, film, stain, or discolouration resulting from either asbestos removal or cleaning activities.

4.2.4.4 After completion of the initial cleaning and after the Inspector has passed the visual inspection, spray sealant on all surfaces in the work area, including, but not limited to:

4.2.4.4.1 Where asbestos material has been removed.

4.2.4.4.2 Polyethylene sheeting used on walls, floors and ceilings.

4.2.4.5 Sealant should be sprayed using a garden reservoir type low velocity fine mist sprayer. The sprayer cannot be used if the nozzle is partially obstructed, or if a uniform fine mist spray cannot be obtained.

4.2.4.6 Enclosure should be left standing until all the sealant has dried or, if required, until an air sample is taken inside the enclosure, and the fibre concentration level is below 0.05f/cc.

4.2.4.7 After the area is declared clean and written approval to proceed has been received from the Inspector:

4.2.4.7.1 Dismantle boundaries and isolating barriers and treat as asbestos waste. Drop sheets shall be wetted and folded to contain dust and then placed in waste bags.

4.2.4.7.2 Immediately before their removal from the work area, and disposal, clean each filled labelled waste bag using damp cloths or HEPA vacuum and place in second clean clear polyethylene waste bag.

4.2.4.7.3 Dispose of waste as per procedures specified in subsection 1.15 Waste Transport and Disposal.

4.2.4.8 Repair or replace objects damaged in the course of the work. Re-establish objects moved to temporary locations in the course of the work, in their proper positions. Re-secure mounted objects removed in the course of the work in their former positions.

4.3 Type 2 Removal Operation: For Work Using Glove Bags

4.3.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

4.3.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

4.3.1.2 Prevent the spread of dust from the work area using measures appropriate to the work to be done.

4.3.1.2.1 Shut off, lock out and seal all ventilation duct vents with the application of one layer of 6 mil (0.15 mm) thick clear polyethylene sheet sealed with tape.

4.3.1.2.2 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over all flooring in work area where dust and contamination cannot otherwise be safely contained.

4.3.1.2.3 Separate parts of the building required to remain in use from the work area by polyethylene drop sheets around the perimeter of the work area.

4.3.1.2.4 Separate the work area with clearly visible warning signs advising of the hazards of asbestos dust and that entry is restricted to authorized trained personnel wearing personal protective equipment.

4.3.2 Worker Protection Procedures

4.3.2.1 Before proceeding to the work area:

4.3.2.1.1 Each worker shall don respirator and disposable coveralls, including head covering and suitable foot wear. Removal of street clothes in a designated clean room before wearing the disposable coveralls is recommended.

4.3.2.2 Before leaving the work area:

4.3.2.2.1 Each worker shall decontaminate their protective clothing, boots and respirator by first HEPA vacuuming and then by damp wiping using soap and water.

4.3.2.2.2 The removed disposable coveralls shall be disposed of as asbestos waste in a 6 mil (0.15 mm) labelled waste bag.

4.3.2.2.3 The worker shall proceed to clean their hands and arms. The waste water should be collected and filtered using a filter that passes particles 5 microns in size and smaller, before it is discharged into the municipal sewer system.

4.3.3 Asbestos Removal Procedures

4.3.3.1 Asbestos Removal shall not commence until:

4.3.3.1.1 The work area is effectively separated from clean areas of the building by polyethylene drop sheets and the placing of rope barriers at the boundary of the designated work area. The boundaries of the work area shall be a minimum of 10 feet from the location of the insulation being removed.

4.3.3.1.2 Warning signs are posted outside the removal work areas.

4.3.3.1.3 All surfaces which are not possible to clean are sealed with polyethylene sheeting and tape.

4.3.3.1.4 Arrangements have been made for waste disposal, landfill site has been contacted and storage bin is on site.

4.3.3.1.5 Tools equipment and materials are on hand and in the work area.

4.3.3.1.6 Facilities for the washing of hands and face are available for workers leaving the work area.

4.3.3.2 Before beginning work remove visible dust from surfaces in the work area where dust is likely to be disturbed during the course of the work. Use HEPA vacuum, or damp cloths

where damp cleaning does not create a hazard and is otherwise appropriate. Do not use compressed air to clean up or remove dust from any surface.

4.3.3.3 Remove all obstructions from around pipe. Where access is required above plaster ceilings, provide sufficient openings to gain access.

4.3.3.4 Friable material containing asbestos to be removed or disturbed shall be thoroughly surface wetted before and during work unless wetting creates a hazard or causes damage. Use garden type low velocity fine mist sprayer. Sprayers that are partially clogged, or that does not produce uniformly fine mist will not be accepted. Perform work in a manner to reduce dust creation to lowest levels practicable.

4.3.3.5 Inspect all glove bags for defects before using. A defective bag shall not be used.

4.3.3.6 Ensure that the following tools are used:

4.3.3.6.1 Knife shall have a retractable blade.

4.3.3.6.2 Saw shall be a flexible wire type.

4.3.3.6.3 Brushes shall not have metal bristles.

4.3.3.7 After written authorization has been received from the Inspector to proceed perform the removal using the following procedures.

4.3.3.7.1 Place tools necessary to remove insulation, in tool pouch. Wrap the bag around pipe and close zippers. Seal bag to pipe with restraining nylon straps. Welds and folds of glove bag are to remain intact without modification to manufacturers design.

4.3.3.7.2 Place hands in gloves and use necessary tools to remove insulation. Cut or remove exterior insulation covering where applicable to expose asbestos pipe covering. Wet exposed pipe or duct covering with sufficient mixture to suppress any dust. Arrange insulation in bag to obtain full capacity of bag.

4.3.3.7.3 Insert nozzle of spray pump prefilled and primed with water and surfactant into bag through valve and wash down pipe and interior of bag thoroughly, use cloth or sponge to aid in washing process. Wet surface of insulation in lower section of bag.

4.3.3.7.4 Waste material in bags intended for use at more than one location and which are equipped with internal zippers to seal off waste, shall have the upper section of bag thoroughly cleaned then shall be sealed off in lower sections of bag before bag is removed from pipe. Reinstall bag in new location before opening zip lock.

4.3.3.7.5 If bag **(Only if bag is a Safe-T-Strip)** is to be moved along pipe, loosen straps, move bag, re seal to pipe using double pull zipper to pass hangers. Repeat stripping operation.

4.3.3.7.6 To remove bag after completion of stripping wash top section and tools thoroughly. Seal off waste in lower section of bag using zipper. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into appropriately labelled waste disposal bags and seal.

4.3.3.7.7 Prior to removal of bag ensure that pipe is free of all residue. Remove all residue using wet cloths as necessary. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.

4.3.3.7.8 Upon completion of work, cover exposed ends of remaining pipe insulation with polyethylene tape.

4.3.3.7.9 If the glove bag is ripped, cut or opened in any way, work that may disturb friable material shall cease immediately. If the rip, cut or opening is small and easy to repair then the glove bag shall be repaired forthwith with tape. Work may continue once the repairs are complete. If the rip, cut or opening is not small and cannot be easily repaired, place the glove bag forthwith in a suitable asbestos waste container. Any spilled material

containing asbestos shall be cleaned up and removed by using a vacuum equipped with a HEPA filter.

4.3.3.8 All work will be subject to visual inspection and air monitoring. Any contamination of surrounding areas indicated by visual inspection or air monitoring will require the complete enclosure and clean up of affected areas.

4.3.4 Cleanup:

4.3.4.1 Frequently during the work and immediately after completion of the work clean up dust and waste containing asbestos using a HEPA vacuum or by damp mopping.

4.3.4.2 Place dust and waste containing asbestos in sealed dust tight waste bags. Drop sheets and disposable protective clothing shall be treated as asbestos waste and shall be wetted and folded inward to contain dust and then placed in waste bags.

4.3.4.3 Glove bags, disposal bags, drop sheets, cloth rags and any porous materials are to be considered as asbestos waste and handled according to disposal subsection.

4.3.4.4 Immediately before their removal from the work area, and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

4.3.4.5 Seal and remove double bagged waste from site. Dispose of in accordance with procedures specified in section 1.15.

4.3.4.6 Perform final thorough cleanup of work areas and adjacent areas affected by the work using HEPA vacuums.

4.4 Type 3 Removal Operation

4.4.1 Initial Preparation and Isolation of Work Areas: Unless otherwise specified, work carried out as part of this phase shall proceed as follows:

4.4.1.1 Carry out a survey of the work areas to compile an inventory of existing damages and provide a copy to the Consultant.

4.4.1.2 The Contractor is responsible for moving materials and objects which are present in the work areas.

4.4.1.3 Separate the asbestos removal work areas from other areas in the mechanical room required to remain in use as follows by erecting rip-proof polyethylene sheeting and plywood sheeting. The polyethylene sheeting should extend from floor to ceiling and the plywood hoarding should extend 8ft from the floor on the separation side of the enclosure. Use one layer of rip proof poly on the exterior side of the wood stud framing under the plywood sheets. Use two layers of poly on the interior side of the wood frame. The inner layer shall be made up of clear 6 mil poly sheets. The outer layers shall be made up of rip proof poly.

4.4.1.4 All surfaces, equipment and objects located in the work areas and not scheduled for removal shall be pre-cleaned by HEPA vacuuming or wet wiping and shall be protected by one layer of rip proof poly sheeting unless otherwise specified. Dry sweeping or vacuuming with units not equipped with HEPA filters shall not be allowed.

4.4.1.5 All equipment, objects and articles scheduled for removal shall be taken out of the work area only if its removal will not disturb any asbestos-containing materials.

4.4.1.6 Ensure that smoke detectors, fire alarms, heat detectors and other life safety equipment remain active and operating as installed.

4.4.1.7 All specified clean demolition work can be carried out before the Type 3 enclosure is set up on condition that the demolition work does not disturb any asbestos-containing materials.

4.4.1.8 Construct the decontamination enclosure systems for workers and for equipment and materials as specified.

4.4.1.9 Independently seal off all openings leading to the work area using polyethylene sheeting and duct tape. Such openings include, but are not limited to, windows, doorways, corridors, skylights, diffusers, grills and air ducts. Also seal all floor openings independently before covering the entire floor with polyethylene sheeting. Ensure that the individual seals are air tight and water tight.

4.4.1.10 Cover floors with two independently sealed layers of polyethylene sheeting and seal with duct tape. Poly on the floor shall extend a minimum of 30 cm up all vertical surfaces located in the work area.

4.4.1.11 Cover walls with one layer of 6 mil rip-proof polyethylene sheeting (unless specified otherwise). Overlap floor poly with wall poly by a minimum of 30 cm at each layer. The layers of wall poly shall always overlap the layers of the floor poly.

4.4.1.12 Ensure that adjoining sheets of poly used on walls and floors overlap by at least 30 cm.

4.4.1.13 Ensure that poly sheets are properly supported to avoid excessive billowing and failure of the enclosure as a result of applying negative pressure differential. Brace the poly in case of excessive billowing using 1”x2” straps.

4.4.1.14 Use flame resistant polyethylene sheeting near heat sources.

4.4.1.15 Create negative pressure in the work area using HEPA-filtered negative air unit distributed evenly (horizontally and vertically) within the work area. Supply any necessary platforms as required to elevate the negative air unit.

4.4.1.16 Provide enough negative air units to be able to exchange the air volume of the work area at least once every 20 minutes (three air changes per hour) and to maintain a minimum of 0.02” water gauge differential.

4.4.1.17 The pressure differential shall be continuously monitored using an automatic recorder as specified. Place the monitor outside the contaminated work area. A backup negative air unit shall be set up and ready for operation in case one of the original units fail.

4.4.1.18 Operate the negative air units from the start of the preparation and isolation phase until completion of the final clean up work and air testing.

4.4.1.19 Ensure that the necessary make up air is supplied to the work area through flaps installed in the perimeter seal.

4.4.1.20 Replace pre-filters and HEPA filters as necessary to maintain the proper flow rate and to ensure that the unit continues to function properly.

4.4.1.21 Contaminated air from the work area shall be exhausted directly to the outside through sealed ducts. Where necessary, remove existing windows and replace with a plywood panel. Secure panel in place and make weather tight using caulking. Install appropriately sized openings for exhaust (typically 12”). Replace windows upon completion of work.

4.4.1.22 All negative air units which are set up to discharge inside the building shall be leak tested in place using the DOP method.

4.4.1.23 The Contractor is allowed to connect to the owner’s existing water supply for use in the asbestos work areas and in the temporary shower and decontamination facilities. The Contractor shall be responsible for making all the connections using vacuum breakers and other backflow preventers.

4.4.1.24 The Contractor shall use copper pipes and fittings and high pressure hoses when making connections to the main water supply. The Contractor shall also install a main shut-off valve on the clean side of the decontamination enclosure. All connections shall be made down stream form the main shut-off valve. Ensure that the pressure in the temporary water distribution system is relieved if the system is to be left unattended. Ensure that no leaks are present around hose pipe connections. Minimize the possibility of water damage through spills or leaks by providing drip pans of suitable size and by ensuring that the drip pans are drained regularly.

4.4.1.25 Ensure that all water from the drainage facilities installed on the shower and other decontamination enclosures is passed through filtration systems as specified.

4.4.1.26 Test all temporary piping installed during this project and ensure that they are watertight. All temporary pipe installation shall remain water tight for the duration of the project. Pipes shall be installed parallel to walls and shall be temporarily secured to existing structures. Ensure that all piping is removed upon completion of work. Avoid damaging or altering the owner's existing water equipment and piping.

4.4.1.27 All electrical work shall be performed by a licensed electrician in compliance with all applicable regulations. Isolate, disconnect and lockout all power supplying or passing through the work area. Ensure that power supply to the remaining areas of the building is not disrupted during work in asbestos contaminated areas.

4.4.1.28 Unless specified, the use of the existing power and lighting circuits shall not be allowed. Use temporary electrical panels to provide power and lighting to the decontamination facilities and the work area. One electrical panel shall be provided for every 5000 square feet of contained asbestos work areas. Electrical panels shall be equipped and sized to handle all electrical equipment required for the completion of the project. The Contractor shall also be required to provide other additional electrical equipment such as temporary lighting, circuit breakers, panels, transformers and switch gears.

4.4.1.29 The contactor shall be responsible for establishing and maintaining fire and emergency exits from the work area that are acceptable to the Provincial Fire Marshall and other authorities having jurisdiction. The emergency exits shall be sealed in a manner that will not hinder the use of the doors during an evacuation and shall be clearly marked by using proper exit signs.

4.4.1.30 Battery powered emergency lighting shall be installed by the Contractor to provide general lighting throughout the work area in case of loss of power supply to the ground fault panel and to ensure that the emergency exits and the exit routes remain lit during the power failure.

4.4.1.31 Ensure that fire extinguishers are installed throughout the asbestos work area at each of the emergency exits and on both sides of the decontamination facilities. All fire extinguishers installed inside the work area shall be protected by clear polyethylene sheets and shall be easily accessible in case of an emergency.

4.4.1.32 The Contractor shall place warning signs at all access points leading to the contained work area. The signs shall be posted at the curtained door ways and shall read:

CAUTION
ASBESTOS HAZARD AREA
NO UNAUTHORIZED ENTRY
WEAR ASSIGNED PROTECTIVE EQUIPMENT
BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM

4.4.1.33 Once the initial clean preparation and isolation of the work area is completed, the Contractor shall request an inspection from the Consultant before proceeding to next phase. Notify the Consultant 24 hours before the inspection is needed.

4.4.1.34 Once authorization is obtained from the Consultant, proceed to setting up critical seals that might become accessible once removal operations commence.

4.4.1.35 Shut off and lock out the HVAC system serving the subject work area. Ensure that all work requiring the complete shut down of the HVAC system is carried out during the time when the building is not occupied.

4.4.1.36 Unless otherwise specified, all electrical systems scheduled to remain inside the work area during asbestos removal activities shall be sealed using duct tape and poly sheets. Examples of such systems include speakers, wiring, smoke and heat detectors, alarm equipment, communication systems, PA systems, junction boxes, etc.

4.4.1.37 Once all the preparation work is complete, the contactor shall ensure that the work area is maintained neat and organized. All the enclosures shall be inspected by the supervisor before and after the completion of each work shift to ensure that the hoarding walls, polyethylene barriers and enclosures are intact. Any damaged discovered during the inspection shall be repaired immediately. Maintain an inspection log book on site to document when (date and time) the inspection was carried out and by whom (name and signature of the person). Summarize any problems encountered during the inspection.

4.4.1.38 Ensure that the negative air units and the associated ducting and exhaust openings are regularly inspected during the work shift. The pressure differential monitoring unit shall be also inspected regularly during the work shift to ensure that the specified negative pressure inside the work area is maintained.

4.4.2 Entry and Exit Procedures from Asbestos Removal Work Areas: the following general procedures shall be adhered to when entering into and exiting from asbestos abatement work areas:

4.4.2.1 *Work Area Entry Procedures:*

4.4.2.1.1 Every worker and visitor planning to enter the work area shall remove all street clothing including undergarments and shall store them in the clean change room.

4.4.2.1.2 All uncontaminated articles such as clothing, footwear, towels, personal effects, etc. shall be store in the clean room of the decontamination facility.

4.4.2.1.3 The person shall then put on disposal coverall with head covering, respirators with clean filters and foot covering and shall proceed to the work areas through the shower and then the equipment and access room.

4.4.2.2 *Work Area Exit Procedures:*

4.4.2.2.1 Using HEPA vacuuming or wet wiping, remove all gross contamination from personal protective equipment (disposable coveralls, boots, hard hats, safety glasses, exterior of respirator, etc.) in the work area and then proceed to the equipment and access room.

4.4.2.2.2 In the equipment and access room, remove all protective clothing except the respirator and proceed to the shower. All disposal contaminated clothing shall be placed in asbestos disposal bags. Reusable items shall be stored neatly in the equipment and access room for use during the next shift.

4.4.2.2.3 Proceed naked to the shower while still wearing the respirator. While showering, clean the outside of the respirator with soap and water. Seal the openings in the filter as per the manufacturer's instruction or using duct tape. Alternatively, the filters can be disposed of as asbestos waste. Continue showering by thoroughly wetting and washing the body and the head. Wet and clean the inside of the respirator. Filters shall not be allowed in the clean room if not properly sealed.

4.4.2.2.4 Upon completion of showering and drying off, proceed to the clean room and dress in street clothing.

4.4.3 Asbestos Removal Procedures

4.4.3.1 Asbestos removal work shall not commence until the following requirements have been met:

4.4.3.2 All work areas have been and contained as specified, decontamination enclosure systems have been set up and occupied areas of the building have been properly isolated.

4.4.3.2.1 All required notifications have been made and a notice of project has been posted in a visible area.

4.4.3.2.2 Warnings signs have been displayed at all potential access points into the work area.

4.4.3.2.3 All arrangements have been made with the waste disposal facility.

4.4.3.2.4 All equipment, materials and tools needed inside the work area are available and in working condition.

4.4.3.2.5 Appropriate negative pressure differential have been established inside the work area with proper allowance for make up air.

4.4.3.2.6 All building security arrangements have been made.

4.4.3.2.7 Written authorization has been obtained from the Consultant to commence asbestos removal work.

4.4.3.3 Using an airless sprayer, spray the asbestos-containing material with water mixed with a wetting agent. Apply enough amended water to ensure that the material is wet all way through to the substrate. Avoid dripping. Etch the surface of the material being wetted in cases where the water does not penetrate the outer layer of the material.

4.4.3.4 Remove the wet asbestos-containing materials in layers and/or small sections while maintaining exposed surfaces of insulation in a wet condition. Spray the material regularly throughout the removal work to maintain saturation and to minimize the generation and dispersion of dust. Ensure that the wet material does not dry out.

4.4.3.5 Ensure that the removed material and other waste generated during the removal process is collected and bagged immediately. Place the material in yellow labelled bags. Ensure that the waste water is also collected regularly. Avoid pooling of water. Dispose of the waste water in labelled 6 mil polyethylene bags (or other suitable rigid containers) or pump it straight into the sanitary sewer after passing it through the specified two stage filters. Refer to Section 3.3.4 for specific procedures for handling of materials and waste.

4.4.3.6 Mist the air during the removal process using an airless sprayer capable of producing a fine mist and amended water to keep the airborne fibres levels as low as possible. Monitor the air inside the work area during removal. Airborne fibre levels in excess of 2.5 fibres/cc require the utilization of more airless sprayers.

4.4.3.7 Remove deck mounted objects and other obstructions as necessary to facilitate the removal of the asbestos-containing materials. Ensure that the removal work includes all asbestos-contaminated materials specified for removal.

4.4.3.8 After completion of gross asbestos removal work, perform a more thorough cleaning of all surfaces that used to be covered by asbestos to remove all visible residue and fibrous materials. Cleaning shall be carried out using wire brushing (stiff bristle brushes such as nylon or fibre bristles not metal), wet sponging and vacuuming. Ensure that the surfaces remain wet during the performance of this work.

4.4.3.9 Notify the Consultant in cases where asbestos-containing materials is encountered which cannot be properly removed without demolishing building structural members or removing major service elements. The Consultant will advise the Contractor in writing regarding the next course of action. If sealing the material in place is the recommended course of action, apply a penetrating sealer onto the material and ensure that it penetrates all the way to the substrate.

4.4.3.10 Continue with the wet thorough cleaning activities and include other surfaces in the work area including, but not limited to, decontamination facilities, polyethylene sheeting, walls and floor surfaces, equipment, containers, piping, ducts, conduits and poly surfaces used in the equipment and access room and the equipment decontamination facilities. Pre-filters used on the negative air units shall be removed and shall be disposed of as asbestos waste.

4.4.3.11 Request a visual clearance inspection by the Consultant once all the cleaning activities are completed. The level of cleanliness shall be acceptable to the Consultant before a written authorization is issued to apply the lock-down material.

4.4.4 Procedures for Handling of Materials and Waste

4.4.4.1 Seal all filled asbestos waste containers and clean the exterior of the containers and other items by wet sponging. Move the containers from the filling area to a temporary

storage area located within the enclosure and close to the equipment waste decontamination facility.

4.4.4.2 Move the item to the container cleaning room, clean by wet sponges and pass it through the curtained doorway to a second worker stationed in the holding room. The second worker shall be fully protected (similar to the removal workers) and can only leave by going through the work area and exiting through the worker decontamination facility (after taking a shower). The second worker shall then clean or double bag and seal the item and shall pass it through the curtained doorway to a third worker stationed in the transfer room. The third worker enters the transfer room from the clean side and does not need to use personal protective equipment. The third worker is then responsible for transferring the item to the disposal bin or to the Contractor's temporary storage room or truck.

4.4.4.3 All waste generated within the asbestos work area shall be treated as asbestos-contaminated waste and shall be disposed of accordingly. Non-porous materials which can be properly washed and cleaned can be disposed of as normal waste after cleaning.

4.4.4.4 The contactor shall use a combination of a rigid container with 6 mil poly bag to transport and dispose of waste containing sharp materials which could rip two 6 mil poly bag.

4.4.4.5 Transportation of waste and materials through occupied areas of the building shall be limited to a time when the building is not occupied. The Contractor shall use covered carts to transport the waste inside the building. Predetermined transport routes shall be approved by the Consultant. Workers transporting the waste shall be equipped with spill kits and full personal protective equipment and shall be trained to contain and clean any spilled asbestos-containing materials resulting from a failure in the waste containers.

4.4.4.6 Ensure that waste transport routes, loading areas and garbage bin storage areas are kept clean at all times. Garbage bins shall be of the fully enclosed type and shall be locked at all times when not in use. Garbage bins shall be placed only in locations specified and approved by the Owner or his representative.

4.4.4.7 Schedule garbage bin pick up and drop off times in consultation with the Consultant and ensure that the scheduled times do not interfere with the operations of the building Owner of his tenants.

4.4.4.8 Transport and dispose of asbestos waste as specified in Section 1.15.

4.4.5 Procedures for Locking-Down of Work Area

4.4.5.1 Upon completion of clean up operations and after receiving written authorization from the Consultant to proceed, apply a lock-down agent acceptable to the Consultant on all surfaces in the work area such as areas where asbestos materials has been removed, pipes, ducts and other exposed objects present in the work area, polyethylene sheeting and other exposed walls, ceilings and floors, etc. Ensure that the sprayed material covers all surfaces. Apply twice as much lock-agent on areas that used to be covered by asbestos-containing materials.

4.4.5.2 Ensure that proper respiratory protective equipment is used during the application of the lock-down agent since, depending on the nature of the sealer used, potentially hazardous materials could be generated during the application process.

4.4.5.3 Restrict access to the work area for a period of 24 hours after completion of the lock-down application to allow for the dust to settle and for the lock-down agent to dry off. Clearance air samples will then collected inside the work area.

4.4.5.4 The work area shall be considered acceptable for public occupancy only if the airborne fibre levels inside the work area are less than 0.01 fibres/cc. Levels above 0.01 fibres/cc requires that the entire area be re-cleaned and another coat of lock-down agent be applied by the Contractor on all surfaces in the work area. Re-sampling will be carried out and the entire process shall be repeated until the fibres levels are less than 0.01 fibres/cc.

4.4.5.5 The Contractor shall be responsible for all charges associated with re-cleaning work and other associated requirements as specified.

4.4.6 Procedures for Work Area Teardown and Dismantling

4.4.6.1 Proceed with the teardown of the work area only after obtaining written authorization from the Consultant. Ensure that Type 3 procedures remain in effect during this phase of work. The worker and equipment and material decontamination units shall remain fully operational. The negative air units shall continue to operate throughout the duration of the teardown work.

4.4.6.2 Start by removing polyethylene sheeting by carefully folding it away from the walls to the centre of the work area making sure that any loose debris is trapped within the poly. Also remove all enclosures, duct tape, caulking, polyurethane foam and other materials used in setting up the enclosure. Ensure that one layer of polyethylene sheeting is kept in place in situations were re-application of fireproofing is required. Polyethylene and other materials used in setting up enclosures shall be disposed of as asbestos-contaminated waste.

4.4.6.3 Clean all vacuum units, fittings, hoses and other small tools used during the removal work inside the work area, seal in 6 mil poly bags and remove from the work area through the equipment and materials decontamination unit. Wash down and clean other equipment used during the work and remove from the work area.

4.4.6.4 Clean up the asbestos work area including all surfaces and all decontamination enclosures. Remove negative air units pre-filters and dispose of as asbestos waste. Seal the exterior of the unit on all sides with poly and remove from the work area.

4.4.6.5 Remove all waste bags containing polyethylene sheets and other materials used to set up the enclosures and dispose of as specified.

4.4.6.6 Remove all hoarding walls separating the work area from occupied areas except in locations where the walls are set up adjacent to other areas that still contain asbestos. Obtain approval of Consultant before dismantling hoarding walls.

4.4.6.7 Dismantle the remainder of the enclosure including scaffolding, platforms, decontamination facilities, tunnels, etc. Final clean the work area using HEPA vacuuming and wet wiping. Clean and remove all ground fault panels and temporary lighting.

4.4.7 Procedures for Re-Establishment of Objects and Systems

4.4.7.1 Re-establish mechanical and HVAC systems and install new clean air filters where previously removed. Re-establish all electrical system and return to as found condition unless otherwise specified.

4.4.7.2 Repair, replace and make good on all damages not identified during the per-removal survey.

4.4.7.3 Unless otherwise specified, all items and objects removed during the initial preparation phase of the work shall be returned to their original position and shall be properly mounted and secured.

END OF SECTION

C AIN V E G E T A T I O N I N C.

4 SPRUCE BOULEVARD
ACTON, ONTARIO
L7J 2Y2

PHONE 905-699-5899
E-MAIL: cain.vegetation@gmail.com

February 12, 2024

Hi Tymea,

Tree and Shrub recommendations:

Tree #	Species	Recommendation
9	*Quercus rubra* /Red Oak	Tree has died
11	*Quercus rubra*/Red Oak	Tree is no longer there
12	*Quercus rubra*/Red Oak	Remove due to construction impact /Possibly retain with specialized site work
14	*Catalpa speciosa*/Northern Catalpa	Tree is no longer there
20	*Quercus rubra*/Red Oak	Remove due to construction impact /Possibly retain with specialized site work
32	*Acer platanoides*/Norway Maple	Tree has been recently cut
33	*Acer platanoides*/Norway Maple	Tree has been recently cut
34	*Pinus nigra*/Austrian Pine	Remove due to construction impact
35	*Pinus nigra*/Austrian Pine	Remove due to construction impact
36	*Pinus nigra*/Austrian Pine	Remove due to construction impact
40	*Acer platanoides*/Norway Maple	Tree has been recently cut

Shrubs

Taxus (south side of building)	non-native species, overgrown, remove

For all trees that will have the roots disturbed, remove any soil using hand tools not cutting or disturbing the coarse or large roots. Put wood bracing over the roots to support any traffic and protect the roots during the work. Refill the zone around the roots with fine sand or coarse gravel making sure there is a link to existing soil areas.

Put standard tree protection around all existing trees along the drip-line or hard surface edges to protect the existing trees from any damage by equipment or people or from compaction.

Control any dog-strangling vine plants and European buckthorn plants on the site. These need to be removed using the appropriate herbicides.

Also, please avoid disturbing about 25% of the area of root systems of existing trees. Refer to original report for further guidance to minimize impact during construction.

Thanks,
Nancy

Nancy Cain Ph. D.
ISA Certified Arborist ON-1207

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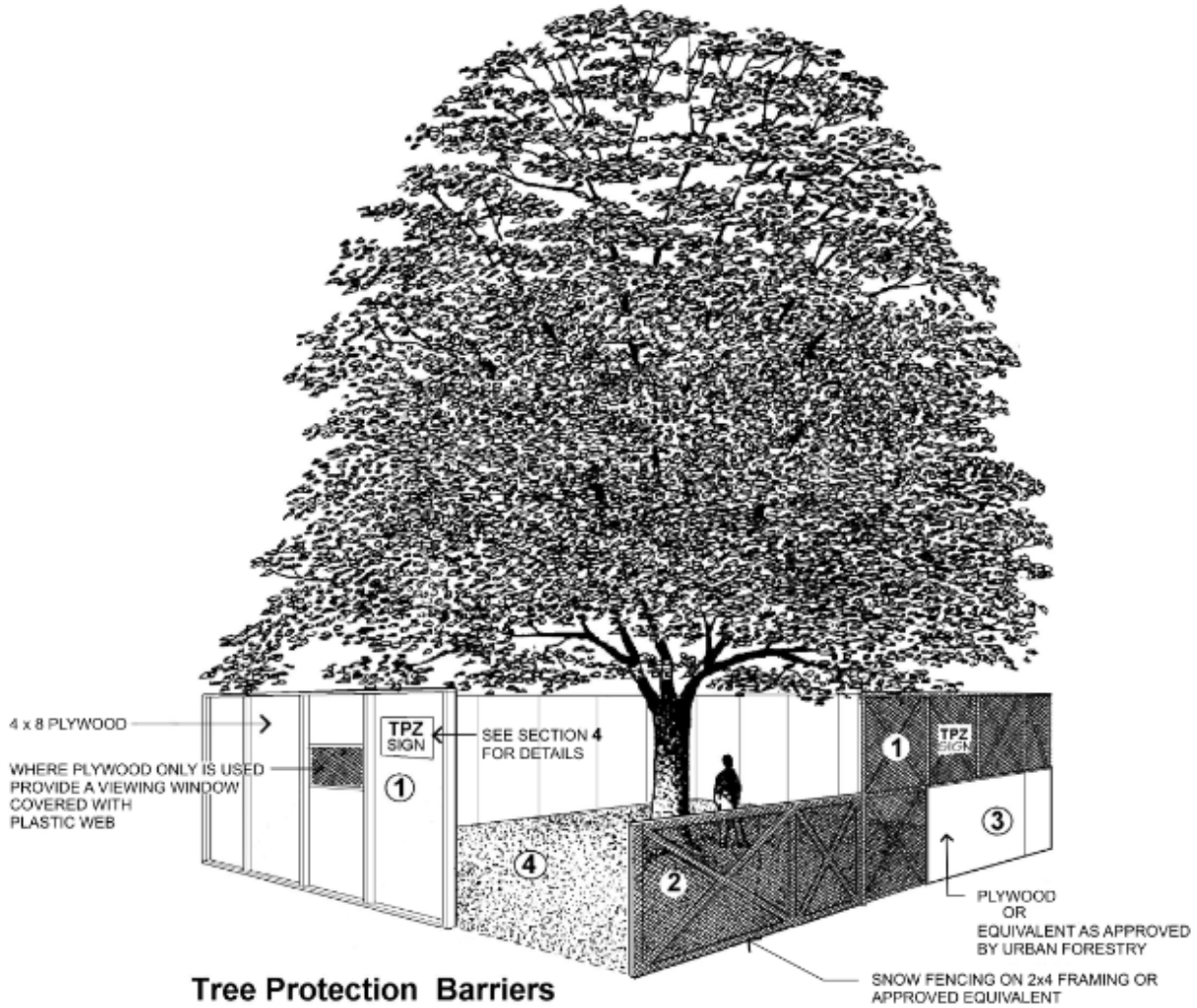
Parks, Forestry & Recreation
Urban Forestry

Tree Protection Policy
and
Specifications for Construction Near Trees



Tree Protection Barriers

July 2016

Table of Contents

1. Introduction

Maintenance, growth and enhancement of the urban forest are important goals of the City of Toronto. Preserving and protecting healthy trees can help the City to achieve these goals. Considering tree protection in the initial stages of construction planning may mean the difference between preserving a healthy tree and having to remove it. Plans created with tree protection in mind help protect the city's urban forest.

The tree protection policy and specifications outlined below reflect the policy of Toronto City Council. Anyone failing to adhere to the tree protection policy and specifications will be financially responsible for any resulting damage to trees and may be charged under the provisions of the applicable City of Toronto tree by-law or subject to orders to comply.

Prior to commencing with any demolition or construction activity it is important that an arborist[1] determines the location, species, size and condition of trees on the property and surrounding properties and becomes familiar with the tree protection by-laws that could impact the proposal.

The following by-laws protect trees in the City of Toronto:

- **Street Tree By-law**, City of Toronto Municipal Code Chapter 813, Article II, protects all trees situated on City streets.
- **Private Tree By-law**, Article III, Chapter 813 of the City of Toronto Municipal Code protects trees on private property with diameter of 30cm or more and trees of any diameter that were planted as a condition of a permit issued under this bylaw or a site plan agreement.
- The **Ravine & Natural Feature Protection By-law**, Chapter 658 of the City of Toronto Municipal Code prohibits and regulates the injury and destruction of trees, as well as filling, grading and dumping within designated areas of the City. There is no minimum diameter for a tree to qualify for protection under the Ravine and Natural Feature Protection By-law. Trees of any size located in the designated areas qualify for protection.
- The **Parks By-law**, Municipal Code Chapter 608, Article VII protects all trees located in a City park.

All above noted by-laws are implemented by Urban Forestry under the authority of the General Manager, Parks, Forestry and Recreation. City of Toronto's tree protection by-laws can be found at www.toronto.ca/trees.

Types of Tree Damage

Physical injury to the trunk, crown and roots of a tree will occur if construction equipment is permitted close to trees or if structures are built into the growing space of a tree. Inappropriate pruning may also result in tree injury. Physical injuries are permanent and can be fatal.

[1] Arborist – An expert in the care and maintenance of trees including an arborist qualified by the Ontario Training and Adjustment Board Apprenticeship and Client Services Branch, a certified arborist qualified by the International Society of Arboriculture, a consulting arborist registered with the American Society of Consulting Arborists, a registered professional forester or a person with other similar qualifications as approved by the General Manager, Parks, Forestry and Recreation.

Root cutting is another type of physical injury that can significantly impact the health of a tree. The majority of tree roots are found in the upper 30 to 60 cm of soil. Excavation for foundations or utility installation may cut roots if the excavation is too close to trees. Trees can become destabilized and may fall over if anchor roots are severed.

Compaction of the soil in the tree root zone is one of the leading causes of tree decline in Toronto's urban forest. Soil compaction occurs primarily from vehicles and equipment moving across the root zones. Piling or storing materials or debris on top of the root system can also result in soil compaction. Soil compaction causes the pore spaces in the soil, which contains air and water necessary for root growth, to be reduced. Without space available for oxygen and water, tree roots will suffocate and tree decline will follow. With rutting, a form of intense compaction, roots are severed by the tires of equipment. Root destruction can also be caused by changes to the existing grade. Adding soil on top of tree roots can smother them by reducing the amount of oxygen and water they can receive. Only a few centimetres of added soil can have a detrimental impact on tree health.

The structural elements of a tree in an optimal growing environment are shown on Figure 1. This figure illustrates the terms used in this policy.

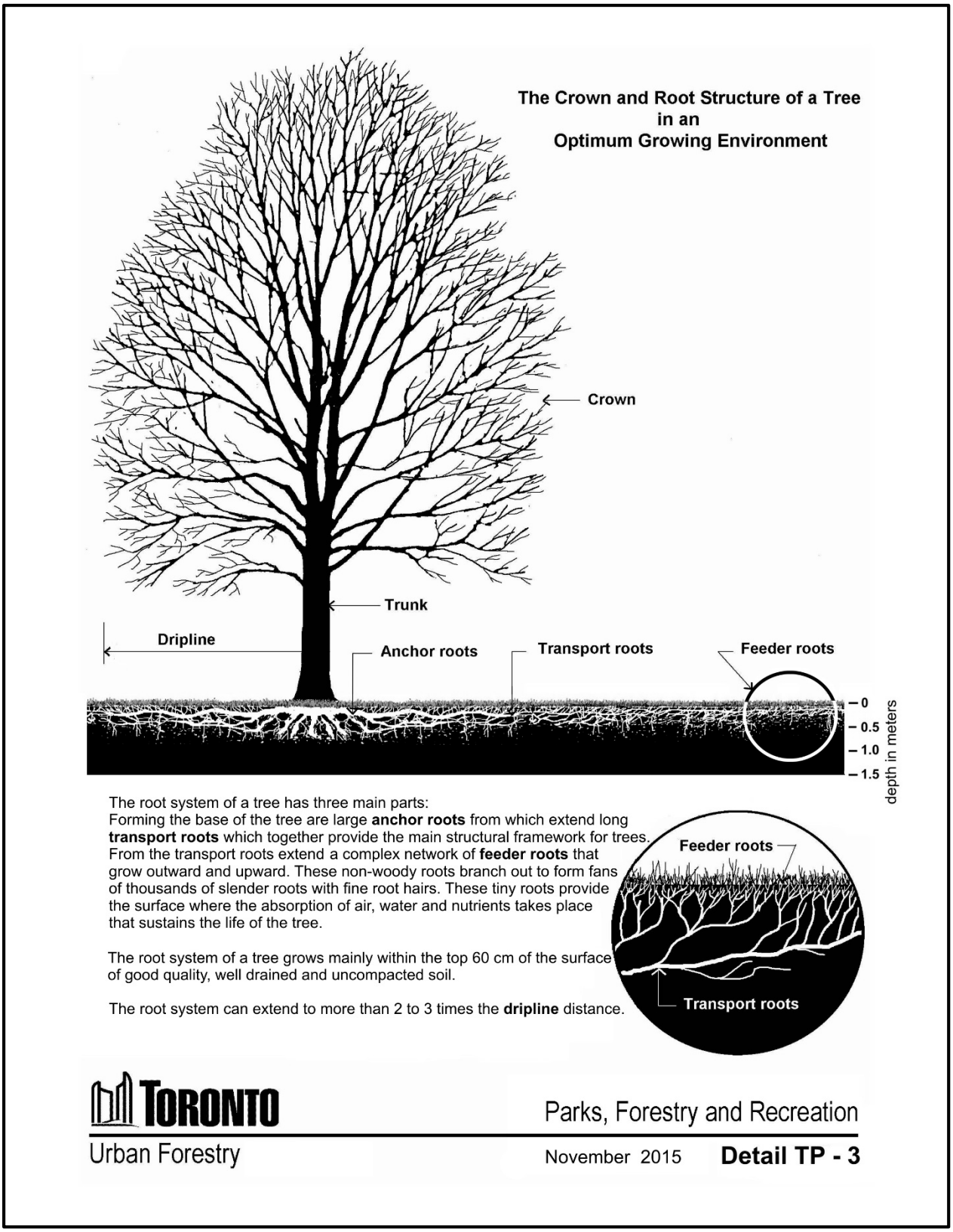


Figure 1: Urban Forestry Detail TP-3

2. Protecting Trees

There are a number of steps that can be taken to protect trees prior to, during and after any construction project. Hiring an arborist should be the first step. An arborist can advise on current tree maintenance requirements and determine the impact the proposal will have on trees and the surrounding natural environment.

An inventory of trees on subject and adjacent properties that may be impacted by the proposed work should be prepared in accordance with the City tree by-laws so that the project can be designed with tree protection in mind. A tree protection plan prepared by an arborist will identify the location, species, size and condition of all trees within the area of consideration, identify the extent of injury where applicable and outline proposed tree protection measures for the trees identified for protection.

The **area of consideration** for trees protected under the Private Tree By-law (Municipal Code, Chapter 813, Article III) includes the entire area of site disturbance, including construction related traffic and material storage, and extends 6m beyond the limit of site disturbance. For trees protected under Ravine and Natural Feature Protection By-law (Municipal Code, Chapter 658), the area of consideration includes the area of site disturbance and 12m area beyond.

The following chart provides the required distances for determining a **minimum tree protection zone** (TPZ) for trees located on a City street, in parks and on private property subject to Private Tree By-law and for trees located in areas regulated under the Ravine and Natural Feature Protection By-law. The minimum tree protection zones are based on the diameter of the tree. While these guidelines provide minimum protection distances for the anchor and transport roots of a tree, there can still be significant loss of the feeder roots beyond the established tree protection zone. Feeder roots are responsible for water and nutrient absorption and gas exchange. **For this reason, Urban Forestry may require a TPZ larger than the minimum, depending on the tree and the surrounding environment.**

Trunk Diameter (DBH)[1]	Minimum Protection Distances Required[2] City-owned and Private Trees	Minimum Protection Distances Required Trees in Areas Protected by the Ravine and Natural Feature Protection By-law
		Whichever of the two is greater:
<10cm	1.2 m	The drip line[4] or 1.2 m
10- 29 cm	1.8 m	The drip line or 3.6 m
30[3] – 40 cm	2.4 m	The drip line or 4.8 m
41 – 50 cm	3.0 m	The drip line or 6.0 m
51 – 60 cm	3.6 m	The drip line or 7.2 m
61 – 70cm	4.2 m	The drip line or 8.4 m
71 – 80cm	4.8 m	The drip line or 9.6 m
81 – 90 cm	5.4 m	The drip line or 10.8 m
91 – 100 cm	6.0 m	The drip line or 12.0 m
>100 cm	6 cm protection for each 1 cm diameter	12cm protection for each 1 cm diameter or the drip line[5]

Table 1: Minimum Tree Protection Zone (TPZ) Determination

[1]Diameter at breast height (DBH) measurement of tree stem taken at 1.4 metres (m) above the ground.
[2]MinimumTree Protection Zone distances are to be measured from the outside edge of the tree base.
[3]Diameter (**30** cm) at which trees qualify for protection under the Private Tree By-law.
[4]The drip line is defined as the area beneath the outer most branch tips of a tree.
[5]Converted from ISA Arborists' Certification Study Guide, general guideline for tree protection barriers of 1 foot of diameter from the stem for each inch of stem diameter.

The diagram below shows how the TPZ is determined:

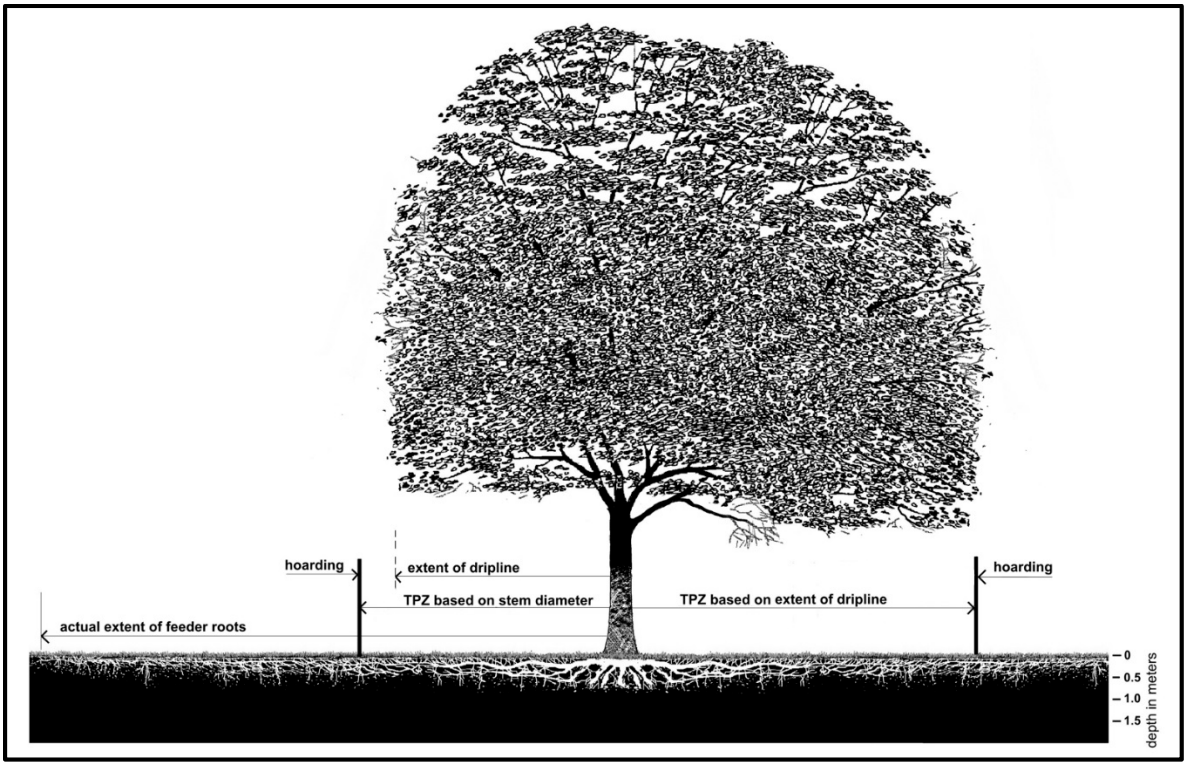


Figure 2: Minimum Tree Protection Zone (TPZ) Determination

In some cases, disturbances in the TPZ may be unavoidable, in which case, the TPZ must be adjusted in consultation with the arborist and Urban Forestry. In these situations, it may be necessary to implement other tree protection measures such as horizontal root protection as noted in section 3 of this document.

In addition to establishing and creating tree protection zones, it may be necessary to implement other protective measures, such as adding mulch to the root zone, aeration of the soil, pruning for deadwood or removing limbs that may be impacted by construction activity. This is also the time to determine the location where new trees can be planted to compliment the construction project and help with the renewal and growth of the urban forest.

Prior to commencing with any excavation, roots approved for pruning by Urban Forestry must first be exposed using pneumatic (air) excavation, by hand digging or by using a low pressure hydraulic (water) excavation. This **exploratory excavation** must be undertaken by an experienced operator under the supervision of a qualified and experienced arborist. The water pressure for hydraulic excavation must be low enough that root bark is not damaged or

removed. This will allow a proper pruning cut and minimize tearing of the roots. The arborist retained to carry out root pruning must contact Urban Forestry no less than three (3) working days prior to conducting any specified work.

Exploratory excavation may also be required for open face cuts outside the minimum tree protection zone (TPZ).

Communication between owners and their designated agents, arborists, contractors and sub-contractors throughout the construction process is critical to ensure that everyone involved is aware of the issues surrounding tree protection, and fully understands the tree protection methodology. Construction damage to trees is often irreversible.

Prohibited Activities Within a TPZ

Except where authorized by Urban Forestry, any activity which could result in injury or destruction of a protected tree or natural feature, or alteration of grade within a Ravine and Natural Feature Protection (RNFP) area, is prohibited within a TPZ, including, but not limited to, any of the following examples:

- demolition, construction, replacement or alteration of permanent or temporary buildings or structures, parking pads, driveways, sidewalks, walkways, paths, trails, dog runs, pools, retaining walls, patios, decks, terraces, sheds or raised gardens
- installation of large stones or boulders
- altering grade by adding or removing soil or fill, excavating, trenching, topsoil or fill scraping, compacting soil or fill, dumping or disturbance of any kind
- storage of construction materials, equipment, wood, branches, leaves, soil or fill, construction waste or debris of any sort
- application, discharge or disposal of any substance or chemical that may adversely affect the health of a tree e.g. concrete sluice, gas, oil, paint, pool water or backwash water from a swimming pool
- causing or allowing water or discharge, to flow over slopes or through natural areas
- access, parking or movement of vehicles, equipment or pedestrians
- cutting, breaking, tearing, crushing, exposing or stripping tree's roots, trunk and branches.
- nailing or stapling into a tree, including attachment of fences, electrical wires or signs
- stringing of cables or installing lights on trees
- soil remediation, removal of contaminated fill
- excavating for directional or micro-tunnelling and boring entering shafts

The above mentioned prohibitions are for area(s) designated as a TPZ. If possible, these prohibitions should also be implemented outside the TPZ in areas where tree roots are located. The roots of a tree can extend from the trunk to approximately 2-3 times the distance of the dripline.

3. Tree and Site Protection Measures

The following are examples of specific tree and site protection measures that may be required by Urban Forestry:

- Plywood tree protection hoarding (minimum 19mm or ¾"), or equivalent barriers, as approved by Urban Forestry, shall be installed in locations as detailed in an Urban Forestry approved Tree Protection Plan. Tree protection barriers must be made of 2.4m (8ft) high plywood hoarding or equivalent as approved by Urban Forestry. Height of hoarding may be less than 2.4m (8ft), to accommodate tree branches that may be lower, or as approved by Urban Forestry. Within a City road allowance where visibility is a consideration, 1.2m (4ft) high orange plastic web snow fencing on a 38 x 89mm (2"x 4") frame should be used. The detail on tree protection barrier construction is shown on Figure 4 in section 7 of this document
- In specific situations where the required full minimum tree protection zone (TPZ) cannot be provided, a **horizontal** (on grade) **root protection**, designed by a qualified professional such as arborist or landscape architect, may be considered, subject to approval by Urban Forestry. Urban Forestry's objective is zero soil compaction within the tree protection zone, therefore best efforts must be made to achieve this objective using materials and best practices available that minimize the vertical loading and spread the loading horizontally.
- Any area designated for stockpiling of excavated soil must be outside of TPZs and be enclosed with sediment control fencing. Sediment control fencing shall be installed in the locations as indicated in an Urban Forestry approved Tree Protection Plan. The sediment control fencing must be installed to Ontario Provincial Standards (OPSD-219.130 – see Section 7, Figure 5) and to the satisfaction of Urban Forestry. When feasible, the sediment control fencing can be attached to the tree protection barrier as shown in Figure 6. Sediment control fencing near trees shall be constructed as per detail shown on Figure 6 of this document

4. Tree Protection Signage

Figure 3: Tree Protection Sign

A sign that is similar to the illustration above may be required to be mounted on all sides of a tree protection barrier for trees protected by the Street Tree By-law and the Private Tree By-law. The sign should be a minimum of 40cm x 60cm and made of white corrugated plastic board or equivalent material. The sign may also be acquired from Urban Forestry Tree Protection and Plan Review (TPPR) district service counters.

5. Tree Protection Plan

All construction related applications must include a Tree Protection Plan that shows details of tree protection, prepared in conjunction with an arborist report or in consultation with an arborist, when protected trees are in proximity to the proposed work. All Tree Protection Plans must be legible, prepared at a usable metric scale and include the following information:

- Show all existing buildings, structures, hard surfaces and all existing trees within the area of consideration (as defined in Section 2 of this document). Depending on the extent of site disturbance, trees on neighbouring properties may need to be included. Note that area of disturbance must include all areas that will be disturbed by the proposed work, including the areas required for over-dig, stockpiling, construction traffic, vehicular access and construction staging
- The extent of the crown (drip line) or the extent of minimum tree protection zone TPZ (whichever is greater) of each existing tree
- Proposed changes on site, including all proposed structures, services, hard surfaces and grade changes
- Indicate vehicular access and construction staging areas. Areas proposed for temporary stockpiling of fill or excavated material shall be fenced with sediment control to prevent sediment runoff
- Indicate location of any excavation that requires root pruning
- Indicate trees proposed to be removed and/or injured
- Highlight and label tree protection barriers and the proposed tree protection zones. (See Table 1 to determine size of tree protection zone. Distances are to be measured from base of tree)
- The extent of proposed tree injury, where applicable.
- Include a comprehensive legend

See Section 6, Tree Protection Plan Notes, and Section 7, Tree Protection Plan Details, for further information.

6. Tree Protection Plan Notes

The following notes are to be included on tree protection plans submitted for construction related applications:

General Notes

- It is the applicants' responsibility to discuss potential impacts to trees located near or wholly on adjacent properties or on shared boundary lines with their neighbours. Should such trees be injured to the point of instability or death the applicant may be held

responsible through civil action. The applicant would also be required to replace such trees to the satisfaction of Urban Forestry

- Tree protection barriers shall be installed to standards as detailed in this document and to the satisfaction of Urban Forestry
- Tree protection barriers must be installed using plywood clad hoarding (minimum 19mm or ¾" thick) or an equivalent approved by Urban Forestry
- Where required, signs as specified in Section 4, Tree Protection Signage must be attached to all sides of the barrier
- Prior to the commencement of any site activity such as site alteration, demolition or construction, the tree protection measures specified on this plan must be installed to the satisfaction of Urban Forestry
- Once all tree/site protection measures have been installed, Urban Forestry staff must be contacted to arrange for an inspection of the site and approval of the tree/site protection requirements. Photographs that clearly show the installed tree/site protection shall be provided for Urban Forestry review
- Where changes to the location of the approved TPZ or sediment control or where temporary access to the TPZ is proposed, Urban Forestry must be contacted to obtain approval prior to alteration
- Tree protection barriers must remain in place and in good condition during demolition, construction and/or site disturbance, including landscaping, and must not be altered, moved or removed until authorized by Urban Forestry
- No construction activities including grade changes, surface treatments or excavation of any kind are permitted within the area identified on the Tree Protection Plan or Site Plan as a minimum tree protection zone (TPZ). No root cutting is permitted. No storage of materials or fill is permitted within the TPZ. No movement or storage of vehicles or equipment is permitted within the TPZ. The area(s) identified as a TPZ must be protected and remain undisturbed at all times
- All additional tree protection or preservation requirements, above and beyond the installation of tree protection barriers, must be undertaken or implemented as detailed in the Urban Forestry approved arborist report and/or the approved tree protection plan and to the satisfaction of Urban Forestry
- If the minimum tree protection zone (TPZ) must be reduced to facilitate construction access, the tree protection barriers must be maintained at a lesser distance and the exposed portion of TPZ must be protected using a horizontal root protection method approved by Urban Forestry
- Any roots or branches indicated on this plan which require pruning, as approved by Urban Forestry, must be pruned by an arborist. All pruning of tree roots and branches must be in accordance with good arboricultural practice. Roots that have received approval from Urban Forestry to be pruned must first be exposed using pneumatic (air) excavation, by hand digging or by a using low pressure hydraulic (water) excavation. The water pressure for hydraulic excavation must be low enough that root bark is not damaged or removed. This will allow a proper pruning cut and minimize tearing of the roots. The arborist retained to carry out crown or root pruning must contact Urban Forestry no less than three working days prior to conducting any specified work
- The applicant/owner shall protect all by-law regulated trees in the area of consideration that have not been approved for removal throughout development works to the satisfaction of Urban Forestry

- Convictions of offences respecting the regulations in the Street Tree By-law and Private Tree By-law are subject to fines. A person convicted of an offence under these by-laws is liable to a minimum fine of $500 and a maximum fine of $100,000 per tree, and /or a Special Fine of $100,000. The landowner may be ordered by the City to stop the contravening activity or ordered to undertake work to correct the contravention
- Prior to site disturbance the owner must confirm that no migratory birds are making use of the site for nesting. The owner must ensure that the works are in conformance with the Migratory Bird Convention Act and that no migratory bird nests will be impacted by the proposed work

The following additional notes shall be added on plans for properties regulated by the Ravine and Natural Feature Protection Bylaw:

- Ravine and Natural Feature Protection By-law (RNFP) note:

Ravine & Natural Feature Protection By-law

The Ravine & Natural Feature Protection By-law, Chapter 658 of the City of Toronto Municipal Code, regulates the injury and destruction of trees, dumping of refuse and changes to grade within protected areas.
Under this by-law protected trees may not be removed, injured or destroyed, and protected grades may not be altered, without written authorisation from Urban Forestry Ravine & Natural Feature Protection, on behalf of the General Manager of Parks, Forestry & Recreation.
Convictions of offences respecting the regulations in the Ravine and Natural Feature Protection By-law are subject to fines, and the landowner may be ordered by the court to restore the area to the satisfaction of the City. A person convicted of an offence under this Bylaw is liable to a minimum fine of $500 and a maximum fine of $100,000 for each tree destroyed, a maximum fine of $100,000 for any other offence committed under this chapter, and /or a Special Fine of $100,000. A person convicted of a continuing offence, including failure to comply with ravine permit conditions is liable to a maximum fine of not more than $10,000 for each day or a part of a day that the offence continues.

- The exact location of the limit of the RNFP area must be shown on all pertinent plans including Tree Protection Plan. The applicant/owner shall have this limit marked on their survey or other plans drawn to a suitable scale. This service costs $72.37 plus tax and can be requested by contacting the City of Toronto, Information and Technology, Geospatial Competency Centre, Map Service Counter at 416-392-2506 or mapsales@toronto.ca. This line may then be transferred onto other plans to be submitted.
- Sediment control fencing shall be installed in the locations as indicated in the Urban Forestry approved sediment control plan. The sediment control fencing must be installed to Ontario Provincial Standards (OPSD-219.130, see Section 7, Figure 5) and to the satisfaction of Urban Forestry. Sediment control near trees and over root zones shall be installed as shown on Figure 6 of this document and to the satisfaction of Urban Forestry.

7. Tree Protection Plan Details

The following diagrams provide details for tree protection barriers and sediment protection barriers:

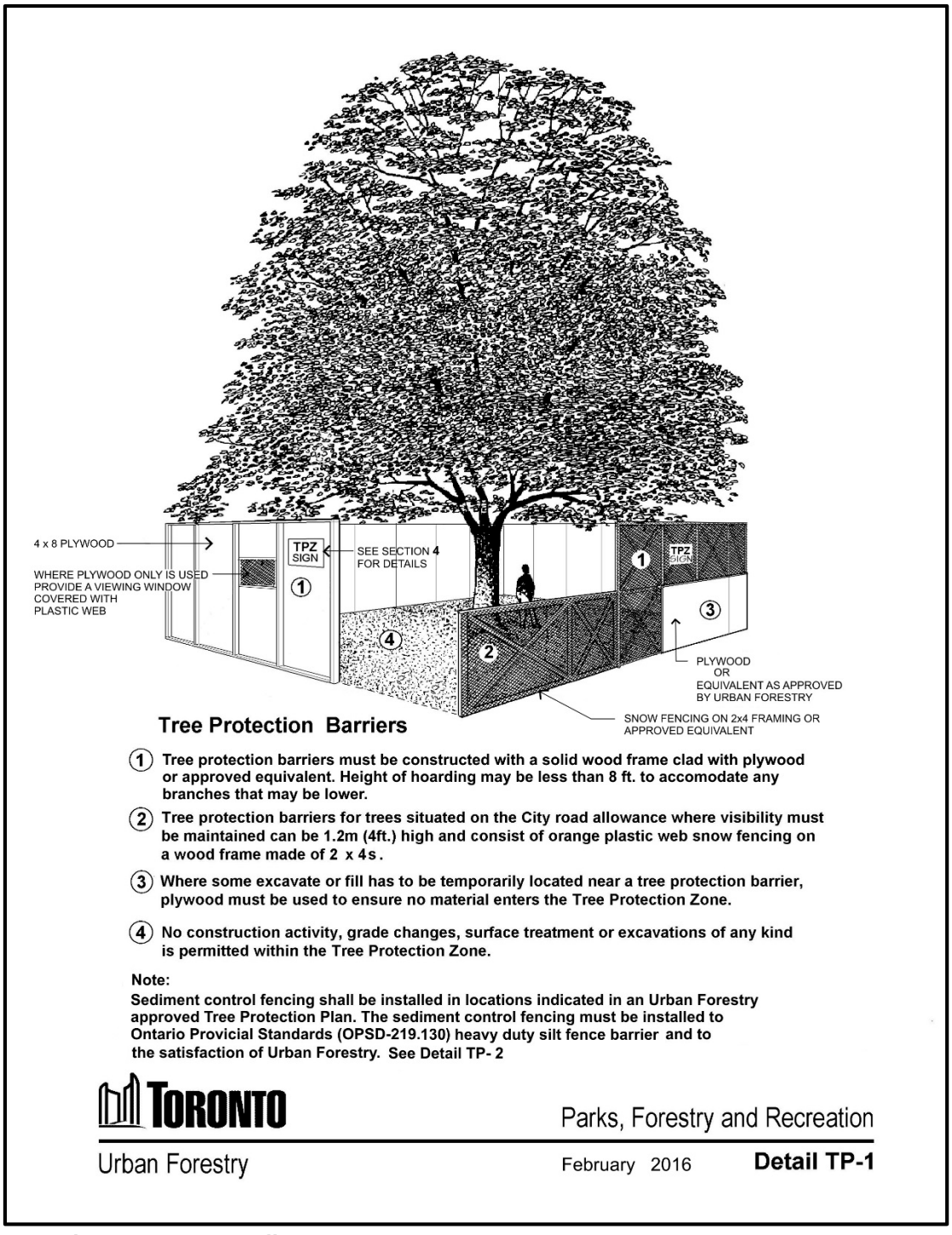


Figure 4: Urban Forestry Detail TP-1

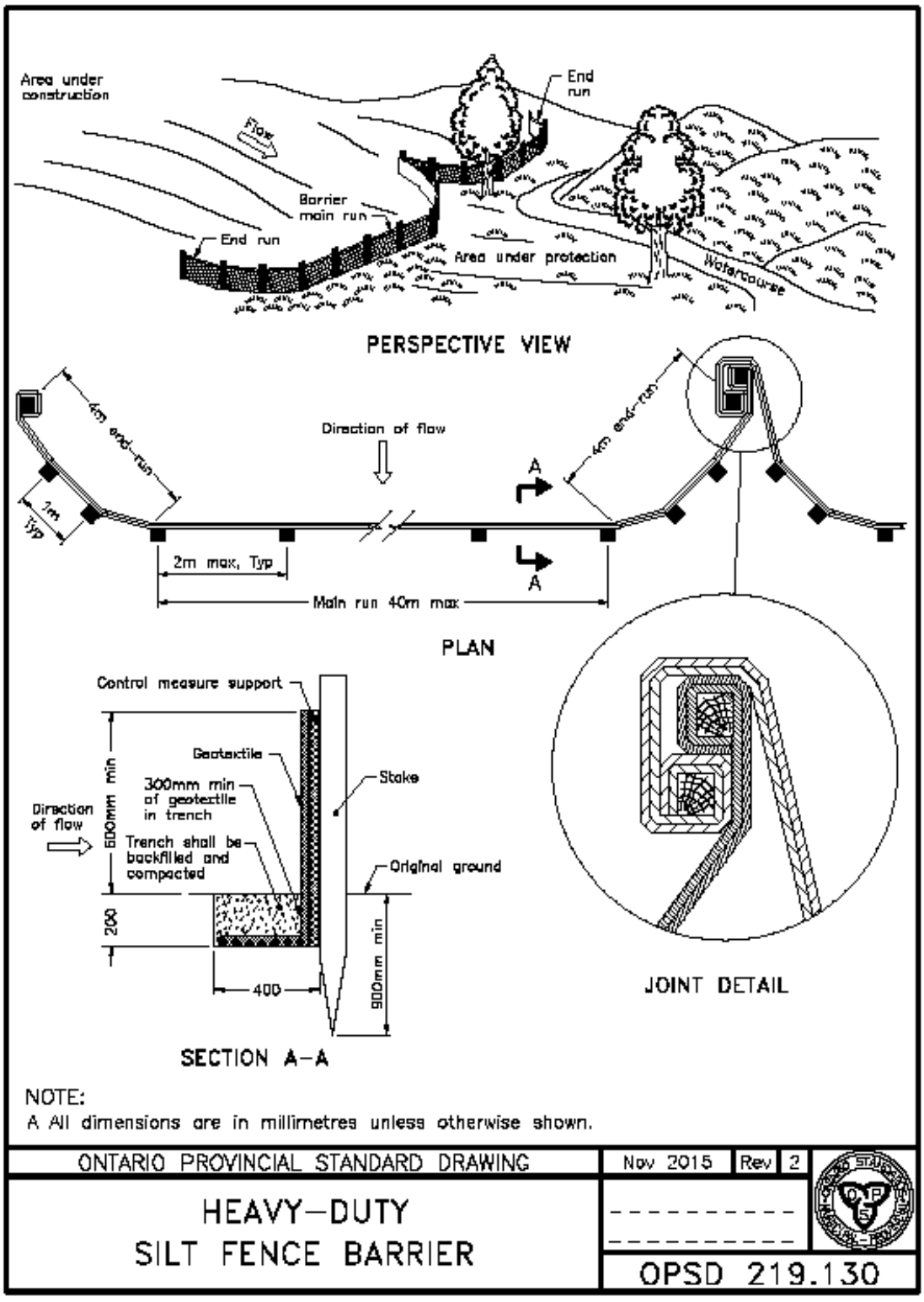


Figure 5: OPSD Detail for Heavy Duty Silt Fence Barrier

The following detail shall be used when constructing sediment protection fencing near trees.

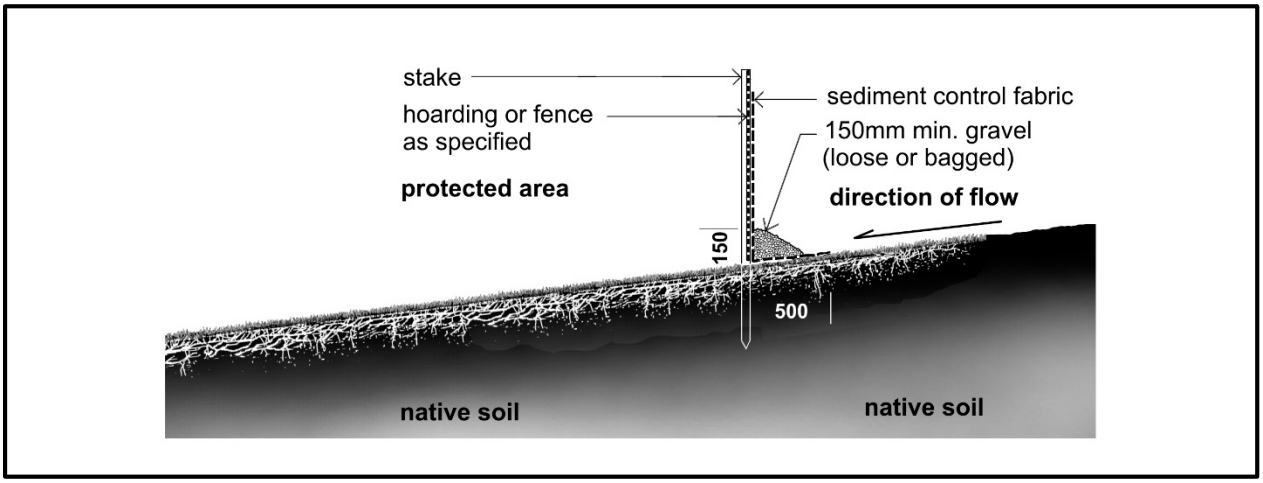


Figure 6: Sediment control barriers for use over tree root zone

8. Permits for Tree Removal or Injury

If the full minimum tree protection zone (TPZ) as identified in Section 2 cannot be provided, a permit to injure the tree must be obtained.

Any requests for removal or injury of a tree protected by City by-laws must be made on the appropriate application forms and submitted to Urban Forestry at the appropriate address. Permit application forms are available at www.toronto.ca/trees. Any requests for tree relocation will be considered as a tree injury.

If approval is granted for removal of a City-owned tree, applicants will assume all costs involved, which include appraised tree value, removal, and tree replacement costs. If approval is granted for removal of private trees or trees in ravine and natural feature protected areas, the permit will be subject to conditions, including tree replacement. If approval is granted for injury of City-owned, private trees or trees in ravine and natural feature protected areas, the permit will be subject to conditions, including implementation of a Tree Protection Plan, as determined by Urban Forestry.

In some instances, where the tree is healthy and the management of the tree or forest cover has not been addressed to the satisfaction of Urban Forestry, requests received by Urban Forestry may be forwarded to a Community Council and City Council for approval.

Urban Forestry does not have the authority to issue a permit to injure or remove a heritage tree[2]. Such requests would be forwarded to a Community Council and/or City Council for approval.

Butternut (*Juglans cinerea, L.*) is an endangered species. Butternuts and their habitat are protected under Endangered Species Act (S.O. 2007, c.6) available on the Government of Ontario website at http://www.ontario.ca/laws/statute/07e06/v1. A permit to injure or remove a butternut tree must be obtained from the Ministry of Natural Resources and Forestry Ontario.

[2] Heritage Tree – A tree that has been designated under Part IV of the Ontario Heritage Act or trees recognized as heritage trees by the Ontario Heritage Tree Program of Trees Ontario.

Any person who contravenes any provision of the City's tree protection by-law is guilty of an offence.

More information on tree protection and permit application forms for tree removal and injury are available on Urban Forestry web page at www.toronto.ca/trees.

For additional information regarding the removal or injury of trees protected under City by-laws, please call 311.

9. Tree Guarantee Deposits

Tree Protection Guarantee

Urban Forestry may request a **tree protection guarantee** to secure the protection of trees that may be impacted by work on city streets, or to secure the satisfaction of all conditions of permit issuance. Tree protection guarantees held by the City shall only be released by the City provided that all construction activities are complete, compliance with all permit terms and conditions has been verified, there has been no encroachment into the minimum tree protection zone (TPZ) and the trees are healthy and in a state of vigorous growth.

Where Urban Forestry has confirmed an unauthorized encroachment into the TPZ or the terms and conditions of a permit have not been complied with, Urban Forestry will retain the guarantee until satisfactory compliance.

It is the applicant's responsibility to submit a written request to Urban Forestry for the refund of the tree protection guarantee deposit as soon as construction and landscaping is completed.

Tree Planting Security

Urban Forestry may request a **tree planting security deposit** in an amount equal to the cost of planting and maintenance for two (2) years in order to ensure compliance with approved landscape or replanting plans. The security deposit may be held by the City after the planting of the trees for a period of two (2) years and shall be released by the City provided that the trees have been maintained, are healthy and in a state of vigorous growth upon inspection, two (2) years after planting. It is the applicant's responsibility to advise Urban Forestry that trees have been planted in accordance with approved plans, in order that the two (2) year maintenance period begin.

Prior to release by the City, any dead/dying trees must be replaced, deadwood and sucker growth should be pruned, and mulch should be topped up where necessary. If stakes and ties were used, they must be removed within one (1) year. Any encroachments are to be removed prior to assumption, including walkways, timbers or bricks that result in increased height of soil or mulch around the trees, and lights in trees.

It is the applicant's responsibility to submit a written request to Urban Forestry for the refund of a Tree Guarantee Deposit, two (2) years after the completion of all construction activity and/or two (2) years after tree planting. This request should be made during the growing season, not while

the trees are dormant, so that a site inspection can be arranged to confirm the trees are acceptable. The City will not release security deposits where trees are not in good condition, or if there are encroachments.

Financial securities must be in the form of a certified cheque, letter of credit or an alternative acceptable to Urban Forestry, with amounts payable to the Treasurer, City of Toronto.

10. Emergency Repairs to Utilities

The utility company is responsible for notifying Urban Forestry by calling 311 as soon as possible when by-law regulated trees are involved, so that an inspector can be dispatched. Urban Forestry staff may be contacted after hours by calling 311, and requesting the assistance of an on-call Urban Forestry inspector.

11. Tree Species that are Intolerant of Construction Disturbance

The following tree species are intolerant of construction disturbance, and tree protection plans must take this into account. The tree protection zones required by these species may need to be quite extensive to avoid damage to the roots and crown associated with compaction, excavation or construction above grade that will impact the branches.

Acer rubrum (red maple)
Acer saccharum (sugar maple)
Betula papyrifera (paper birch)
Carya glabra (pignut hickory)
Fagus grandifolia (American beech)
Liriodendron tulipifera (tulip tree)
Ostrya virginiana (ironwood)
Pinus resinosa (red pine)
Pinus strobus (white pine)
Prunus serotina (black cherry)
Quercus alba (white oak)
Quercus velutina (black oak)
Tsuga canadensis (eastern hemlock)
Tilia americana (basswood)

12. Contact Information

Tree Protection and Plan Review (City-owned and Private Trees)

North York District
5100 Yonge Street, 3rd Floor
Toronto, ON, M2N 5V7
Telephone: 416-395-6670
Fax: 416-395-7886
tpprnorth@toronto.ca

Etobicoke York District
399 The West Mall, Main Floor, North Block
Toronto, ON, M9C 2Y2
Telephone: 416-338-6596
Fax: 416-394-8935
tpprwest@toronto.ca

Scarborough District
150 Borough Drive, 5th Floor
Toronto, ON, M1P 4N7
Telephone: 416-338-5566
Fax: 416-396-4170
tppreast@toronto.ca

Toronto and East York District
50 Booth Avenue, 2nd Floor
Toronto, ON, M4M 2M2
Telephone: 416-392-7391
Fax: 416-392-7277
tpprsouth@toronto.ca

Ravine and Natural Feature Protection

General Enquiries
Telephone: 416-392-2513
Fax: 416-392-1915
Email: rnfp@toronto.ca

Office Location
18 Dyas Road, 1st Floor
Toronto, ON, M3B 1V5

Areas regulated under Ravine and Natural Feature Protection By-law can be viewed using the City's mapping tool available at www.toronto.ca/trees.

Exterior Restoration Photographs and Descriptions: Refer to Elevation Drawings A4.00 and A4.01

E01 – Replace tongue and groove slatted wood soffit boards moisture damaged and metal screen patch. Replace tongue and groove slatted wood soffit boards rotted at intersection with wood siding wall. Custom mill tongue and groove boards to match existing.
Strip paint from existing soffit boards to bear wood, prime and paint, typical for all soffits.

E02 – Horizontal wood siding – 2 lowest boards green moss buildup for full length. Mitered outside corner and interior corners rotting. Boards to be replaced. Replace wood skirt board white paint in poor condition. Board profiles to match existing. Prime and paint new boards to match existing. Window opening masonry sill below grade; path for moisture infiltration.

Remove existing window and infill opening with existing salvaged brick. Set brick infill in 25mm from adjacent face brick to form shadow line.

E03 – At masonry foundation wall replace damaged brick corner at grade. Affected area to be repointed.

E04 – Most mass timber columns on perimeter of west veranda all appear to be in good condition. Remove any peeling paint, prime and repaint. One column appears to be settling (refer to bubbled area on elevation). Further investigation of pier and footing condition will be conducted in a future phase. Typical painting note applies also to east veranda.

E05 – Horizontal wood siding – lowest board near grade has moisture damage for full length. Inside and outside corners in poorest condition. Replace all rotten boards, match existing profile, prime and paint.

E06 – Wood frame windows in fair condition. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing

wood frames to be restored as required where cracked or deteriorated, re-puttied, weather-stripped, caulked and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Flashing above top wood trim piece to be replaced if in poor condition. Original metal flashing
was copper. Prime, paint and caulk perimeter of windows. Notes are typical for all exterior wood windows and doors.

E07 –The primary entrance has been lowered to be accessible. Make good existing wood siding boards. Reposition existing wood doors as shown on drawings. Any damaged replacement siding boards to match existing species and profile, prime and paint. Salvage all existing brick for reuse as noted on drawings.

E08 – Reposition existing wood doors as shown on drawings. Existing transom to remain in original position provide new transom between existing transom and existing door as shown on drawings. Refer to note E06 for door and window restoration. Designated Substance Survey identified asbestos in existing window putty, treat accordingly. Add automatic door operators for barrier-free compliance, locate operator to the interior side. Existing astragal can be removed. Existing door hardware to be removed and replaced as per hardware schedule.

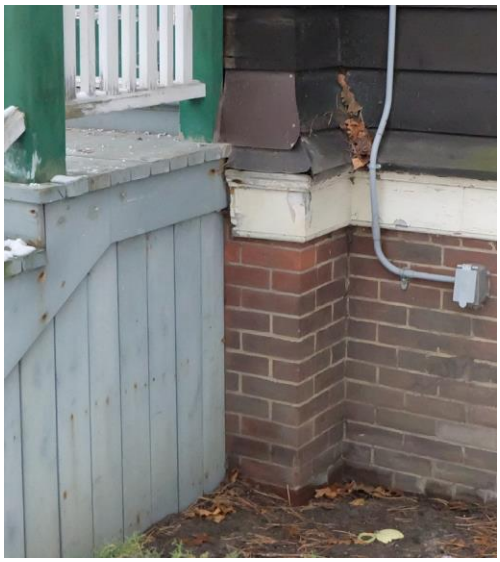
E09A – Existing circular vent grille not per original detailing. Original design is a window and not a vent. Replace vent with a new leaded glass window with wood sash to match original design, refer to original drawings.

E09B – Existing circular vent grille not per original detailing. Original design is a window and not a vent. Replace vent with a new leaded glass window with wood sash to match original design, refer to original drawings.

E09C – Existing circular vent grille not per original detailing. Original design is a window and not a vent. Replace vent with a new leaded glass window with wood sash to match original design, refer to original drawings.

E09D & E44– Existing circular vent grille not per original detailing. Original design is a window and not a vent. Replace vent with a new leaded glass window with wood sash to match original design, refer to original drawings.

E10 – Refer to note E06 for window restoration.

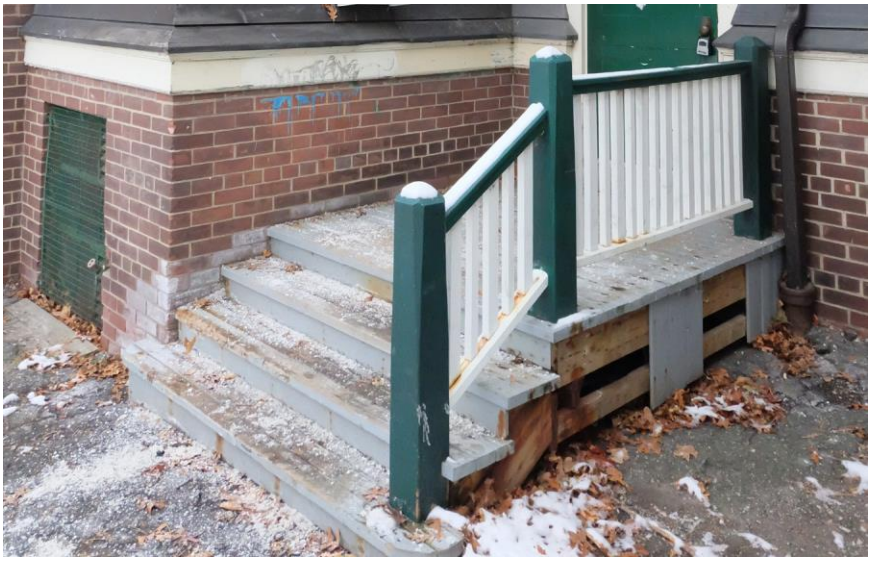


E11 - Horizontal wood siding – 2 lowest boards are moisture damaged. Mitered outside corners rotting, replace skirt board on left hand side of entrance in poor condition. Boards to be replaced. Board profiles to match existing. Prime and paint new boards.

E12 – Replace tongue and groove slatted wood soffit moisture damaged through u-shaped recess. Paint in poor condition. Rotten wood at intersection with wood siding wall. Inside corners in poor condition to be replaced. Existing wood soffit to be restored as required where cracked or deteriorated to be made good and painted. Replace rotten sections of soffit boards. Refer to note E01.

E12 – Replace tongue and groove slatted wood soffit moisture damaged through u-shaped recess. Paint in poor condition. Rotten wood at intersection with wood siding wall. Inside corners in poor condition to be replaced. Existing wood soffit to be restored as required where cracked or deteriorated to be made good and painted. Replace rotten sections of soffit boards. Refer to note E01.

E13 – Existing green wood door in poor condition, restore door, refer to note E06 Door to be replaced. Existing wood door trim in fair condition. Allow for paint stripping, crack-filling, re-caulking, and paint. Prime and paint all remedial work, match existing colour.

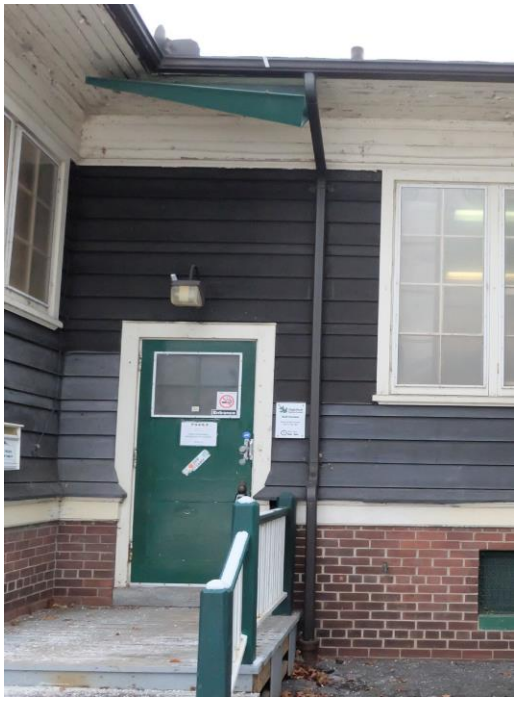


E14 – Existing wood plank stair to be removed. Entire assembly including stair, landing, and handrail to be replaced. Detailing to be adapted to current OBC. Salting of wood stairs has accelerated adjacent brick foundation wall deterioration. Affected brick area to be cleaned and repointed if necessary.

E15 – Window openings with ventilation louvers. Sill below grade for westernmost opening (asphalt surfacing). Windows to be restored. Refer to note E06

E16 - Horizontal wood siding – 2 lowest boards are patched at outside corner. Splintered boards along outside corner to be patched or replaced as needed. All rotten boards are to be replaced. Board species and profiles to match existing. Prime and paint.


E17 – Wood frame windows in fair condition. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames to be restored as required where cracked or deteriorated, re-puttied, weather-stripped, caulked and painted. Note – Designated
Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Refer to note E06.



E18 – Snow dam at inside corner of roof overhang leading to improvised metal trough fastened to soffit to divert water away from entrance with new eave trough to match existing. Downspout connects to below grade storm drain to remain.

E19 – Brick damage at existing hose bib. Replace damaged brick with existing salvaged brick. Affected area to be repointed.

E20 – Incoming electrical service drop. New electric meter

E21 – Make good brick at removed redundant PVC venting for gas furnace through brick foundation.

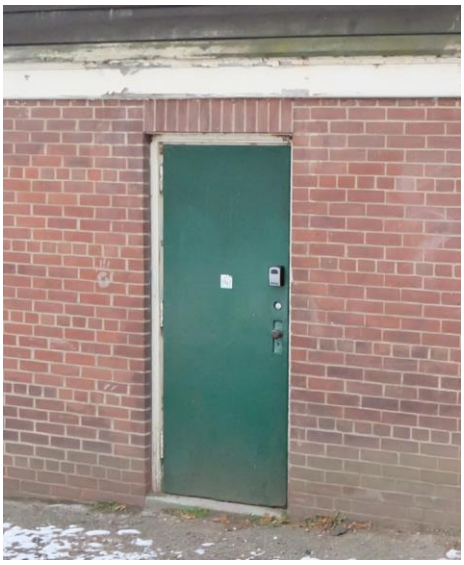
E22 – Downspout outlet close to building face at asphalt grade. Grade depressed at outlet, sloped toward building. Some moisture damage on brick foundation wall due to grade issue. Existing gas meter including metal barrier removed. Make good existing brick with salvaged brick.

E23 – Repointing of brick masonry near top of chimney required 15 courses.

E24 – Horizontal wood siding – 2 lowest boards are moisture damaged. Splintered boards along outside corner to be replaced for full heights. Board species and profile to match existing. Prime and paint.

E25 – Existing wood plank stair, wood guardrails are past their service life and should be replaced. Match existing design on original drawings.

E26 – Restore existing green wood doors in worn condition but salvageable. Framed acrylic sheets fastened over divided lite door glazing on exterior side. If doors reused, acrylic sheets to be removed. Obsolete hardware to be replaced. Existing wood door trim, divided lite transom window, wood cornice in fair condition. Allow for paint stripping, crack-filling, re-caulking, and paint. Allow for re-sealing of transom window panes. Refer to note E06.




E27 – Existing metal storage room door and frame in poor condition - to be removed and replaced. Prime and paint.

E28 – Horizontal wood siding – 2 lowest boards are moisture damaged. Splintered boards along outside corner to be replaced for full heights. Skirt board below siding appears to be moisture damaged. Boards to be replaced. Board species and profile to match existing. Prime and paint.

E29 – Horizontal wood siding boards that are in contact with eavestrough are moisture damaged and are to be replaced. . Board species and profile to match existing. Prime and paint.
Restore wood frame windows in fair condition. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-caulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Refer to note E06.

E30 – Open and restore existing windows into Women's Toilet (not in use) covered with plywood from exterior. Windows not visible from exterior. As viewed from interior, window in fair condition. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-caulked, and painted. Designated Substance

Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Refer to note E06. Flashing above top wood trim piece to be replaced if in poor condition. Match original copper flashing.

E31A – Existing wood guard barriers are consistent with original detailing and of no heritage character. Replace with design details from original drawings.
E32A - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

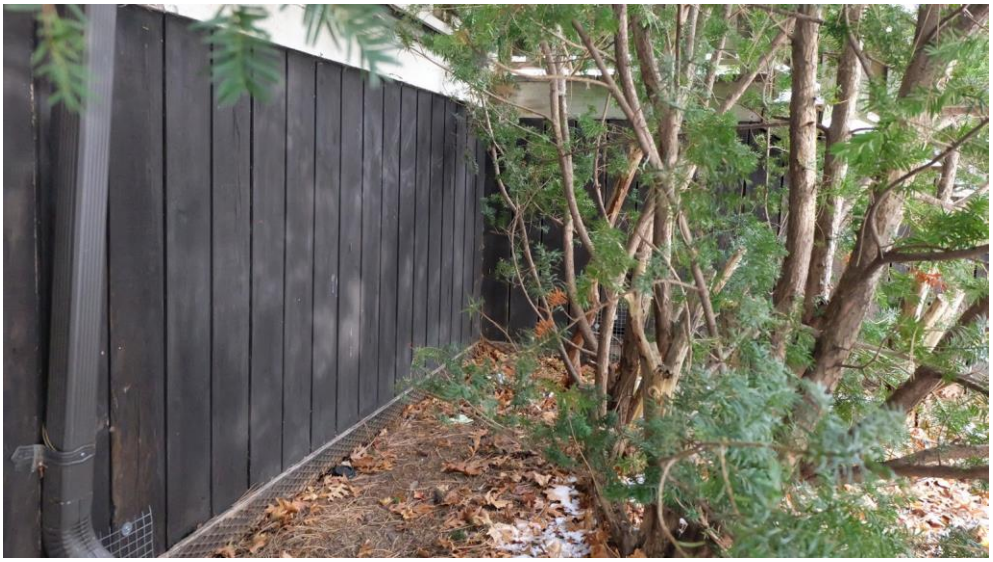
E31B – Existing wood guard barriers are consistent with original detailing and of no heritage character. Replace with design details from original drawings.

E32B - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

E31C – Existing wood guard barriers are consistent with original detailing and of no heritage character. Replace with design details from original drawings.
E32D - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

E32C - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

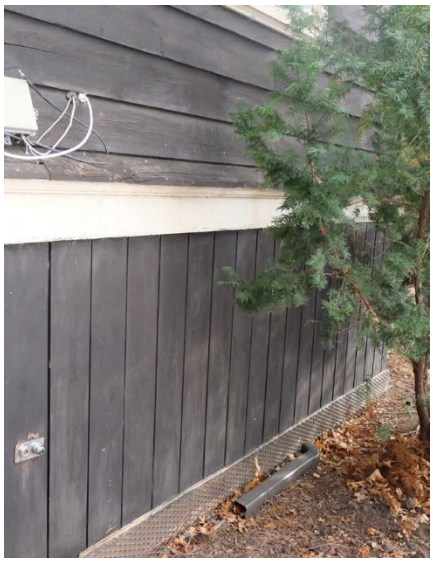
E32E - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.



E32F - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

E32F & E32H- All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

E32F - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.



E32H - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

E32G - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.

E34B – Existing wood guard barrier around west veranda has peeling paint but salvageable. Detailing per original design. Some pickets are newer but have no paint finish. Existing finish to

be stripped, crack-filled, and the whole is to be primed and repainted. Any rotten wood to be replaced.

E32I - All vertically-oriented wood sheeting cladding on building perimeter in poor condition, to be removed and replaced. Sheeting damaged by weather and wildlife.
E34C – Existing wood guard barrier around west veranda has peeling paint but salvageable. Detailing per original design. Some pickets are newer but have no paint finish. Existing finish to be stripped, crack-filled, and the whole is to be primed and repainted. Any rotten wood to be replaced.

E33 – Restore existing windows into Men's Toilet (not in use) covered with plywood from exterior. Windows not visible from exterior. Washroom will be removed as part of proposed

work. As viewed from interior, window panes broken. Divided lite windows to have panes replaced and re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-caulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Flashing above top wood trim piece to be replaced if in poor condition. Match original metal flashing was copper. Refer to note E06.

E34A – Existing wood guard barrier around west veranda has peeling paint but salvageable. Detailing per original design. Some pickets are newer but have no paint finish. Existing finish to be stripped, crack-filled, and the whole is to be primed and repainted. Any rotten wood to be replaced.

E35 – Horizontal wood siding – moisture damage in area of downspout. Sheet metal patch over section of siding. Whole section to be replaced. Metal flashing along veranda roof to be addressed as part of rework. Wood skirt board below siding in poor condition and is be replaced. Board species and profile to match existing. Prime and paint.

E36 – Existing step to be painted.

E37A – Horizontal wood siding – 2 lowest boards are moisture damaged for extent shown and should be replaced. Existing wood skirt board in poor condition. Board must be removed as part of wood sheeting removal. If removal renders boards unusable, replacement boards to match original detailing.

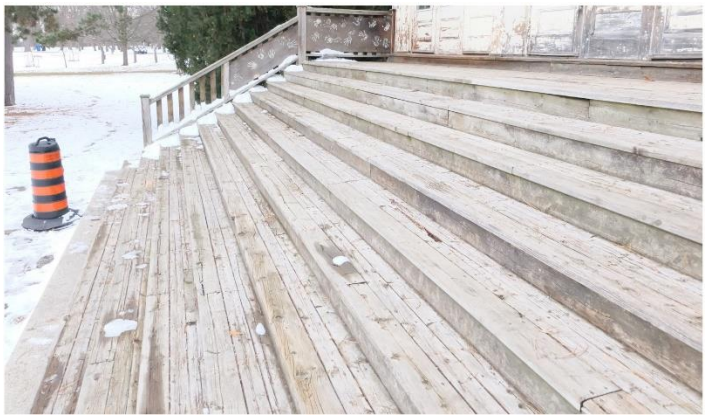
E37B – Horizontal wood siding – 2 lowest boards are moisture damaged for extent shown and should be replaced. Existing wood skirt board in poor condition. Board must be removed as part of wood sheeting removal. If removal renders boards unusable, replacement boards to match original detailing.

E37C – Horizontal wood siding – 2 lowest boards are moisture damaged for extent shown and should be replaced. Existing wood skirt board in poor condition. Board must be removed as part

of wood sheeting removal. If removal renders boards unusable, replacement boards to match original detailing.

E37D – Horizontal wood siding – 2 lowest boards are moisture damaged for extent shown and should be replaced. Existing wood skirt board in poor condition. Board must be removed as part of wood sheeting removal. If removal renders boards unusable, replacement boards to match original detailing.

E38 – Horizontal wood siding – boards at outside corner are in poor condition. Gaps opening around boards. Boards split at corner joint. Boards to be replaced on either side of corner to match existing.



E39 – Existing exterior stair in poor condition. Replace intermediate support beam at grade below stair rotten with pressure treated beam. Prime and paint stair.

E40A – Restore wood frame windows with single-pane divided lite glazing in fair condition. Windowed areas obscured by tree growth. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, recaulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Refer to note E06.

E40B – Restore wood frame windows with single-pane divided lite glazing in fair condition. Windowed areas obscured by tree growth. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, recaulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Refer to note E06.

E40C – Restore wood frame windows with single-pane divided lite glazing in fair condition. Windowed areas obscured by tree growth. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, recaulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Refer to note E06.

E40D – Restore wood frame windows with single-pane divided lite glazing in fair condition. Windowed areas obscured by tree growth. No overt signs of rot. Sill and base of windows have peeling paint. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, recaulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Any rotten boards to be replaced. Refer to note E06.

E41A – Restore wood frame windows and doors with single-pane divided lite glazing appear to be in fair condition. No overt signs of rot on exposed portions. Windowed areas obscured by tree growth. Metal panels cover bottom portion of operable windows on exterior side as a barrier from 1 storey height to grade – not OBC compliant. Original design features wood guards spanning the width of the window bays, to be reinstated. Original design details to be adapted to current OBC. Bottom portion of operable windows not visible due to metal panels. Operable window panels open inward full height, casement-style. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-

caulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Replace rotten boards. Refer to note E06.

E41C – Restore wood frame windows and doors with single-pane divided lite glazing appear to be in fair condition. No overt signs of rot on exposed portions. Windowed areas obscured by tree growth. Metal panels cover bottom portion of operable windows on exterior side as a barrier from 1 storey height to grade – not OBC compliant. Original design features wood guards spanning the width of the window bays, to be reinstated. Original design details to be adapted to current OBC. Bottom portion of operable windows not visible due to metal panels. Operable window panels open inward full height, casement-style. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-caulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Replace rotten boards. Refer to note E06.

E41B – Restore wood frame windows and doors with single-pane divided lite glazing appear to be in fair condition. No overt signs of rot on exposed portions. Windowed areas obscured by tree growth. Metal panels cover bottom portion of operable windows on exterior side as a barrier from 1 storey height to grade – not OBC compliant. Original design features wood guards spanning the width of the window bays, to be reinstated. Original design details to be adapted to current OBC. Bottom portion of operable windows not visible due to metal panels. Operable window panels open inward full height, casement-style. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-caulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Replace rotten boards. Refer to note E06.

E41D – Restore wood frame windows and doors with single-pane divided lite glazing appear to be in fair condition. No overt signs of rot on exposed portions. Windowed areas obscured by tree growth. Metal panels cover bottom portion of operable windows on exterior side as a barrier from 1 storey height to grade – not OBC compliant. Original design features wood guards spanning the width of the window bays, to be reinstated. Original design details to be adapted to current OBC. Bottom portion of operable windows not visible due to metal panels. Operable window panels open inward full height, casement-style. Divided lite windows to be re-sealed to minimize air leakage at minimum. Existing wood frames and trim to be stripped, crack-filled, re-caulked, and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Replace rotten boards. Refer to note E06.

E42 – Existing wood doors and fixed wood panels in poor condition. Exterior facing wood cladding over columns, octagonal in shape, may be salvageable. Octagonal boxes that clad around metal columns to be insulated from interior side as part of energy retrofit. Wood to be restored as required where cracked or deteriorated, re-puttied, weather-stripped, caulked and painted. Designated Substance Survey identified asbestos in existing window putty. Treat accordingly. Refer to note E06.

E43– Remove metal panel over siding in behind downspout. Replace damaged boards. Board species and profile to match existing. Prime and paint.

E45 – Metal panel over siding in behind downspout. Replace damaged boards. Board species and profile to match existing. Prime and paint.

ORBITENGINEERING
Consulting Engineers

HYDROGEOLOGICAL INVESTIGATION

Proposed New High Park Visitor and Nature Centre

375 COLBORNE LODGE DRIVE, TORONTO, ON

Prepared for:

City of Toronto

By:

Orbit Engineering Limited

Project No. OE231465DG

April 4, 2023

Orbit Engineering Limited
9-1900 Clark Boulevard Brampton ON L6T 0E9
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Parks, Forestry & Recreation, Parks Development & Capital Projects
Etobicoke Civic Centre,
399 The West Mall, 2nd Floor,
Toronto, Ontario, M9C 2Y2
Email :John.Keen@toronto.ca

Attention: John Keen, Project Manager

Dear Mr. Keen,

RE:

HYDROGEOLOGICAL INVESTIGATION
Proposed New High Park Visitor and Nature Centre
375 Colborne Lodge Drive, Toronto, ON

Enclosed please find the Hydrogeological Investigation report related to the above noted site.

For and on behalf of Orbit Engineering Limited,

Hafiz Muneeb Ahmad, M.Sc., M.Eng., P.Eng. QP_{ESA}
Senior Principal Engineer
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LIST OF ACRONYMS AND DEFINITIONS

BH	Borehole
EASR	Environmental Activity and Sector Registry
K	Hydraulic Conductivity
mbgs	Metres Below Ground Surface
MOECC	Ontario Ministry of the Environment and Climate Change
ORCA	Otonabee Region Conservation Authority
O.Reg.903	Ontario's Wells Regulation
PTTW	Permit to Take Water
PHCs	Petroleum Hydrocarbons
VOCs	Volatile Organic Compounds
PAHs	Polycyclic Aromatic Hydrocarbons
WWIS	Water Well Information System
WWR	Water Well Records

1 INTRODUCTION

1.1 General

Orbit Engineering Limited (Orbit) was retained by City of Toronto (the Client) to complete a Hydrogeological Investigation to evaluate the existing site conditions for the proposed building addition to the existing High Park Visitor and Nature Centre. The project site is located at 375 Colborne Lodge, Toronto, Ontario. The approximate Project site location plan and approximate location of boreholes are shown on **Drawings 1 and 2.**

This work was conducted initially in accordance with Blanket Order Contract# 47024684, our proposal OE231465DG, dated January 19, 2023, under the Purchase Order # 9520273 by the City of Toronto. The award letter E-mail was issued to Orbit on January 23, 2023.

Based on the information provided by the client to Orbit, it is our understanding that the project will undergo significant addition and/or modification to the existing building structure with unfinished basement. The bottom of the existing foundation level is 106.35 m, and the average of ground surface elevation is 107.68 m, approximately. It is out understanding that the bottom elevation of the footings for the proposed addition will match with the existing footing level, which is 106.35 m. The client document provided to Orbit is attached in **Appendix C**.

1.2 Purpose

The purpose of the Hydrogeological Investigation was to characterize the existing hydrogeological conditions at and in the vicinity of the Site, assess the groundwater regime, and provide recommendations for groundwater control/dewatering (if needed) during the construction of the proposed development at the Site by means of seven (7) exploratory boreholes for the proposed development, and to provide associated hydrogeological recommendations for the construction activities. For the Hydrogeological Investigation, five (5) boreholes (BH1/MW to BH5/MW) were converted to monitoring wells to assess groundwater level fluctuations and groundwater quality at the Site.

The hydrogeological investigation was also requested to evaluate the potential impacts on the local groundwater system in the vicinity of the Site as a consequence of the proposed construction activities and to identify appropriate mitigative measures, if and where necessary. This investigation will also act as a guideline in the assessment of the substructure and the perimeter drainage flow (permanent dewatering) if needed. The hydrogeological investigation was performed based on the information and drawings provided to Orbit by the Client (**Appendix C**).

2 METHOD OF INVESTIGATION

2.1 General

This Hydrogeological Investigation began with a review of the previously completed geotechnical report by Orbit (Orbit, 2023) and published information within the Site area, including previously published regional physiographic and geologic mapping from Ontario Geological Survey (OGS). Many of these documents are

referred to throughout various sections of this report and the relevant details can be found in the **References** section following the text of the report.

In particular, the work completed during this Hydrogeological Investigation consisted of the following tasks:

- Reviewing and interpreting of available reports and publicly published data;
- Developing Health and Safety and, the Field Sampling and Analysis Plans for work at the Site;
- Assessing the current Site conditions, areas of interest and to confirm the previous borehole locations;
- Reviewing water well records available from the Ministry of the Environment, Conservation and Parks (MECP);
- Developing the groundwater monitoring wells installed at the Site (if groundwater available in MWs);
- Completion of in-situ hydraulic conductivity tests (slug tests) at five (5) monitoring wells (if groundwater available in MWs);
- Measuring groundwater levels in the monitoring wells located at the Site;
- Collecting and analyzing groundwater quality samples from the monitoring wells (if groundwater available in MWs);
- Evaluating potential dewatering requirements for the proposed construction at the Site;
- Estimation of the underfloor and perimeter drainage flow for permanent dewatering (if needed); and,
- Preparation of this Hydrogeological Investigation report that provides a summary and interpretation of hydrogeological data collected during the investigation program, as well as an assessment and quantification of groundwater control/dewatering requirements for construction.

2.2 Boreholes and Monitoring Wells

Orbit carried out a Geotechnical Investigation at the Site on February 2023 and drilled seven (7) boreholes (BH1/MW - BH5/MW, and BH6 - BH7) in the area of the proposed structure. For this hydrogeological investigation, five (5) boreholes were converted into groundwater monitoring wells (BH1/MW - BH5/MW).

The logs of the seven boreholes are provided in **Appendix A**. The approximate borehole locations are shown in **Drawing 2.**

The ground surface elevation at the borehole locations were inferred from a topography plan provided to Orbit by the Client. The elevations of the boreholes are presented on the borehole log sheets attached in **Appendix A**. The construction details of the monitoring wells are summarized in **Table 2.1** below.

Table 2.1: Information on Groundwater Monitoring Wells

Monitoring Well / Borehole ID	Northing	Easting	Approximate Ground Surface Elevation (mASL)	Depth of Well / Borehole (mBGS)
	NAD 83, UTM Zone 17T			
BH1/MW	4834303.46	623897.36	109.1	18.9
BH2/MW	4834293.55	623872.05	109.5	9.8
BH3/MW	4834266.75	623900.86	108.5	9.8
BH4/MW	4834278.12	623927.03	107.3	9.8
BH5/MW	4834283.27	623935.08	106.3	9.8

2.3 Groundwater Monitoring and Sampling

Orbit's staff visited the site on February and March 2023 at different times, to collect groundwater samples to be analyzed under guidelines of Ontario Provincial Water Quality Objective (PWQO) and City of Toronto Sanitary and Storm Sewer Use By-laws. All monitoring wells were found dry during all times of our site visit in February and March 2023, then no groundwater samples were taken.

2.4 In-Situ Hydraulic Conductivity Testing

As all monitoring wells were dry, then in-situ hydraulic conductivity test was not carried out.

3 SITE CONDITIONS

3.1 Physical Setting

The subject site is located at 375 Colborne Lodge, Toronto, ON. The site topography is relatively flat and slightly sloped towards southwest. It is situated in the High Park neighborhood, near the intersection of Colborne Lodge Drive and Parkside Drive. The site is located within the boundaries of the larger High Park, which is a large public park in the city of Toronto. The site is situated on the western edge of the park, near the shore of Lake Ontario. **Drawings 1 and 2** present a site plan and approximate boreholes and monitoring well's location. According to the topographic map (topographic-map.com), the geodetic elevation of the project area is approximately between 92 and 109 m above sea level. Groundwater flow direction is inferred towards the north of Lake Ontario. The groundwater flow direction may also be influenced by utility trenches and other subsurface structures and may migrate in the bedding stone of nearby subsurface utility trenches. Groundwater flow direction can only be confirmed with the long-term measurement of groundwater elevations at the project area. According to the Oak Ridges Moraine Atlas, which is available online at (https://www.ontario.ca/page/oak-ridges-moraine) and the Niagara Escarpment Plan (NEP) Maps available online at (https://www.escarpment.org/home), the Site is not located within an area where either the Oak Ridges Moraine Conservation Plan or the Niagara Escarpment Plan would be applicable.

3.2 Climatic Conditions

Average monthly climate data from an Environment Canada climate station located at the CCN Toronto (Station ID 6157012), approximately 5.42 km Southeast of the Site, for the period between 1981 and 2010 is provided in **Table 3.1** (www.climate.weather.gc.ca/climate_normals/). The data indicates that the climate in the study area is typical continental with cold winters and warm summers and precipitation records showing local seasonal variation. As shown **Table 3.1**, below, the mean annual precipitation is 831.1mm/year, with an annual mean rainfall of 714.0mm/year (85.91% of total precipitation). Average monthly precipitation ranged from 53.7mm in March to 84.7mm in September. The mean annual daily temperature is 9.4 degrees Celsius (°C), ranging from -3.7 °C in January to 22.3 °C in July.

Table 3.1: Climate Data Summary (1981 – 2010) – CCN TORONTO (ID 6157012)

MONTH	Daily Average Temperature (°C)	Average Rainfall (mm)	Average Snow (cm)	Average Precipitation (mm)
January	-3.7	29.1	37.2	61.5
February	-2.6	29.7	27.0	55.4
March	1.4	33.6	19.8	53.7
April	7.9	61.1	5.0	68
May	14.1	82	0	82
June	19.4	70.9	0	70.9
July	22.3	63.9	0	63.9
August	21.5	81.1	0	81.1
September	17.2	84.7	0	84.7
October	10.7	64.3	0.1	64.4
November	4.9	75.4	8.3	84.1
December	-0.5	38.2	24.1	61.5
Year	9.4	714	121.5	831.1

NOTE: Data was obtained from the Environment Canada website (Environment Canada, 2017).

3.3 Physiography and Drainage

The Site is located in the physiographic region known as the Iroquois plain as shown in **Drawing 3**. The Iroquois Physiography region is characterized by flat, gently rolling terrain. This is a result of the region's glacial history, as the area was covered by a large ice sheet during the last ice age. It is composed of a variety of glacial deposits, including sand, gravel, and clay. The physiographic landform in which the Site exists is called the Sand Plains. The Iroquois physiographic region is primarily composed of sedimentary rock, specifically limestone and shale. In addition to limestone and shale, the Iroquois region also contains other sedimentary rocks, such as sandstone and siltstone, as well as some igneous and metamorphic rocks that have been intruded or exposed through uplift and erosion. The region is also characterized by a series of ridges and hills that were formed by the erosion of the sedimentary rock, interspersed with valleys and

lowlands. Local, shallow, groundwater flow patterns are expected to mimic local topography and be directed to the north of Lake Ontario.

3.4 Geological Mapping

A review of available published surficial geology mapping from OGS (2010) indicates that sand and gravel with minor silt and clay derived from coarse-textured glaciolacustrine deposits occur in the immediate vicinity of the Site. As shown in **Drawing 4**, one (1) primary surficial geologic unit are interpreted by OGS to occur within the vicinity of the Site, including (chronologically from older to younger units)

- Unit 9c: Coarse-textured glaciolacustrine deposits consist of sand and gravel with minor silt and clay (Foreshore and basinal deposits).

3.5 Subsurface Soil Conditions

The subsurface soil conditions encountered during boreholes advanced at the Site are shown on the borehole logs attached in **Appendix A**. A summary of the soil conditions is provided below. The borehole logs indicate the subsurface conditions only at the borehole locations. Note that the material boundaries indicated on the attached logs are approximate and based on visual observations. These boundaries typically represent a transition from one material type to another and should not be regarded as an exact plane of geological change. It should be pointed out that the subsurface conditions will vary across this Site.

3.5.1 Soil Conditions

The soils explored in the boreholes generally consisted of topsoil/pavement, fill, and native soil layers.

3.5.1.1 Topsoil

A topsoil layer was encountered at the ground surface at the boreholes (BH2/MW to BH5/MW & BH7) with thickness ranged from 150 to 200 mm. The data provided here pertaining to the topsoil thickness is confirmed at the borehole locations only and may vary between and beyond the boreholes. This information may not be considered sufficient for estimating topsoil quantities and associated costs.

3.5.1.2 Pavement Structure

One borehole (BH1/MW) was drilled on February 15, 2023, on the existing pavement structure (i.e., Parking area) and encountered 50 mm thickness of asphalt overlying on fill and/or possibly fill material.

3.5.1.3 Fill

Underneath the topsoil/pavement structure, fill and/or possibly fill material was encountered in all boreholes. The explored possible fill extended to approximate depths of 0.6 to 2.3 m below the existing ground surface. The explored fill/possibly fill generally consisted of silty sand, brown, moist, in very loose to compact state.

3.5.1.4 Sandy Silt to Silty Sand

Native deposits were encountered underlying the earth fill/possibly fill in boreholes. The native materials at borehole locations predominantly consisted of greyish brown to grey, moist, compact to very dense

sandy silt to silty sand with trace clay. These sandy deposits extended to maximum explored depths of 9.8-18.9 m in (BH1/MW- BH5/MW), 4.1 m and 2.1 m in (BH6 & BH7) below the existing ground surface.

It should be noted that the thickness of native deposit could vary between and beyond the borehole locations within the depth of investigation, and this should be considered when estimating.

The typical grain size distribution of the sandy deposits (BH1/MW-SS3, BH1/MW-SS4, BH1/MW-SS13) shows the following gradation:

Gravel:	0 - 2%
Sand:	24 - 85%
Silt:	9 - 68%
Clay:	2 - 8%

4 GROUNDWATER CONDITIONS

4.1 Regional Groundwater Recharge

Recharge is the process by which groundwater is replenished and involves the vertical infiltration of water through the subsoil deposits and geologic materials to the saturated zone. The major sources of recharge in the study area are a result of precipitation and freshet. The amount of groundwater recharge in a particular area depends on surficial geology, topography, and the extent of land development in that area. Generally, regional groundwater recharge is irregularly distributed temporally and spatially as interpreted from specific climatic conditions, local geology, and land development status.

Generally, the area of the Site is expected to have a moderate to high groundwater recharge rate due to the presence of Coarse texture glaciolacustrine deposits at the surface. The proposed site is located in green area and an unrestricted unpaved area, then no major changes are expected in the groundwater recharge rate due to the planned construction.

4.2 Groundwater Level Fluctuations

The groundwater level data collected from the monitoring wells are provided in the borehole logs in **Appendix A**. During the groundwater monitoring program at the subject site in February and March 2023, there was no groundwater observed and all monitoring wells were dry.

It should be noted that groundwater conditions vary depending on factors such as temperature, season, precipitation, construction activity, and other situations, which may be different from those encountered at the time of the monitoring. The possibility of groundwater level fluctuations at the Site should be considered when designing and developing the construction plans for the project.

Regional groundwater flow in the area typically reflects the local topography and generally occurs from topographic highs to topographic lows. The dominant regional groundwater flow direction is expected to be the southwest toward Lake Ontario and Grenadier Pond.

4.3 Groundwater Use in the Study Area

A review of the available data from the MECP Water Well Information System (WWIS) database was carried out to identify active wells near the Site. The database search was requested for the area located within 500m from the Site. This search identified records for 22 wells.

Drawing 5 presents the locations of the identified wells as well as the associated water use categories within 500 m around the Site. A detailed table showing water well record (WWR) information for these wells is provided in **Appendix B**.

The observation wells identified in the database search are considered most likely to be associated with recent construction activities and/or infrastructure upgrades in the area. It is assumed that two wells installed in 2020 and 2021 are used for groundwater monitoring. This is consistent with the expectations that potable water in the study area is available from the City of Toronto.

Based on the hydrogeological information and data analysis in this report, the potential impacts to surface water and groundwater resources in the vicinity of the Site due to construction of the proposed structure at the Site are not considered significant. The area of the Site is currently serviced with the municipal water supply from the City of Toronto.

4.4 Groundwater Quality for Temporary Dewatering

As aforementioned, there were no groundwater samples taken in this investigation owing to all monitoring wells being dry, therefore no groundwater quality tests were conducted.

5 GROUNDWATER DEWATERING ESTIMATES

There is no groundwater dewatering estimation (during construction activities) as all monitoring wells were dry. Consequently, short-term dewatering system is not needed at the subject site.

5.1 Long-Term Drainage System

The foundation of the basement of the planned building at the subject site is above the groundwater table with adequate depth, then sub-slab drainage system is not recommended. However, perimeter drainage system and one row of underfloor/sub-slab drainage system are required along the exterior basement walls for long-term control of the groundwater seepage from rain and storm events.

The quantity of long-term dewatering was calculated based on the climate data (rain and storm events) provided in **Table 3.1** considering the perimeter of exterior building walls of 120 m, approximately, and influence zone of 5 m. The expected quantity of long-term dewatering rate with 100 % contingency is found to be (2 x 120 x 5 x 0.003 = 3.6 m^3/day).

The water can potentially be discharged into city of Toronto storm or sanitary system as the source of water is storm and rain provided that a water discharge permit from the City of Toronto is obtained. In order to discharge to the city of Toronto storm/sanitary system, additional treatment would be required to reduce movement of sediment with the groundwater, a proper filtration or sediment settlement tank should be used. The Filtration system can potentially be filter bags and/or settlement tanks. Allowing for

variations in grain size in the aquifer, specifically hydraulic conductivity and transmissivity, seepage through floor or from surface, it is expected that there will be variations in the amount of groundwater that can be drained by foundation drainage systems. It is prudent to consider a contingency factor in designing the drainage capacity. It is recommended that the drainage capacity including sumps, pumps and related utilities is designed for minimum 2.5 L/min (0.7 gpm).

6 SUMMARY AND CONCLUSION

Based on the results of the subsurface investigation, hydrogeological assessment, and analysis of hydraulic conductivity testing and groundwater level monitoring data, the following summary of conclusions and recommendations is provided:

- The soil lithology in the proposed construction area is generally composed of topsoil in all borehole locations with thickness ranged from 150 to 200 mm. Fill material was encountered in all boreholes and extended to depths of 0.6 to 2.3 mbgs composed of silty sand, brown, moist, in very loose to compact state. Underneath the fill materials, the native deposits were encountered and composed of sandy silt to silty sand and extended to maximum explored depths of boreholes.
- Groundwater table was not observed in all monitoring wells during drilling, after drilling, and during the period of groundwater monitoring program from February to March 2023.
- Short-term dewatering during construction activities is not required for the proposed development, however, the contractor is responsible to keep the excavation level dry in all cases.
- The quantity of long-term dewatering rate with 100 % contingency is estimated to be 3.6 m3/day considering rain and storm events only. Therefore, perimeter drainage system and one row of underfloor drainage basement are required along the exterior basement walls.
- The water can potentially be discharged into city of Toronto storm or sanitary system provided that a water discharge permit from the City of Toronto is obtained and additional treatment would be required to reduce movement of sediment with the groundwater, a proper filtration or sediment settlement tank should be used.
- Orbit recommends the decommissioning of existing groundwater monitoring wells after completion of the construction of the project. In conformance with Ontario's Wells Regulation (O.Reg.903) of the Ontario Water Resources Act, the installation and eventual decommissioning of groundwater wells must be carried out by a licensed well contractor. If a well will be damaged/destroyed during the construction activities, then the well should be properly decommissioned in advance of that work.

7 STATEMENT OF LIMITATIONS

The contents of this report are subject to the attached 'Limitations of Report' sheet attached to this report. The reader's attention is specifically drawn to these conditions as it is considered essential that they be followed for proper use and interpretation of this report. The Statement of Limitations is not intended to reduce the level of responsibility accepted by Orbit, but rather to ensure that all parties who have been given reliance for this report are aware of the responsibilities each assumes in so doing.

This report was prepared by Orbit exclusively for the account of City of Toronto (the CLIENT). Other than by the CLIENT, copying or distribution of this report or use of or reliance on the information contained herein, in whole or in part, is not permitted without the express written permission of Orbit. Any use, reliance on or decision made by any person other than CLIENT based on this report is the sole responsibility of such other person. The CLIENT and Orbit make no representation or warranty to any other person with regard to this report and the work referred to in this report and the CLIENT and Orbit accept no duty of care to any other person or any liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm that may be suffered or incurred by any other person as a result of the use of, reliance on, any decision made or any action taken based on this report or the work referred to in this report.

8 CLOSURE

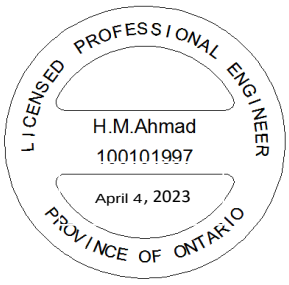
We trust that this information is satisfactory for your present requirements. Should you have any questions or require additional information, please do not hesitate to contact this office.

For and Behalf of Orbit Engineering Limited,

Aly Ahmed, Ph.D., P.Eng.
Senior Engineer

Reviewed by:

Hafiz Muneeb Ahmad, M.Eng., M.Sc., P.Eng., QP$_{ESA}$
Senior Principal



9 REFERENCES

Cashman, P.M. and Preene, M. (2001). Groundwater Lowering in Construction: A Practical Guide to Dewatering, Spon Press, 476p.

Chapman, L.J., and Putnam, D.F. (1984). The Physiography of Southern Ontario, Third Edition, Ontario Geological Survey, Special Volume 2.

Riley P.M. Mulligan (2013). Quaternary Landform and Sediment Analysis of the Alliston Area (Southern Simcoe County), Ontario, Canada.

Conservation Authorities Geoscience Working Group. 2013. Hydrogeological Assessment Submissions-Conservation Authority Guidelines for Development Applications.

Bouwer, H. and R.C. Rice, 1976 A Slug Test Method for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

Environment Canada (2021) Canadian National Climate Archive, Canadian Climate Norms and Averages (1981 – 2010), Albion Field Station (Station ID 6150103)

Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig and S. McMurray. (1998). Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02. 225 p.

Ministry of the Environment. 2003. Stormwater Management Planning and Design Manual.

Ministry of Environment and Energy (MOEE). 1995, MOEE Hydrogeological Technical Information Requirements for Land Development Applications.

Orbit (2021). Geotechnical Investigation - Proposed Truck Centre, 0 Healey Road, Caledon, Ontario

Powers, J.P., Corwin, A.B., Paul, C.S. and Kaeck, W.E. (2007). Construction Dewatering and Groundwater Control: New Methods and Applications - Third Edition. New York, New York: John Wiley & Sons.

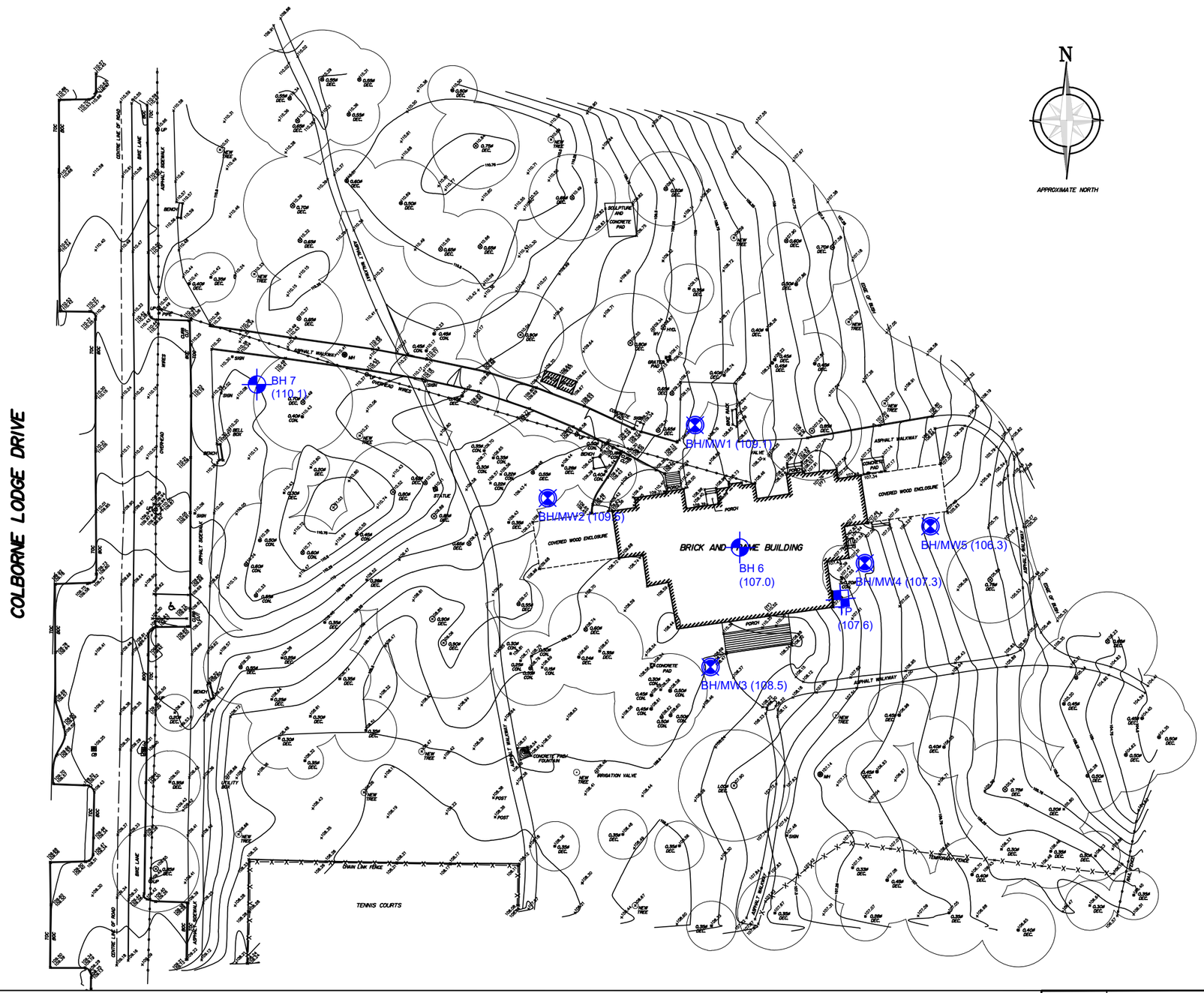
Sichart, W. and W. Kyrieleis, 1930. Grundwasser Absekungen bei Fundierungsarbeiten. Berlin, Germany.

T.S. Steenhuis, W.H. Van Der Molen, 1986: The Thornthwaite-Mather procedure as a simple engineering method to predict recharge, Journal of Hydrology, Volume 84, Issues 3–4, 30 May 1986, Pages 221-229, ISSN 0022-1694, 10.1016/0022-1694(86)90124-1.

Drawings

`

ORBIT ENGINEERING	**APPROXIMATE SITE LOCATION PLAN**		
	Date: **MAR 2023**	**HYDROGEOLOGICAL INVESTIGATION** **PROPOSED BUILDING ADDITION** **375 COLBORNE LODGE DR, TORONTO, ON**	Prepared By: **AM**
	Project: **OE231465DG**		Reviewed By: **HA**
		Prepared for: **City of Toronto**	Drawing No. **1**



TOPOGRAPHIC SURVEY OF

HIGH PARK FOREST SCHOOL
CITY OF TORONTO

5 0 5 10 15 20 25 Meters

SCALE 1 : 300

I.H. Gelbloom Surveying Limited
Ontario Land Surveyor
2015

LEGEND

UP	Lamp post
FF	Flood light
CON.	Coniferous Tree
DEC.	Deciduous Tree
ø	Diameter
TOC	Top of Curb
BOC	Bottom of Curb
HYD.	Top of Wall
CB	Catch Basin
MH	Maintenance Hole
WV	Water Valve
123.98	Elevations

METRIC

Distances and Elevations shown on this plan are in metric and can be converted to feet by dividing by 0.3048.

BENCHMARK

Elevations are Referred to the City of Toronto Benchmark No. 1221974001l having an Elevation of 112.971 m.

Topographic Survey completed on the 15th day of July, 2015.

NOTES:

1. The boundaries and soil types have been established only at borehole locations. Between boreholes they are assumed and may be subject to considerable error.
2. Soil samples will be retained in storage for three months and then destroyed unless the client advises an extended time period is required.
3. Asphalt and granular base quantities should not be established from the information provided at the borehole locations.
4. Borehole elevations should not be used to design building(s) or floor slab(s) or parking lot(s) grades.
5. This drawing forms part of the report (project number as referenced) and should only be used in conjunction with this report.

LEGEND

BH6-BH7 — **Approximate Borehole Location**

BH/MW1 - BH/MW5 — **Approximate Borehole/Monitoring Well Location**

TP — **Approximate Test Pit Location**

drawn	AM
approved	HA
date	MAR 2023
scale	As Shown
original size	Tabloid

ORBITENGINEERING
Consulting Engineers

Client: CITY OF TORONTO

Project: HYDROGEOLOGICAL INVESTIGATION
PROPOSED BUILDING ADDITION
375 COLBORNE LODGE DR, TORONTO, ON

Title: APPROXIMATE BOREHOLE, MONITORING WELL AND TEST PIT LOCATION PLAN

Project no: OE231465DG

Drawing no: 2

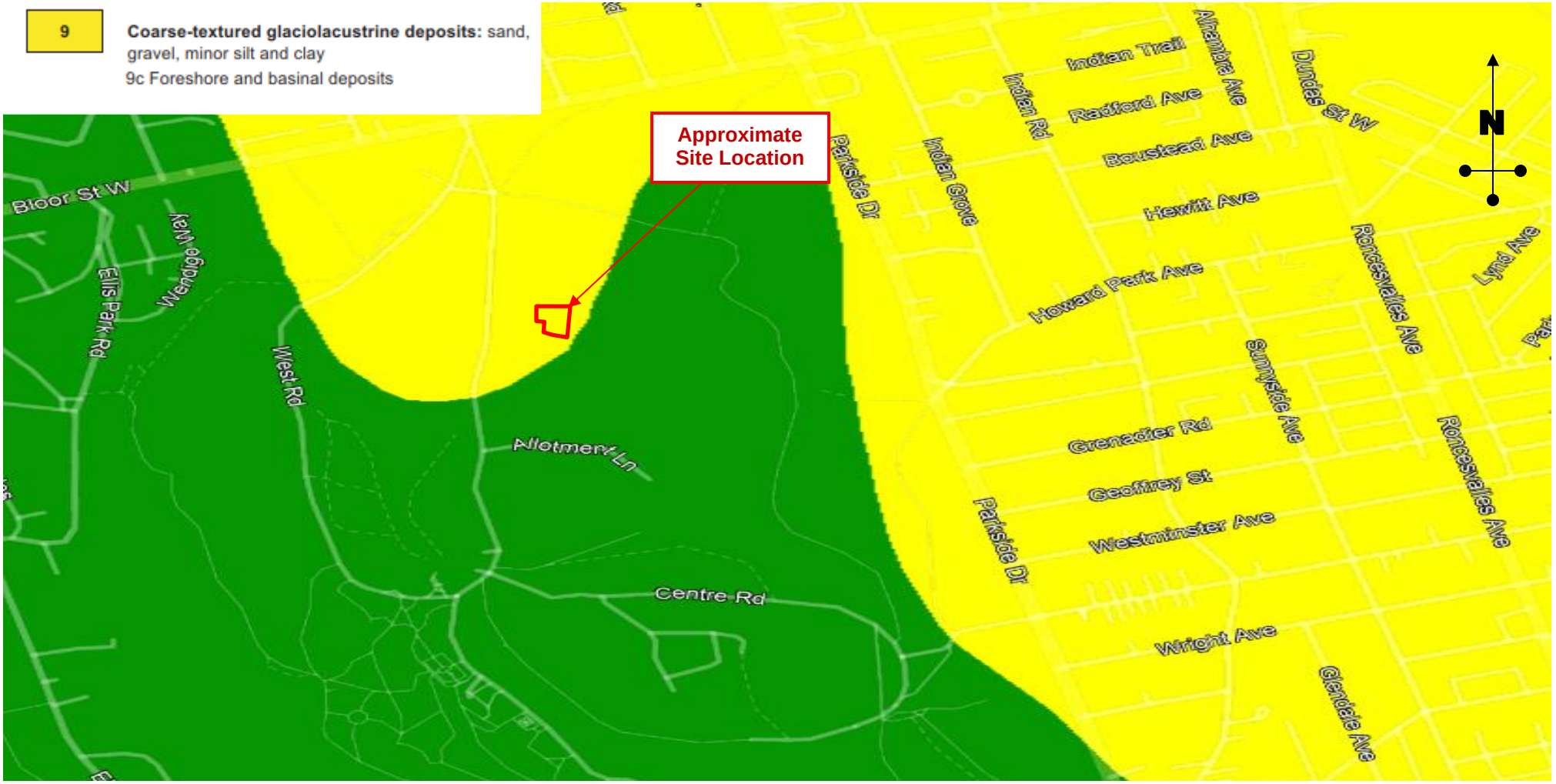
LEGEND

Site Physiography

ORBITENGINEERING

Date: MAR 2023	HYDROGEOLOGICAL INVESTIGATION PROPOSED BUILDING ADDITION 375 COLBORNE LODGE DR, TORONTO, ON	Prepared By: F.M.
Project: OE231465DG		Reviewed By: H.A.
	Prepared for: CITY OF TORONTO	Drawing No.: 3

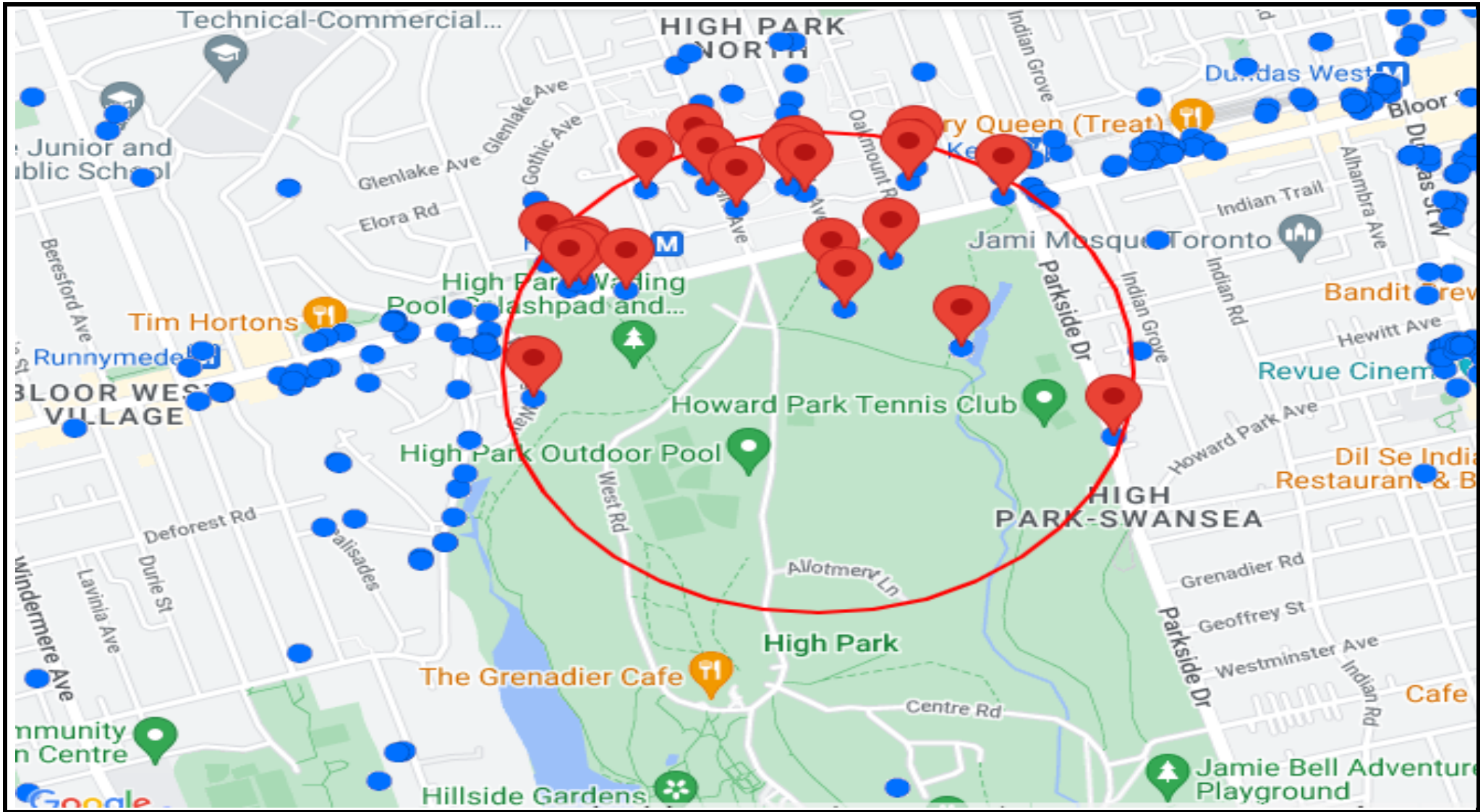
LEGEND



Surficial Geology

ORBITENGINEERING

Date: **MAR 2023**	**HYDROGEOLOGICAL INVESTIGATION PROPOSED BUILDING ADDITION 375 COLBORNE LODGE DR, TORONTO, ON**	Prepared By: **F.M.**
Project: **OE231465DG**		Reviewed By: **H.A.**
	Prepared for: **CITY OF TORONTO**	Drawing No.: **4**



ORBITENGINEERING	**MECP Water Well Records Near the Site**		
	Date: **MAR 2023**	**HYDROGEOLOGICAL INVESTIGATION PROPOSED BUILDING ADDITION 375 COLBORNE LODGE DR, TORONTO, ON**	Prepared By: **F.M**
	Project: **OE231465DG**		Reviewed By: **H.A.**
		Prepared for: **CITY OF TORONTO**	Drawing No.: **5**

Appendix A

Borehole Logs

ORBITENGINEERING

LOG OF BOREHOLE BH1/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834303.46 E 623897.36

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-15-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
109.1 / 0.0	**Asphalt:** 50mm				
108.9 / 0.2	**Possibly Fill:** silty sand, trace gravel, brown, moist, loose	1	SS	6	
		2	SS	3	108
106.8 / 2.3		3	SS	2	
	Sandy Silt to Silty Sand: trace clay, greyish brown, moist, compact	4	SS	18	
		5	SS	19	106
	grey, dense to very dense below 4.6m	6	SS	55	104
		7	SS	54	
		8	SS	50	102
		9	SS	46	100
		10	SS	48	98
		11	SS	46	
		12	SS	55	96
		13	SS	61	94
		14	SS	52	92
90.2 / 18.9		15	SS	38	
	End of Borehole:				

Notes: MW installed upon completion of drilling, well screen depth (16.7m to 18.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
(20 40 60 80 100)

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
	2	85	9	4
	0	37	61	2
	0	24	68	8

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH2/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834293.55 E 623872.05

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
109.5												
109.4 / 0.1	**Topsoil:** 150mm											
	Possibly Fill: silty sand, brown, moist, loose to compact		1	SS	7		109		○			
1			2	SS	12				○			
108.0												
1.5	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact to dense		3	SS	12		108		○			
2			4	SS	19		107		○			
3			5	SS	24		106		○			
4												
5			6	SS	36		105		○			
6							104					
			7	SS	29		103		○			
7	very dense below 7.6m											
8			8	SS	61		102		○			
9							101					
99.7			9	SS	56		100		○			
9.8	**End of Borehole:**											

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ $^{\varepsilon}$=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH3/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834266.75 E 623900.86

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
108.5							
108.4 / 0.1	**Topsoil:** 150mm						
	Possibly Fill: silty sand, brown, moist, very loose to loose		1	SS	5		108
1			2	SS	4		
107.0							107
1.5	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact to dense		3	SS	30		
2			4	SS	24		106
3			5	SS	37		105
4			6	SS	38		104
5							
6	very dense below 6.1m		7	SS	90		103
7							102
8			8	SS	85		101
9							100
98.7			9	SS	93		99
9.8	**End of Borehole:**						

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH4/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834278.12 E 623927.03

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
107.3												
107.2 / 0.1	**Topsoil:** 200mm											
	Possibly Fill: silty sand, brown, moist, very loose		1	SS	4		107					
106.5												
0.8	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact to dense		2	SS	31		106					
			3	SS	20							
			4	SS	27		105					
			5	SS	23		104					
			6	SS	45		103					
	very dense below 6.1m		7	SS	86		102					
			8	SS	92		101					
			9	SS	98		100					
97.5							99					
9.8	**End of Borehole:**						98					

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH5/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834283.27 E 623935.08

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	ELEVATION
106.3					
106.2	**Topsoil:** 150mm				
0.1	**Possibly Fill:** silty sand, trace gravel, brown, moist, loose to compact	1	SS	9	106
1		2	SS	10	105
104.8					
1.5	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact	3	SS	16	
2		4	SS	15	104
3	very dense below 3.1m	5	SS	53	103
4					
5		6	SS	51	102
6					101
		7	SS	65	100
7					
8		8	SS	75	99
9					98
96.5		9	SS	82	97
9.8	**End of Borehole:**				

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH6

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834285.53 E 623905.89

DRILLING DATA
Method: Portable Drilling Equipment
Diameter: 50mm
Date: Mar-06-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
107.0												
0.0	**Possibly Fill:** silty sand, brown, loose		1	SS	7							
106.4												
0.6	**Sandy Silt to Silty Sand:** trace clay, greyish brown, moist, compact		2	SS	10		106					
1												
			3	SS	15		105					
2	dense to very dense below 2.3m		4	SS	49		104					
3			5	SS	55							
			6	SS	62		103					
4												
102.9												
4.1	**End of Borehole:**											

Notes:
Water Levels:
(i) During Drilling: --
(ii) At completion: Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH7

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834314.33 E 623824.39

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-15-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 8

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
110.1												
0.0 / 110.0	**Topsoil:** 150mm											
0.1	**Possibly Fill:** silty sand, brown, moist, very loose to loose		1	SS	4		110		○			
			2	SS	6		109		○			
108.6												
1.5	**Silty Sand to Sandy Silt:** trace clay, greyish brown, moist, compact		3	SS	10				○			
108.0							108					
2.1	**End of Borehole:**											

Notes:
(i) During Drilling: Dry
(ii) At completion: Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Appendix B

Information on Water Well Records Acquired from MECP

Well Record Information	Well Tag # (since 2003)	Audit #	Contractor Lic#	Well Depth (m)	Date of Completion (MM/DD/YYYY)
PDF | HTML	N/A	N/A	4610	38.4	01/06/1959
HTML	N/A	Z34275	7241	0.3	12/08/2005
PDF | HTML	A039322	Z40541	7241	9.1	04/14/2006
PDF | HTML	A062180	Z82191	6032	16.8	08/11/2008
PDF | HTML	A062180	Z66433	6032	17.8	01/21/2008
PDF | HTML	A111959	Z127117	7215	N/A	01/06/2011
HTML	A146872	C25217	7360	N/A	
PDF | HTML	A154109	Z178002	7241	5.5	08/29/2013
HTML	A163719	C22299	7360	N/A	05/06/2014
PDF | HTML	A186587	Z216335	7241	12.1	07/18/2015

PDF | HTML	A186364	Z216334	7241	10.4	07/17/2015
PDF | HTML	A186543	Z216393	7241	15.5	07/24/2015
PDF | HTML	A188438	Z212268	7241	14.9	10/06/2015
PDF | HTML	A188611	Z212266	7241	14.5	10/07/2015
PDF | HTML	A181782	Z222509	7241	14.6	10/09/2015
PDF | HTML	A187658	Z214115	7247	12.2	12/22/2015
HTML	A187658	C37292	7230	N/A	05/23/2017
PDF | HTML	A222461	Z252370	7075	18.3	04/30/2018
PDF | HTML	A222465	Z252371	7075	18.3	04/30/2018
PDF | HTML	A184013	Z252391	7075	18.3	04/26/2018
PDF | HTML	A184014	Z210344	7075	18.3	04/27/2018
PDF | HTML	A293739	DTS5XYXP	6607	18.3	09/04/2020
HTML	N/A	Z364234	7241	N/A	06/04/2021

Appendix C

Drawings Provided by the Client

Proposed Floor Plan – Level 1 (upper)

Proposed Floor Plan – Level 0 (lower)

ORBITENGINEERING
Consulting Engineers

GEO-EXCHANGE TESTING REPORT FOR THE PROPOSED NEW HIGH PARK VISITOR AND NATURE CENTRE

375 COLBORNE LODGE DRIVE, TORONTO, ON

Prepared for:

City of Toronto

By:

Orbit Engineering Limited

Project No: OE231465DG

May 31, 2023

Orbit Engineering Limited
9-1900 Clark Boulevard Brampton ON L6T 0E9
www.orbitengineering.ca info@orbitengineering.ca

ORBITENGINEERING
Consulting Engineers

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www.orbitengineering.ca
,info@orbitengineering.ca

June 5, 2023

City of Toronto
Parks, Forestry & Recreation, Parks Development & Capital Projects
Etobicoke Civic Centre,
399 The West Mall, 2nd Floor,
Toronto, Ontario, M9C 2Y2
Email :John.Keen@toronto.ca

Attention: John Keen, Project Manager

RE: Geo-Exchange Testing Report for the Proposed New High Park Visitor and Nature Centre, 375 Colborne Lodge Drive, Toronto, ON

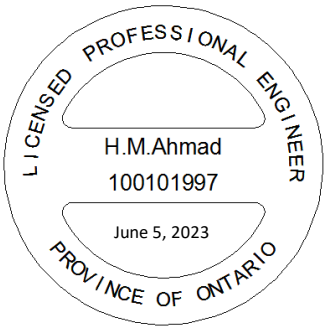
Enclosed is a copy of the Geo-Exchange Testing Report related to the above noted site.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

For and on behalf of Orbit Engineering Limited

Aly Ahmed, Ph.D., P. Eng
Principal Engineer

Reviewed by



Hafiz Muneeb Ahmad, M.Sc., M.Eng., P.Eng., QP_{ESA}
Senior Principal Engineer
Email: hafiz.ahmad@orbitengineering.ca
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EXECUTIVE SUMMARY

Orbit Engineering Limited (Orbit) was retained by the City of Toronto to carry out a geo-exchange testing for the proposed New High High Park and Nature Centre. The site is located at 375 Colborne Lodge Drive, Toronto, ON.

A formation thermal conductivity test was performed on the geothermal bore located at 375 Colborne Lodge Drive, Toronto, Ontario. The vertical bore was completed on April 21, 2023 by Desrosiers Geothermal Drilling. Geothermal Resource Technologies (GRTI) test unit was attached to the vertical bore on the afternoon of May 8, 2023.

This report provides an overview of the test procedures and analysis process, along with plots of the loop temperature and input heat rate data. The collected data was analyzed using the "line source" method and the following average formation thermal conductivity was determined.

Formation Thermal Conductivity = 1.31 Btu/hr-ft-°F (2.28 W/m-K)

Due to the necessity of a thermal diffusivity value in the design calculation process, an estimate of the average thermal diffusivity was made for the encountered formation.

Formation Thermal Diffusivity ≈ 0.90 ft^2/day (0.0097 cm^2/s)

The undisturbed formation temperature for the tested bore was established from the initial loop temperature data collected at startup.

Undisturbed Formation Temperature ≈ 53.5 - 54.5 °F (11.9 - 12.5 °C)

The average undisturbed formation temperature of 54.0°F was used as the undisturbed temperature, and the average bore thermal resistance from the test data was clacualted.

The Average Bore Thermal Resistance = 0.170 hr-ft-°F/Btu (0.098 m-K/W).

The thermal conductivity for the grout used in the bore installation is provided below.

Grout Thermal Conductivity ≈ 1.2 Btu/hr/ft/°F

The formation thermal properties determined by this test do not directly translate into a loop length requirement (i.e., feet of bore per ton). These parameters, along with many others, are inputs to commercially available loop-field design software to determine the required loop length. All test procedures along with data analyis process were developed by Geothermal Resource Technologies Inc. (GRTI) and attached in **Appendix A**.

Additional questions concerning the use of these results are discussed in the frequently asked question (FAQ) section at www.grti.com.

Subsurface Conditions

The subsurface conditions at the location of the explored hole comprise pavement/topsoil, fill materials, native soil, and bedrock. A summary of the subsurface conditions is provided below:

1. Pavement/Topsoil: It has varies in thickness from 50 to 200 mm, measured below the existing ground surface (mbgs).
2. Fill material: It was encountered below the topsoil and extended to dpths of 0.6 to 2.3 m (mbgs).
3. Native Soil:
   - **3.1.** Deposits of sandy silt to silty sand were encountered below the fill and extended to depth of 18.5 m (mbgs), approximately.
   - **3.2.** Deposits of sand and gravel were encountered below sandy depoits and extended to a depth of 35.0 m (mbgs), approximately.
4. Shale bedrock: It was encountered below the sand and gravel deposits and extended to a depth of 41.0 m (mbgs), approximately.
5. Limestone: It was encountered below the shale bedrock and extended to the end of the explored hole depth.

It is important to note that the provided subsurface data provided presents the conditions at the hole location only, and variations may occuer beyond the hole location. Therefore, the contractors are responsible for conducting their own investigation to determine the exact type and depth of subsurface layers.

APPENDIX A

Formation Thermal Conductivity
Test & Data Analysis

Test location **375 Colborne Lodge Dr**
Toronto, ON

Test Date May 8-10, 2023

Analysis For Groundheat Solar Wind Corp.
211 Rodinea Rd
Vaughan, ON L6A 1R4
Phone: 416-230-4949

Test Performed By Groundheat Solar Wind Corp.

EXECUTIVE SUMMARY

A formation thermal conductivity test was performed on the geothermal bore at 375 Colborne Lodge Dr., Toronto, Ontario. The vertical bore was completed on April 21, 2023 by Desrosiers Geothermal Drilling. Geothermal Resource Technologies' (GRTI) test unit was attached to the vertical bore on the afternoon of May 8, 2023.

This report provides an overview of the test procedures and analysis process, along with plots of the loop temperature and input heat rate data. The collected data was analyzed using the "line source" method and the following average formation thermal conductivity was determined.

Formation Thermal Conductivity = 1.31 Btu/hr-ft-°F (2.28 W/m-K)

Due to the necessity of a thermal diffusivity value in the design calculation process, an estimate of the average thermal diffusivity was made for the encountered formation.

Formation Thermal Diffusivity ≈ 0.90 ft^2/day (0.0097 cm^2/s)

Bore thermal resistance calculations were made on the test data using the method outlined in the Gehlin Doctoral Thesis[1]. Since the average value listed below was empirically determined from the test data it may not directly correlate with values found in loopfield design programs.

Bore Thermal Resistance = 0.170 hr-ft-°F/Btu (0.098 m-K/W)

The undisturbed formation temperature for the tested bore was established from the initial loop temperature data collected at startup.

Undisturbed Formation Temperature ≈ 53.5-54.5°F (11.9-12.5°C)

The formation thermal properties determined by this test do not directly translate into a loop length requirement (i.e. feet of bore per ton) with many others, are inputs to commercially available loop-field design software to determine the required loop length. Additional questions concerning the use of these results are discussed in the frequently asked question (FAQ) section at www.grti.com.

[1] Signhild Gehlin. "Thermal Response Test - Method Development and Evaluation," (Doctoral Thesis, Lulea University of Technology, 2002).

Test Procedures

The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) has published recommended procedures for performing formation thermal conductivity tests in the ASHRAE HVAC Applications Handbook, Geothermal Energy Chapter. The International Ground Source Heat Pump Association (IGSHPA) also lists test procedures in their Design and Installation Standards. GRTI's test procedures meet or exceed those recommended by ASHRAE and IGSHPA, with the specific procedures described below:

Grouting Procedure for Test Loops – To ensure against bridging and voids, it is recommended that the bore annulus is uniformly grouted from the bottom to the top via tremie pipe.

Time Between Loop Installation and Testing – A minimum delay of five days between loop installation and test startup is recommended for bores that are air drilled, and a minimum waiting period of two days for mud rotary drilling.

Undisturbed Formation Temperature Measurement – The undisturbed formation temperature should be determined by recording the loop temperature as the water returns from the u-bend at test startup.

Required Test Duration – A minimum test duration of 36 hours is recommended, with a preference toward 48 hours**.**

Data Acquisition Frequency - Test data is recorded at five minute intervals.

Equipment Calibration/Accuracy – Transducers and datalogger are calibrated per manufacturer recommendations. Manufacturer stated accuracy of power transducers is less than ±2%. Temperature sensor accuracy is periodically checked via ice water bath.

Power Quality – The standard deviation of the power should be less than or equal to 1.5% of the average power, with maximum power variation of less than or equal to 10% of the average power.

Input Heat Rate – The heat flux rate should be 51 Btu/hr (15 W) to 85 Btu/hr (25 W) per foot of installed bore depth to best simulate the expected peak loads on the u-bend.

Insulation – GRTI's equipment has 1 inch of foam insulation on the FTC unit and 1/2 inch of insulation on the hose kit connection. An additional 2 inches of insulation is provided for both the FTC unit and loop connections by insulating blankets.

Retesting in the Event of Failure – In the event that a test fails prematurely, a retest may not be performed until the bore temperature is within 0.5°F of the original undisturbed formation temperature or until a period of 14 days has elapsed.

DATA ANALYSIS

Geothermal Resource Technologies, Inc. (GRTI) uses the "line source" method of data analysis to determine the thermal conductivity of the formation. The line source method assumes an infinitely thin line source of heat in a continuous medium. A plot of the late-time temperature rise of the line source temperature versus the natural log of elapsed time will follow a linear trend. The linear slope is inversely proportional to the thermal conductivity of the medium. Applying the line source method to a u-bend grouted in a borehole, the test must be run long enough to allow the finite dimensions of the u-bend pipes and the grout to become insignificant. Experience has shown that approximately ten hours is required to allow the error of early test times and the effects of finite borehole dimensions to become insignificant.

In the analysis of the data from the formation thermal conductivity test, the average temperature of the water entering and exiting the u-bend heat exchanger was plotted versus the natural log of elapsed testing time. Using the Method of Least Squares, linear coefficients were calculated that produce a line that fit the data. This procedure was repeated for various time intervals to ensure that variations in the power or other effects did not produce inaccurate results.

Bore thermal resistance was determined using the formula outlined in Gehlin's Doctoral Thesis[2]. A serial development was used to approximate the exponential integral. The calculated bore resistance applies only to the test conditions, a bore in an operating loopfield could have a significantly different resistance due to changes in the loop fluid temperature, flow rate and presence of antifreeze.

The calculated results are based on test bore information submitted by the driller/testing agency. GRTI is not responsible for inaccuracies in the results due to erroneous bore information. All data analysis is performed by personnel that have an engineering degree from an accredited university with a background in heat transfer and experience with line source theory. The test results apply specifically to the tested bore. Additional bores at the site may have significantly different results depending upon variations in geology and hydrology.

Through the analysis process, the collected raw data is converted to spreadsheet format (Microsoft Excel®) for final analysis. If desired, please contact GRTI and a copy of the data will be made available in either a hard copy or electronic format.

CONTACT: Galen Streich
Regional Managing Engineer
Elkton, SD
Ph: 866-991-4784
gstreich@grti.com

[2]Gehlin, 12-13

Test Bore Details

(As Provided by Groundheat Solar Wind Corp.)

Location	375 Colborne Lodge Dr Toronto, ON
Driller	Desrosiers Geothermal Drilling
Installed Date	April 21, 2023
Borehole Diameter	5 ½ in. (140 mm)
Casing	Temporary casing to 25 ft (8 m)
U-Bend Size	1 1/2 inch (48 mm OD) HDPE
U-Bend Depth Below Grade	850 ft (259.1 m)
Grout Type	Cetco
Grout Mixture	50 lb bentonite, 18 lb TC Booster, 15 gal water
Grouted Portion	Entire bore

Drill Log

Formation Description	Depth (ft)	Depth (m)
Asphalt, topsoil, sand	0'-60'	0-18 m
Shale	60'-134'	18-41 m
Limestone	134'-850'	41-259 m

THERMAL CONDUCTIVITY TEST DATA

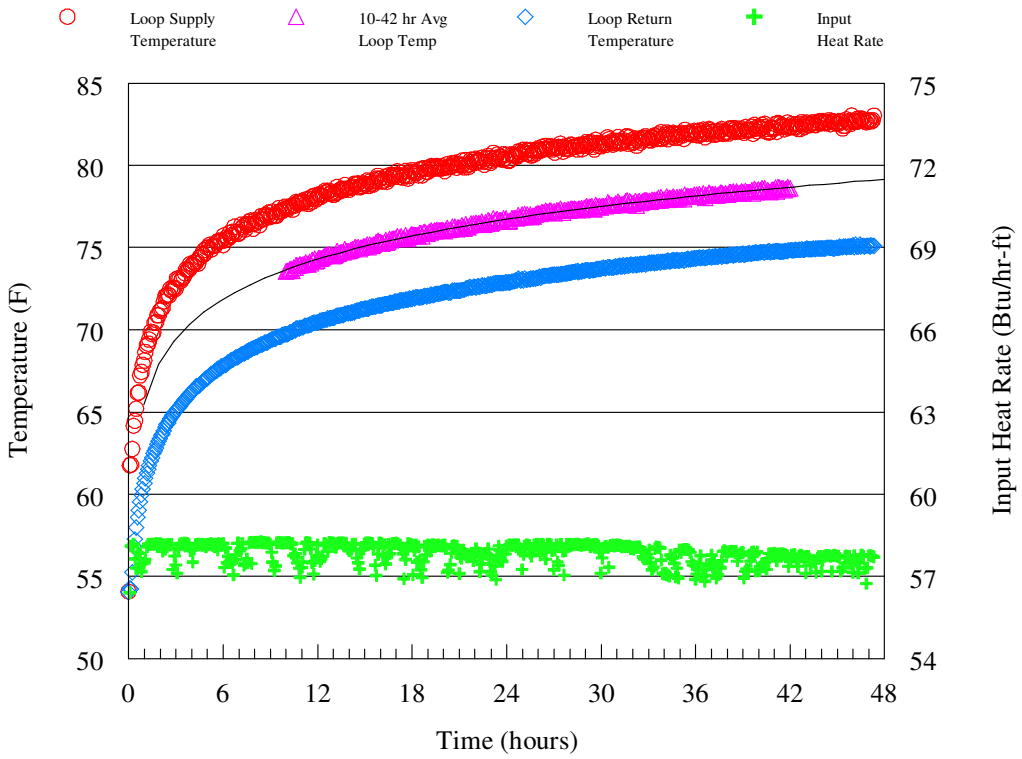


FIG. 1: TEMPERATURE & HEAT RATE DATA VS TIME

Figure 1 above shows the loop temperature and heat input rate data versus the elapsed time of the test. The temperature of the fluid supplied to and returning from the U-bend are plotted on the left axis, while the amount of heat supplied to the fluid is plotted on the right axis on a per foot of bore basis. In the test statistics below, calculations on the power data were performed over the analysis time period listed in the Line Source Data Analysis section.

SUMMARY TEST STATISTICS

Test Date	May 8-10, 2023
Undisturbed Formation Temperature	53.5-54.5°F (11.9-12.5°C)
Duration	47.3 hr
Average Voltage	243.9 V
Average Heat Input Rate	49,160 Btu/hr (14,407 W)
Avg Heat Input Rate per Foot of Bore	57.8 Btu/hr-ft (16.9 W/ft)
Circulator Flow Rate	13.0 gpm (49 L/min)
Standard Deviation of Power	0.63%
Maximum Variation in Power	1.74%

LINE SOURCE DATA ANALYSIS

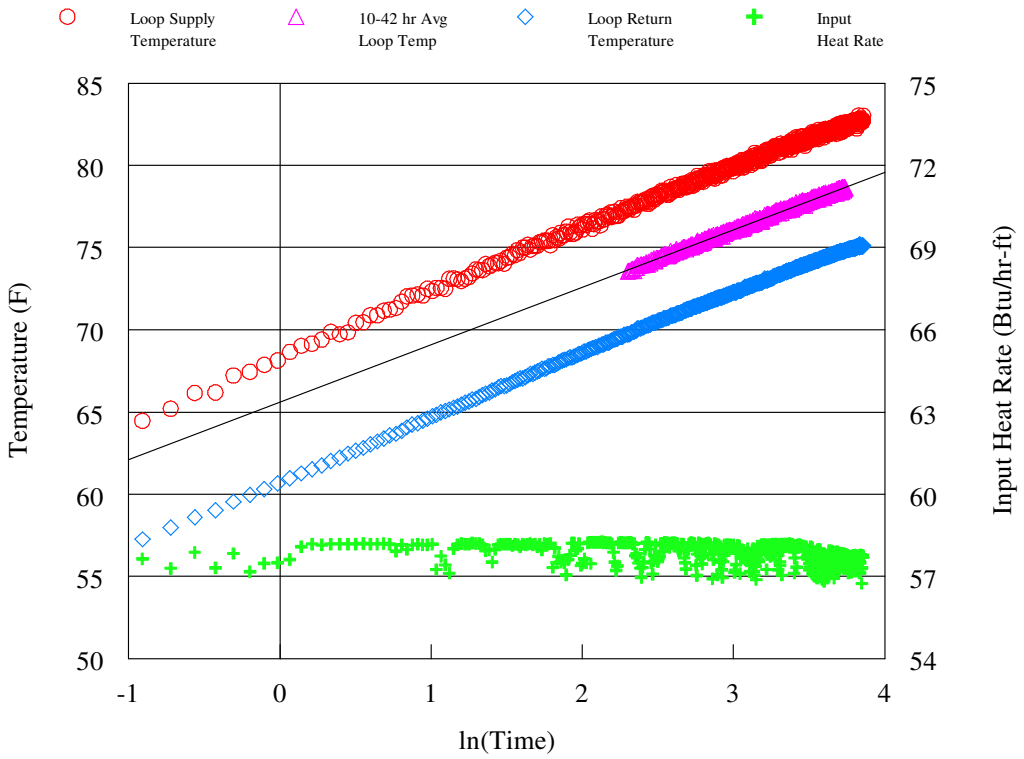


FIG. 2: TEMPERATURE & HEAT RATE VS NATURAL LOG OF TIME

The loop temperature and input heat rate data versus the natural log of elapsed time are shown above in Figure 2. The temperature versus time data was analyzed using the line source method (see page 3) in conformity with ASHRAE and IGSHPA guidelines. A linear curve fit was applied to the average of the supply and return loop temperature data between 10 and 42.0 hours. The slope of the curve fit was found to be 3.50. The resulting thermal conductivity was found to be **1.31 Btu/hr-ft-°F (2.28 W/m-K)**.

THERMAL DIFFUSIVITY

The reported drilling log for this test borehole indicated that the formation consisted of topsoil, sand, shale and limestone. Heat capacity values for shale and limestone were calculated from specific heat and density values listed by Kavanaugh and Rafferty[3]. A weighted average of heat capacity values based on the indicated formation was used to determine an average heat capacity of 35.1 Btu/ft^3-°F for the formation. A diffusivity value was then found using the calculated formation thermal conductivity and the estimated heat capacity. The thermal diffusivity for this formation was estimated to be **0.90 ft^2/day (0.0097 cm^2/s)**.

[3]Stephen P. Kavanaugh and Kevin Rafferty, Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems (Atlanta: ASHRAE, 2014), 75.

BORE THERMAL RESISTANCE

Resistance to heat transfer from a geothermal bore can be viewed as consisting of two components, bore resistance and ground resistance. This relationship is diagrammed in Figure 3, where t_f is the loop fluid temperature, t_b is the bore wall temperature and t_g is the ground temperature. The ground resistance is dependent upon the formation thermal conductivity and diffusivity. Factors that affect bore thermal resistance include the resistance of the pipe material, diameter of the heat exchanger, position of the heat exchanger in the bore, the bore diameter, casing length and type, and the thermal conductivity of the grout/backfill in the bore annulus. A detailed examination of bore resistance is discussed by Kavanaugh and Rafferty[4].

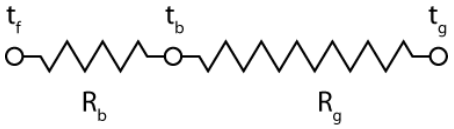


FIG. 3: RESISTANCE DIAGRAM FOR A GEOTHERMAL BORE

Bore thermal resistance calculations were made on the test data according to the formula below as outlined in the Gehlin Doctoral Thesis[5]. The calculated formation thermal conductivity and thermal diffusivity from the Line Source Analysis were used in the formula. The average undisturbed formation temperature of 54.0°F was used as the undisturbed temperature, and the average bore thermal resistance from 10-42.0 hr was found to be **0.170 hr-ft-°F/Btu (0.098 m-K/W)**.

The calculated bore resistances apply only to the test conditions, and a bore in an operating loopfield could have a significantly different resistance due to changes in the loop fluid temperature, flow rate, and presence of antifreeze. Additional information on bore resistance may be found in the study by Oklahoma State University and Oklahoma Gas & Electric where various vertical bore heat exchanger configurations were tested[6].

$$R_b = \frac{H}{Q} * \left\{ T(t) - T_g - \frac{Q}{4\pi\lambda_g H} * \left[Ei\left(\frac{r_b^2}{4\alpha_g t}\right)\right]\right\}$$

Where:

	R_b	Borehole thermal resistance (hr-ft-°F/Btu)
	H	Active U-bend depth (ft)
	Q	Average heat injected (Btu/hr)
	$T(t)$	Temperature dependent on time t (°F)
	T_g	Undisturbed ground temperature
	λ_g	Formation thermal conductivity (Btu/hr-ft-°F)
	r_b	Average borehole radius (in)
	α_g	Formation thermal diffusivity (ft^2/hr)

[4]Stephen P. Kavanaugh and Kevin Rafferty, Geothermal Heating and Cooling: Design of Ground-Source Heat Pump Systems (Atlanta: ASHRAE, 2014), pages 58-67.
[5]Gehlin, 12-13.
[6] Beier, R. and Ewbank, G. (2012, August). *In-Situ Test Thermal Response Tests Interpretations, OG&E Ground Source Heat Exchange Study*. Retrieved from https://igshpa.org/research/.

CERTIFICATE OF CALIBRATION

GRTI maintains calibration of the datalogger, current transducer and voltage transducer on a regular schedule. The components are calibrated by the manufacturer using recognized national or international measurement standards such as those maintained by the National Institute of Standards and Technology (NIST).

FTC Unit 252

DA Unit 33

PRIMARY EQUIPMENT		
COMPONENT	CALIBRATION DATE	CALIBRATION DUE DATE
Datalogger	12/30/2021	12/30/2024
Current Transducer	1/19/2022	1/19/2025
Voltage Transducer	1/19/2022	1/19/2025

GRTI periodically verifies the combined temperature sensor/datalogger accuracy via a water bath. Temperature readings are simultaneously taken with a digital thermometer that has been calibrated using instruments traceable to NIST.

DATE	3/12/2023	4/24/2023		
THERMOCOUPLE 1 (°F)	49.3 49.3 49.4	66.9 67.0 67.0		
THERMOCOUPLE 2 (°F)	49.3 49.4 49.4	66.9 67.0 67.0		
THERMOCOUPLE 3 (°F)	49.2 49.3 49.4	66.9 67.1 67.1		
THERMOCOUPLE 4 (°F)	49.3 49.4 49.4	67.0 67.1 67.1		
DIGITAL THERMOMETER (°F)	49.2 49.3 49.4	67.1 67.1 67.2		

ORBIT ENGINEERING
Consulting Engineers

GEOTECHNICAL INVESTIGATION

PROPOSED NEW HIGH PARK VISITOR AND NATURE CENTRE

375 COLBORNE LODGE DRIVE, TORONTO, ON

Prepared For:

CITY OF TORONTO

(Contract 47024684)

Prepared by:

ORBIT ENGINEERING LIMITED

Project No. OE231465DG

March 31, 2023

Orbit Engineering Limited
9-1900 Clark Boulevard Brampton ON L6T 0E9
www.orbitengineering.ca info@orbitengineering.ca

ORBITENGINEERING
Consulting Engineers

March 31, 2023

City of Toronto
Parks, Forestry & Recreation, Parks Development & Capital Projects
Etobicoke Civic Centre,
399 The West Mall, 2nd Floor,
Toronto, Ontario, M9C 2Y2
Email :John.Keen@toronto.ca

Attention: John Keen, Project Manager

RE: Geotechnical Investigation
Proposed New High Park Visitor and Nature Centre
375 Colborne Lodge Drive, Toronto, ON

Enclosed is a copy of the geotechnical investigation report related to the above noted site.

For and on behalf of Orbit Engineering Limited

Hafiz Muneeb Ahmad, M.Eng., M.Sc., P.Eng., QP_{ESA}, Consulting Engineer
Senior Principal Engineer
Email: hafiz.ahmad@orbitengineering.ca
M: +1 647 983 3155

Executive Summary

A geotechnical investigation based on seven boreholes (BH1/MW - BH5/MW, BH6 & BH7) and one test pit (TP1) was carried out for the proposed building addition and /or modification to the existing building structure at the site. The project site is located at 375 Colborne Lodge in Toronto, Ontario. Six boreholes (BH1/MW-BH5/MW & BH7) were drilled outside the existing building structure, and one borehole (BH6) was drilled inside at the basement level. The approximate Project site location plan and approximate location of boreholes are shown on **Drawings 1 and 1A.**

Based on the information provided by the client to Orbit, it is our understanding that the project will undergo significant addition and/or modification to the existing building structure with unfinished basement. The client document provided to Orbit is attached in **Appendix E**.

Topsoil was measured 150 – 200 mm at boreholes excluding BH1/MW & BH6 where pavement structure (i.e. Asphalt approximate 50mm and possible fill was observed). It should be noted that the thickness of the topsoil and asphalt explored at the borehole locations may not be representative for the site and should not be relied on to calculate the amount of topsoil and asphalt quantities at the site.

Underneath the topsoil/pavement structure, fill and/or possibly fill material was encountered in all boreholes. The explored possible fill extended to approximate depths of 0.6 to 2.3m below the existing ground surface. The explored fill/possibly fill generally consisted of silty sand, brown, moist, in very loose to compact state.

Native deposits were encountered underlying the earth fill/possibly fill in boreholes. The native materials at borehole locations predominantly consisted of greyish brown to grey, moist, compact to very dense sandy silt to silty sand with trace clay. These sandy deposits extended to maximum explored depths of 9.8-18.9m in (BH1/MW- BH5/MW), 4.1m and 2.1m in (BH6 & BH7) below the existing ground surface.

During drilling and at completion of drilling, no ground water was found in all Boreholes/Monitoring wells. Groundwater levels in the Boreholes/Monitoring wells (BH1/MW-BH5/MW) were measured for an extended period of time (Please see **Table 3.2** for details). A perched water condition can occur due to the accumulation of surface water at the interface of fill and native soils. It should be noted that groundwater levels vary and are subjected to seasonal fluctuations and can respond to major precipitation events. The depth of groundwater table can also be influenced by the presence of underground features such as utility trenches.

The proposed building addition can be supported on conventional spread and/or strip footings founded on the undisturbed native soil for a geotechnical reaction of 150 kPa at the Serviceability Limit States (SLS) and a factored geotechnical resistance (with geotechnical resistance factor of 0.5) of 225 kPa at the Ultimate Limit State (ULS)**.** The recommended founding levels and geotechnical resistance for the proposed building addition will need to be confirmed by Orbit at the time of construction. Underpinning may be required to support the existing building structure. The recommendations for underpinning are outlined on **Drawings 10 and 11.**

The depth of the existing perimeter wall footing is 1330 mm below the existing grade. The undisturbed native compact silty sand to sandy silt underneath the existing perimeter footing at the test pit location (TP1) can

support a geotechnical reaction of 150 kPa at Serviceability Limit States (SLS) and a factored geotechnical resistance (with geotechnical resistance factor of 0.5) of 225 kPa at the Ultimate Limit State (ULS).

The basement floor slab can also be supported on grade provided the existing fill/possible fill and surficial weak/softened native soil are removed and the base thoroughly proof rolled. Any soft or unstable areas detected are further sub-excavated and replaced with imported Granular A and/or Granular B Type 2. The imported granular material must meet the specifications defined in OPSS-1010-13. The existing fill free from topsoil and organics may be used to raise the grade, provided it should be confirmed by a qualified geotechnical professional from Orbit at the time construction. The fill required to raise the grade must be placed in shallow lifts (each lift not more than 200mm) and compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the on-site possible fill, loose to compact silty sand above water table can be classified as **Type 3 soils**. The native soils consisting of dense to very dense sandy silt to silty sand can be classified as **Type 2 soils**. Wet sandy deposits (if encountered) can be classified as **Type 4 soils**. As a general rule, the excavations in Type 2 soils can be carried out without support using side slopes 1H:1V, while the bottom 1.2m of the excavation can be cut vertically and could retain the wall for a short period of time. The excavation in Type 3 soil can be carried out maintaining the side slopes not steeper than 1H:1V. The excavations in Type 4 soils will require minimum flatter side slopes of 3H to 1V. These slopes should be visually monitored for any movement especially if workers are present within the excavation. These temporary slopes should only be utilized for a short duration. If an excavation contains more than one type of soil, the soil shall be classified as the type with the highest number among the types of present.

Excavations can be carried out with heavy hydraulic backhoe. Based on the borehole information, no major problems with groundwater are anticipated for the proposed excavations. It is expected that any seepage, which occurs during wet periods through possible fill or native soils, can be removed by conventional pumping from sumps for excavation.

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2015, the subject site for the proposed structure can be classified as Class ‘D’ for seismic site response. Consideration could be given to conduct an earthquake site assessment with the use of in-situ testing of the seismic characteristics (i.e., Geophysical testing – Multi-channel Analysis of Surface Waves-MASW) which may lead to an improved site classification (i.e., from Class D to Class C).

TABLE OF CONTENTS

DRAWINGS

Drawing #	Description
Drawing 1	Site Location Plan
Drawing 1A	Borehole Location Plan
Drawing 1B	Notes on Sample Descriptions
Drawing 2-8	Borehole Logs
Drawing 9	Drainage and Backfill recommendations
Drawing 10	Guidelines for underpinning in soils
Drawing 11	Underpinning Details

TABLES

APPENDICES

1 INTRODUCTION

Orbit Engineering Limited (Orbit) was retained by the City of Toronto to undertake a geotechnical investigation for the proposed building addition to the existing High Park Visitor and Nature Centre. The project site is located at 375 Colborne Lodge, Toronto, Ontario. The approximate Project site location plan and approximate location of boreholes are shown on **Drawings 1 and 1A.**

This work was conducted initially in accordance with Blanket Order Contract# 47024684, our proposal OE231465DG, dated January 19, 2023, under the Purchase Order # 9520273 by the City of Toronto. The award letter E-mail was issued to Orbit on January 23, 2023.

Based on the information provided by the client to Orbit, it is our understanding that the project will undergo significant addition and/or modification to the existing building structure with unfinished basement. The client document provided to Orbit is attached in **Appendix E**.

The purpose of this investigation was to assess the subsurface conditions at seven (7) borehole locations (BH1/MW-BH5/MW, BH6 and BH7) and one (1) test pit location at the subject referenced site and from the findings in the boreholes make geotechnical engineering recommendations for the following:

1. Foundations
2. Floor slab and permanent drainage
3. Excavations and backfill
4. Earth pressures
5. Pavement
6. Earthquake considerations
7. Corrosivity test results
8. Environmental considerations

This report is provided on the basis of the terms of reference presented above and, in the text, and on the assumption that the design will be in accordance with the applicable codes and standards. If there is any change in the design features relevant to the geotechnical analyses, or if any question arises concerning the geotechnical aspects of the codes and standards, Orbit should be contacted to review the design. It may then be necessary to carry out additional boring and reporting before the recommendations of Orbit can be relied upon.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for The City of Toronto and its architects, consultants, contractors, and designers. Third party use of this report without Orbit's consent is prohibited. The limitation conditions

presented in **Appendix A** form an integral part of the report and they must be considered in conjunction with this report.

2 FIELD AND LABORATORY WORK

Borehole locations for this investigation were established by the client and were marked on the ground by Orbit personnel in accordance with the client requirements. Prior to drilling operations, underground utilities were cleared at the borehole locations by the public utilities' companies. A private locator firm was also engaged to confirm that the borehole locations were clear from the underground services.

For this geotechnical investigation, seven (7) boreholes were drilled out which five boreholes (BH1/MW-BH5/MW) were converted to monitoring wells. (BH1/MW) was drilled to a maximum depth of 18.9m, four boreholes (BH2/MW-BH5/MW) were drilled to a maximum depth of 9.8m, one borehole (BH7) was drilled to an approximate depth of 2.1m, and one borehole (BH6) was drilled in the basement area to an approximate depth of 4.1m. The boreholes were advanced at the site in the month of February 2023, and March 2023 by a specialist drilling sub-contractor (TCI) under full-time supervision of Orbit staff with a CME75 drill rig using continuous-flight auger equipment (0.2m hollow stem augers). Portable drilling equipment was used for borehole BH6.

Samples were retrieved at regular intervals with a 50mm O.D. split-barrel sampler driven with a hammer weighing 624 N (63.5 kg) and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method (ASTM D1586). The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 300 mm (12 inches) was recorded as SPT 'N' value of the soil which indicated the consistency of cohesive soils or compactness of non-cohesive soils. The results of SPT are shown in the Record of Boreholes.

The samples were logged in the field and returned to the Orbit Engineering Limited laboratory for detailed examination by the project engineer and for laboratory testing. The approximate borehole locations are shown on **Drawing 1A**.

Water level observations were made during drilling and at the completion of the drilling operations. Groundwater level was measured in the monitoring wells installed by Orbit (please see Table 3.1 and Table 3.2 for details). The remaining boreholes were backfilled upon completion as per current regulations.

The borehole elevations were interpreted from the topographical survey provided by the client to Orbit. Note, these elevations are approximate and only for the purpose of relating borehole soil stratigraphy and should not be used or relied on for other purposes.

As well as visual examination in the laboratory, all soil samples retrieved from the boreholes were tested for water content determinations. Grain Analysis tests were carried out on the selected soil samples (BH1/MW- SS3, SS4 & SS13), shown on Figure **B1**(**Appendix B**) and presented in **Table 2.1.**

Table 2.1 Summary of Grain Size Tests

Sample Detail	Approximate Depth Below the Existing Ground Surface (m)	Approximate Geodetic Elevation (m)	Type of Test	Lab Results
BH1/MW-SS3	1.5 - 2.1	107.6 – 107.0	MH	Figure B1
BH1/MW-SS4	2.3- 2.9	106.8 – 106.2	MH	Figure B1
BH1/MW-SS13	15.2-15.8	93.9 – 93.3	MH	Figure B1

Note:

- MH stands for sieve and Hydrometer Analysis

In addition to boreholes, one test pit (TP1) was excavated to a depth of 1.3m, to explore details of the existing perimeter footing adjacent to proposed building addition.

3 RESULTS OF THE INVESTIGATION

The site was generally flat at the borehole locations. The approximate site location plan and approximate borehole/monitoring wells are presented on **Drawings 1 & 1A.** Notes on sample descriptions and the general features of fill material and native soils are presented on **Drawing 1B**. Detailed subsurface conditions are presented on borehole log sheets, attached as **Drawings 2 to 8.**

Details of the subsurface conditions encountered at the borehole locations are provided on the borehole logs following the text of this report. The borehole logs indicate the subsurface conditions only at the borehole locations. Note the material boundaries indicated on the attached sheets are approximate and based on visual observations. These boundaries typically represent a transition from one material type to another and should not be regarded as an exact plane of geological change. It should be pointed out that the subsurface conditions will vary across this site. The subsurface soil and groundwater conditions are summarized as follows.

3.1 Subsurface Conditions

In general, below the topsoil/pavement structure, the site is underlain by fill/possibly fill materials and native soils. The subsurface conditions encountered in the boreholes are summarized as follows.

3.1.1 Topsoil

A topsoil layer was encountered at the ground surface at the boreholes (BH2/MW to BH5/MW & BH7). The thickness of topsoil was measured in the range of 150 to 200 mm. The data provided here pertaining to the topsoil thickness is confirmed at the borehole locations only and may vary between and beyond the boreholes. This information may not be considered sufficient for estimating topsoil quantities and associated costs.

3.1.2 Pavement Structure

One borehole (BH1/MW) was drilled on February 15, 2023, on the existing pavement structure (i.e., Parking area) and encountered 50 mm thickness of asphalt overlying on fill and/or possibly fill material.

3.1.3 Possible Fill

Underneath the topsoil/pavement structure, fill and/or possibly fill material was encountered in all boreholes. The explored possible fill extended to approximate depths of 0.6 to 2.3m below the existing ground surface. The explored fill/possibly fill generally consisted of silty sand, brown, moist, in very loose to compact state.

3.1.4 Sandy Silt to Silty Sand

Native deposits were encountered underlying the earth fill/possibly fill in boreholes. The native materials at borehole locations predominantly consisted of greyish brown to grey, moist, compact to very dense e sandy silt to silty sand with trace clay. These sandy deposits extended to maximum explored depths of 9.8-18.9m in (BH1/MW- BH5/MW), 4.1m and 2.1m in (BH6 & BH7) below the existing ground surface.

It should be noted that the thickness of native deposit could vary between and beyond the borehole locations within the depth of investigation, and this should be taken into account when estimating.

The typical grain size distribution of the sandy deposits (BH1/MW-SS3, BH1/MW-SS4, BH1/MW-SS13) shows the following gradation:

Gravel:	0 - 2%
Sand:	24 - 85%
Silt:	9 - 68%
Clay:	2 - 8%

3.2 Groundwater Conditions

During drilling and at completion of drilling, there was no ground water found in the boreholes. Groundwater levels in the monitoring wells BH1/MW-BH5/MW installed by Orbit were recorded for an extended period of time (please see **Tables 3.1** and **3.2** for details). A perched water condition can occur due to the accumulation of surface water at the interface of fill and native soil. It should be noted that groundwater levels vary and are subjected to seasonal fluctuations and can respond to major precipitation events. The depth of groundwater table can also be influenced by the presence of underground features such as utility trenches. Detailed comments on Groundwater condition will be provided in a separate report (Hydrogeological Investigation Report)

Table 3.1: Groundwater Levels Observed in Boreholes

BH No.	Date of Drilling	Date of Water Measurement	Depth/Elevation of Groundwater (m)
BH6	March 06, 2023	During Drilling	Dry/102.9
		At Completion	Dry/102.9
BH7	February 15, 2023	During Drilling	Dry / 108.0
		At Completion	Dry / 108.0

Table 3.2: Groundwater Levels Observed in Monitoring Wells

BH No.	Date of Water Measurement	Depth/Elevation of Groundwater (m)	Total Depth/Elevation of Monitoring Well (m)
BH1/MW	Feb 15, 2023	Dry	18.9/ 90.2
	Mar 06, 2023	Dry	
	Mar 30, 2023	Dry	
BH2/MW	Feb 15, 2023	Dry	9.8/ 99.7
	Mar 06, 2023	Dry	
	Mar 30, 2023	Dry	
BH3/MW	Feb 15, 2023	Dry	9.8/98.7
	Mar 06, 2023	Dry	
	Mar 30, 2023	Dry	
BH4/MW	Feb 15, 2023	Dry	9.8/97.5
	Mar 06, 2023	Dry	
	Mar 30, 2023	Dry	
BH5/MW	Feb 15, 2023	Dry	9.8/96.5
	Mar 06, 2023	Dry	
	Mar 30, 2023	Dry	

4 DISCUSSION AND RECOMMENDATIONS

It is our understanding that the project will consist of of building addition to the existing building structure. Based on the information retrieved from boreholes, our geotechnical recommendations are provided in the following sections.

The following section of the report provides our interpretation of the factual geotechnical data obtained during our field evaluation and is intended for the guidance of the design engineer only. Where comments are made on aspects of construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors bidding on or undertaking the work should make their own interpretation of the subsurface information provided as it affects their proposed construction methods, equipment selection, scheduling, safety, and the like.

The boreholes BH1/MW-BH5/MW, BH6 and BH7 were drilled and sampled within the footprints of the proposed building addition. The fill/possibly fill depth at these boreholes varies from 0.6m to 2.3m (corresponding to geodetic elevations 106.4m to 106.8m) below the existing grade.

4.1 Foundation

The proposed structures foundations can be supported on conventional spread and/or strip footings founded on the undisturbed native soil for a geotechnical reaction of 150 kPa at the Serviceability Limit States (SLS) and a factored geotechnical resistance (with geotechnical resistance factor of 0.5) of 225 kPa at the Ultimate Limit State (ULS)**.** The recommended founding levels and geotechnical resistance for the proposed building structures will need to be confirmed by Orbit at the time of construction.

One test pit (TP1) was excavated on March 7, 2023, to assess the condition of the existing perimeter footing using a rubber-tired backhoe. under the observation of Orbit personnel. The test pit was excavated to an approximate depth of 1.3m below the existing ground surface.

The approximate test pit locations in the plan are shown on **Drawing 1A.** The summary of our findings in the test pit is summarized on

Table 4.1:

Table 4.1: Summary of Findings at Test Pit

Test Pit No.	Approximate Location	Depth below Existing Grade(mm)/Elevation (m)	Thickness of Footing (mm)	Footing Projection (mm)	Founding Soil
TP1	South-East Corner of the existing building	1330 / 106.35	260	130 on East 230 on South	Sandy Silt

The depth of the existing perimeter wall footing 1330 mm below existing grade while the footing projection is 130mm on the east and 230mm on the south. The thickness of the existing wall footing was measured 260mm at the test pit location.

The undisturbed native sandy silt to silty sand underneath the existing perimeter footing at the test pit location (TP1) can support a geotechnical reaction of 150 kPa at Serviceability Limit States (SLS) and a factored geotechnical resistance (with geotechnical resistance factor of 0.5) of 225 kPa at the Ultimate Limit State (ULS).

In the vicinity of the existing buried utilities, all footings must be lowered to undisturbed soils, or alternatively, the services must be structurally bridged. The footings should not be lowered to wet sandy deposits.

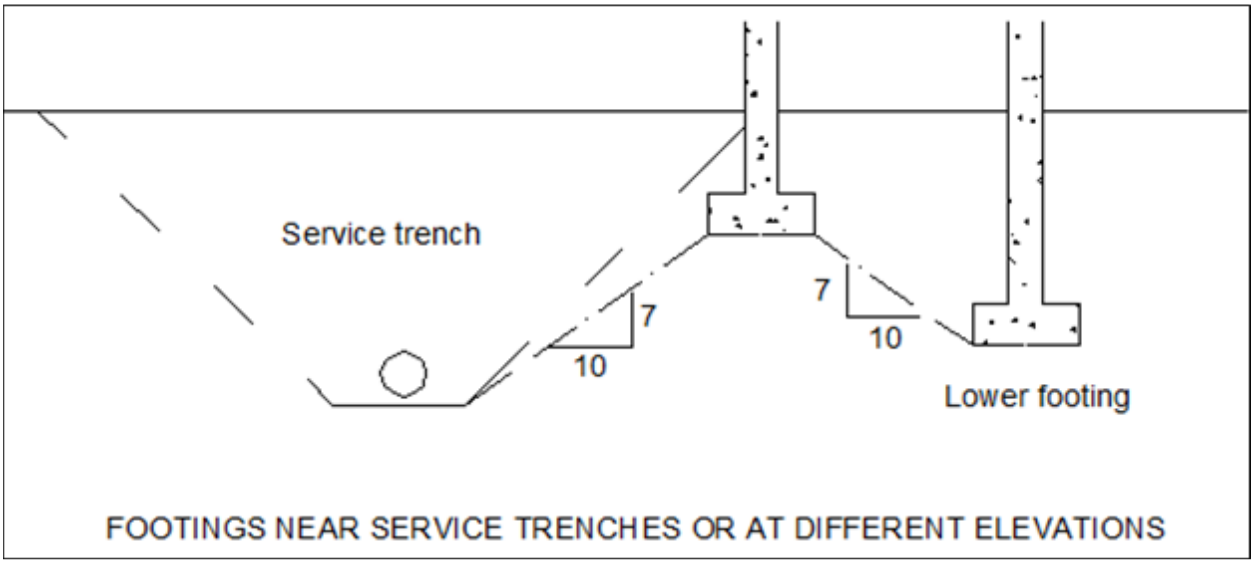
Considering the cohesionless soils, the base of footings can easily be disturbed by foot traffic and should be covered by 50mm of skim coat concrete immediately after cleaning and inspection.

During winter construction, foundations and slab on grade must not be poured on frozen soil. Foundations must always be adequately protected from cold weather and freezing conditions.

Footing exposed to seasonal freezing conditions should be provided with at least 1.2m of earth cover or equivalent thermal insulation against frost action. Foundations designed to the specified bearing capacity at the serviceability limit states (SLS) are expected to settle less than 25mm total and 19mm differential.

Where it is necessary to place footings at different levels, the upper footing must be found below an imaginary 10 horizontal to 7 vertical line drawn up from the base of the lower footing. The lower footing must be installed first to help minimize the risk of undermining the upper footing. Should any excavation extend below the existing footing within the influence zone of imaginary 10 horizontal to 7 vertical line from the base of the existing footing, underpinning will be required. The general guideline and detail for underpinning is presented on **Drawings 10 and 11.** Footing close to underground services should also be set back from the services based on this slope limitation as shown on the following figure.

The recommended bearing capacities and the corresponding founding elevations would need to be confirmed by the representative of Orbit during construction. It should be noted that the recommended bearing capacities have been calculated by Orbit from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by Orbit to validate the information for use during the construction stage.



FOOTINGS NEAR SERVICE TRENCHES OR AT DIFFERENT ELEVATIONS

4.2 Floor Slab and Permanent Drainage

The basement floor slab can also be supported on grade provided the existing fill and surficial weak/softened native soil are removed and the base thoroughly proof rolled. Any soft or unstable areas

detected are further sub-excavated and replaced with imported Granular A and/or Granular B Type 2. The imported granular material must meet the specifications defined in OPSS-1010-13. The existing fill free from topsoil and organics may be used to raise the grade, provided it should be confirmed by a qualified geotechnical professional from Orbit at the time construction. The fill required to raise the grade must be placed in shallow lifts (each lift not more than 200mm) and compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

A moisture barrier consisting of at least 200mm thick layer of well compacted 19mm clear crushed stone is recommended to place directly under the floor slab. The stone bed would act as a barrier and prevent capillary rise of moisture from the subgrade to the floor slab. This moisture barrier has been proven to be effective for conventional floor surfaces such as carpet, vinyl tile and ceramic tile. However, if special floor coverings such as sheet P.V.C. with heat sealed seams, as is used in gymnasiums, is considered, either a high efficiency vapour barrier or venting may be required to prevent moisture accumulating between the concrete floor and the P.V.C. flooring.

The estimated modulus of subgrade reaction (ks) equal to 30MN/m^3 may be used for the design of slab-on-grade supported on native soils, provided that the construction is in accordance with the recommendations provided herein. If the engineered fill (Granular A or B Type II) having minimum thickness of 300mm, this value can be increased to 35MN/m^3. The estimated value provided above may need to be adjusted based on the structure size and locations of detail design.

The basement floor slab should not be tied to any load-bearing walls or columns unless they have been designed accordingly. Contraction/expansion joints should be provided for the slabs as required by the structural engineer.

To err on the conservative side, a perimeter drainage system and one row of underfloor drainage will be required along the exterior basement walls. The perimeter drainage system shown on **Drawing 9** is recommended for the basement walls where open cut procedures are used.

It should be noted that permanent, fail-safe drainage should be designed around any depressed areas such as below grade pits, as well as behind retaining walls (if applicable).

Frost Slab or adequate thermal insulation is required for any exterior slab which is sensitive to movement (e.g., sidewalk in front of the doors). The remaining portion of the exterior slab which is not sensitive to movement (e.g., regular sidewalks) does not require thermal insulation subject to placement of adequate granular base (min 200mm to 300mm thick), and positive drainage of the granular base. Differential frost heave should be expected where frost slab (or slab with thermal insulation) about the slab without any thermal insulation (e.g., away from the doors) or asphalt.

4.3 Excavation and Backfill

Excavations can be carried out with heavy hydraulic backhoe. Based on the borehole information, no major problems with groundwater are anticipated for the proposed excavations. It is expected that any

seepage, which occurs during wet periods through fill or native soils, can be removed by conventional pumping from sumps for excavation.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the on-site possible fill, loose to compact silty sand above water table can be classified as **Type 3 soils**. The native soils consisting of dense to very dense sandy silt to silty sand can be classified as **Type 2 soils**. Wet sandy deposits (if encountered) can be classified as **Type 4 soils**. As a general rule, the excavations in Type 2 soils can be carried out without support using side slopes 1H:1V, while the bottom 1.2m of the excavation can be cut vertically and could retain the wall for a short period of time. The excavation in Type 3 soil can be carried out maintaining the side slopes not steeper than 1H:1V. The excavations in Type 4 soils will require minimum flatter side slopes of 3H to 1V. These slopes should be visually monitored for any movement especially if workers are present within the excavation. These temporary slopes should only be utilized for a short duration. If an excavation contains more than one type of soil, the soil shall be classified as the type with the highest number among the types of present.

The existing fill free from topsoil and native soils can be used as general construction backfill where it can be adequately compacted with suitable type compactors. Loose lifts of soil, which are to be compacted, should not exceed 200 mm. Noted that the excavated soils are subject to moisture content increase during wet weather which would make these materials too wet for adequate compaction. Stockpiles should therefore be compacted at the surface or be covered with tarpaulins to help minimize moisture intake.

Imported granular fill, which can be compacted with handheld equipment, should be used in confined areas.

The excavated soils are not considered to be free draining. Where free draining backfill is required, imported granular fill such as OPSS Granular B should be used.

Stockpiles should be placed well away from the edge of excavation and their height should be controlled so that they do not surcharge the sides of the excavation. Surface drainage should be controlled to prevent flow of surface water into the excavations. Excavation safety and stability of temporary construction slopes and lateral support systems are the contractor's responsibility.

During winter construction, concrete and/or fill must not be placed on frozen fill or soil. Subgrades and foundations must be placed adequately protected at all times from cold weather and freezing conditions.

4.4 Earth Pressure

The lateral earth pressures acting on retaining walls or underground structures may be calculated from the following expression:

$$p = K(\gamma h + q)$$

Where p = Lateral earth pressure in kPa acting at depth h

K	=	Earth pressure coefficient equal to 0.5 for vertical walls and horizontal Granular B backfill used for permanent construction. Water pressure must be considered if continuous wall drains are not used.
γ	=	Unit weight of backfill, a value of 20.5 kN/m^3 may be assumed
h	=	Depth to point of interest in meters
q	=	Equivalent value of surcharge on the ground surface in kPa

The above expression assumes that the perimeter drainage system prevents the buildup of any hydrostatic pressure behind the wall.

4.5 Pavement

Superpave asphalt mixes is mandatory to be used in this project based on the guidelines provided by the city of Toronto. The mix design shall be the responsibility of the Contractor. The JMFs selected for use by the Contractor shall produce HMA that is in accordance with the requirements of OPSS.MUNI 1101 and TS-1151 Material Specifications for Superpave, Stone Mastic, and Warm Mix Asphalt. The recommended Hot Mix Asphalt (HMA) type to be used in this project is provided in **Table 4.3**. All asphalt layers should be tested for all asphalt parameters and for compaction during the construction to meet the materials specifications for Superpave Stone Mastic, and Warm Mix Asphalt OPSS.MUNI 1101 and TS-1151.

Table 4.2: Recommended Mix Types for Surface and Base course

Pavement Layer	Hot Mix Type	Thickness, mm
Surface Layer	Superpave 9.5 (SP-9.5)	40
Base Layer	Superpave 19 (SP-19.0)	80

All paved surfaces should be sloped to provide satisfactory drainage towards catch basins. Installation of full-length subdrains on all roads is recommended. The subdrains should be properly filtered to prevent the loss of (and clogging by) soil fines.

Alternatively, consideration should be given to the use of rigid Portland Cement Concrete pavement where there is intense truck use, parking and turning of vehicles. The following **Table 4.4** provides the minimum recommended rigid pavement structure.

Table 4.3: Minimum Rigid Concrete Pavement Structure

Pavement Layer	Compaction Requirements	Heavy Duty Pavement
Portland Cement Concrete (CAN3-CSA A23.1) - Class C-2	CAN3-CSA A23.1	225mm

Pavement Layer	Compaction Requirements	Heavy Duty Pavement
Base Course: Granular A (OPSS 1010) or 19 mm Crusher Run Limestone	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150mm

It must be noted that this structure does not provide full protection of the subgrade from frost penetration; therefore, the pavement slabs must be separated from the building structure.

Concrete should be proportioned, mixed, placed and cured in accordance with the requirements of CSA Standard CAN/CSA-A23.1-14 for class C-2 exposure, with the following key requirements:

- Minimum 28-day compressive strength: 32 MPa
- Air entrainment (14-20mm): 5 to 8 %
- Maximum water/cementing material ratio: 0.45

Concrete should be placed and spread in a manner which avoids segregation. It should be consolidated with a vibratory screed or internal vibrators. Consolidation close to form edges must be given special consideration.

Concrete should be finished to a thickness tolerance of 0 to plus 10mm. Concrete must be cured adequately to provide durability and strength. Curing can be accomplished by wet blankets, sprinkling, plastic sheets and curing compounds. Curing should begin immediately after the loss of bleed water.

Concrete pavement should be provided with joints to control stresses and prevent the formation of irregular cracks. Recommended joint spacing is 24 to 30 times slab thickness to a maximum dimension of about 4.0m. We would also recommend that load transfer dowels be placed at 50 mm spacing at the joints.

Sawed joints should be cut before random cracking occurs in the slab, usually within 6 to 18 hours after concrete placement. The maximum thickness (aperture) of control joints should be 6mm, while the depth of control joints should be about 1/4th of the slab thickness.

The pavement should be closed to traffic until a minimum flexural strength of 2MPa is attained or an approximate compressive strength of 20MPa. This minimum strength is generally reached when the concrete can be saw cut without raveling.

Additional comments on the construction of parking areas and access roadways are as follows:

1. As part of the subgrade preparation, proposed parking areas and access roadways should be stripped of all fill soil, loose to very loose native soil materials within a minimum depth of 0.6m below the underside of the designed subbase and then thoroughly proof rolled by using a loaded truck or a roller with a minimum rated capacity of 20 tons, under the full-time supervision. Any localized soft or unstable areas detected must be further sub-excavated and bridged by using clean fill materials

similar to adjacent areas placed in shallow lifts (maximum 200mm thick and at or near "±2%" optimum moisture contents) and compacted to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD). Similarly, the fill required to raise the grade should consist of inorganic soil, placed in the shallow lifts, and compacted to the afore mentioned SPMDD requirements.

2. The long-term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped (preferably at a minimum grade of two percent) to provide effective surface drainage toward catch basins. Surface water should not be allowed to pond adjacent to the outside edges of pavement areas. Continuous pavement subdrains should be provided along both sides of the driveway/access routes and drained into respective catch basins to facilitate drainage of the subgrade and granular materials. This is particularly important in heavy-duty pavement areas. The subdrain invert should be maintained at least 0.3m below subgrade level. Subdrains should also be provided at all catch basins within the parking area.

3. The locations and extent of sub-drainage required within the paved areas should be reviewed by this office in conjunction with the proposed lot grading. Assuming that satisfactory crossfalls in the order of two percent have been provided, subdrains extending from and between catch basins may be satisfactory. In the event that shallower crossfalls are considered, a more extensive system of sub-drainage may be necessary and should be reviewed by Orbit.

4. The above pavement structure considers that construction will be carried out during the dry period of the year. If the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material or placement of geogrids may be required. The need for additional sub-base material and/or placement of geogrids including filter fabric to stabilize the base is best determined during construction. It is recommended that the existing subgrade be heavily proof rolled prior to placement and any areas showing excessive deflection be replaced prior to placing the granular sub-base material.

5. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavourable weather.

6. It is recommended that Orbit be retained to review the final pavement structure designs and drainage plans prior to construction to ensure that they are consistent with the recommendations.

4.6 Earthquake Considerations

Based on the borehole information and according to Table 4.1.8.4.A of OBC 2015, the subject site for the proposed structure can be classified as Class 'D' for seismic site response. Consideration could be given to conduct an earthquake site assessment with the use of in-situ testing of the seismic characteristics (i.e.,

Geophysical testing – Multi-channel Analysis of Surface Waves-MASW) which may lead to an improved site classification (i.e., from Class D to Class C).

4.7 Corrosivity Test Evaluation

Two (2) selected samples from the native deposit (BH1/MW-SS4, BH3/MW-SS4) were submitted for corrosivity analysis to assess the aggressiveness of soil. The test results for pH and water-soluble sulphate content are presented in **Appendix C** and are also shown in **Table 4.5**.

Table 4.4: Sulphate and PH Test Results of Soil Samples

Sample No.	Depth (m)	pH	Water Soluble Sulphate Content (ppm)
BH1/MW – SS4	2.3-2.9	8.19	Less than detection limit
BH3/MW – SS4	2.3-2.9	8.48	Less than detection limit

According to Table 3 of CSA Standard, CAN/CSA-A23.1-04 the degree of exposure to sulphate attack is negligible at the location of BH1/MW-SS4 & BH3/MW-SS4, therefore normal Portland cement (GU) can be used in the subsurface concrete.

The need for cathodic protection to grey or ductile cast iron pipe is given in the AWWA C105/A21.5-10, Table A1 “Soil-test evaluation”, as enclosed in **Appendix C**. A summary of the evaluation based on the test values is summarized in **Table 4.6**.

Table 4.5: Summary of Test Results for Cathodic Protection

Sample No.	Depth Below the Existing Ground Surface (m)	Assigned Points
BH1/MW – SS4	2.3-2.9	3.0
BH3/MW – SS4	2.3-2.9	3.0

According to the AWWA rating system, the test results give a maximum of 3.0 points, thus cathodic protection is not required.

It should be noted that there may be other overriding factors in the assessment of corrosion potential, such as the application of de-icing salts on the roadway and subsequent leaching into the subsoils, stray currents, etc.

4.8 Soil Electrical Conductivity

The soil electrical conductivity (mS/cm) chemically tested at borehole locations (BH1 & BH7) are 0.27mS/cm and 0.10 mS/cm respectively. The lab test results are attached in **Appendix D**.

4.9 Environmental Considerations

The results of soil chemical analysis with a letter report is attached in **Appendix D** to this report.

5 GENERAL COMMENTS

The recommended bearing capacities and the corresponding founding elevations would need to be confirmed by the representative of Orbit during construction. It should be noted that the recommended bearing capacities have been calculated by Orbit from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field inspections provided by Orbit to validate the information for use during the construction.

In this regard, Orbit should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, Orbit will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The information in this report in no way reflects on the environmental aspects of the soil condition at the site and has not been specifically addressed in this report, since this aspect was beyond the scope and terms of reference. Should specific information be required, additional testing may be required.

6 CLOSURE

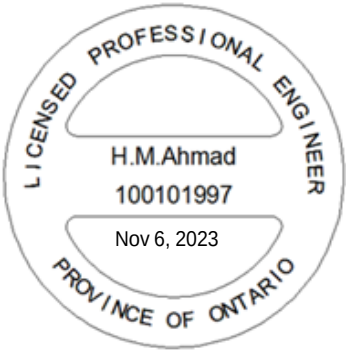
We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

For and on behalf of Orbit Engineering Limited,

Aly Ahmed, Ph.D., P.Eng.
Principal Engineer

Reviewed by

Hafiz Muneeb Ahmad, M.Eng., M.Sc., P.Eng., QP_{ESA}, Consulting Engineer
Senior Principal Engineer



Drawings

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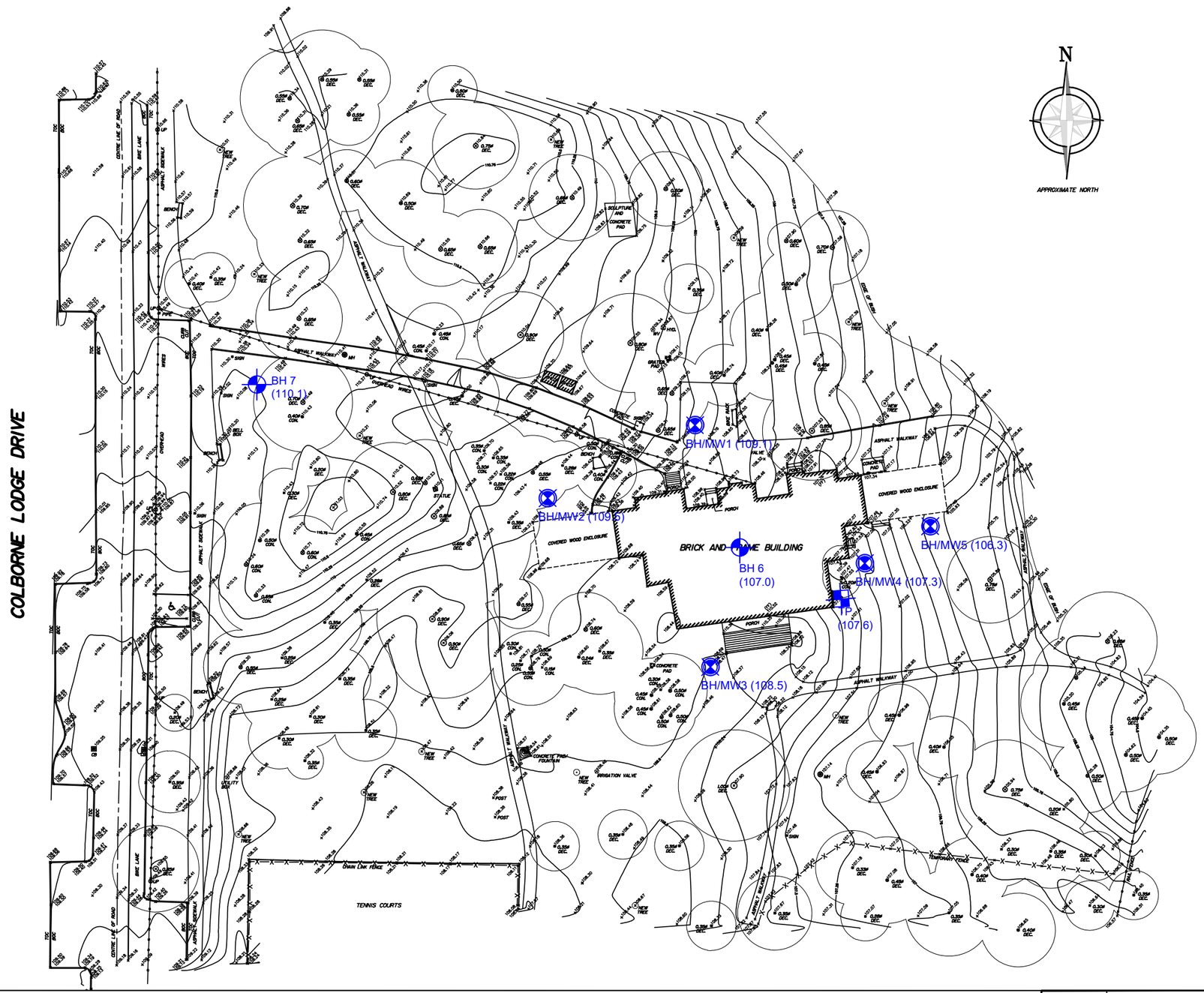
ORBIT ENGINEERING	**APPROXIMATE SITE LOCATION PLAN**		
	Date: **MAR 2023**	**Geotechnical Investigation** **375 Colborne Lodge Drive,** **City of Toronto, ON**	Prepared By: **AM**
	Project: **OE231465DG**		Reviewed By: **HA**
		Prepared for: **City of Toronto**	Drawing No. **1**



TOPOGRAPHIC SURVEY OF

HIGH PARK FOREST SCHOOL CITY OF TORONTO

5 0 5 10 15 20 25 Meters

SCALE 1 : 300

J.H. Gelbloom Surveying Limited
Ontario Land Surveyor
2015

LEGEND

UP	Lamp post
FF	Flood light
CON.	Coniferous Tree
DEC.	Deciduous Tree
ø	Diameter
TOC	Top of Curb
BOC	Bottom of Curb
HYD.	Top of Wall
CB	Catch Basin
MH	Maintenance Hole
WV	Water Valve
123.56	Elevations

METRIC

Distances and Elevations shown on this plan are in metric and can be converted to feet by dividing by 0.3048.

BENCHMARK

Elevations are Referred to the City of Toronto Benchmark No. 1221974001l having an Elevation of 112.971 m.

Topographic Survey completed on the 15th day of July, 2015.

NOTES:

1. The boundaries and soil types have been established only at borehole locations. Between boreholes they are assumed and may be subject to considerable error.
2. Soil samples will be retained in storage for three months and then destroyed unless the client advises an extended time period is required.
3. Asphalt and granular base quantities should not be established from the information provided at the borehole locations.
4. Borehole elevations should not be used to design building(s) or floor slab(s) or parking lot(s) grades.
5. This drawing forms part of the report (project number as referenced) and should only be used in conjunction with this report.

LEGEND

BH6-BH7 — **Approximate Borehole Location**

BH/MW1 - BH/MW5 — **Approximate Borehole/Monitoring Well Location**

TP — **Approximate Test Pit Location**

drawn	AM
approved	HA
date	MAR 2023
scale	As Shown
original size	Tabloid

ORBITENGINEERING
Consulting Engineers

Client: CITY OF TORONTO

Project: NEW HIGH PARK VISITOR AND NATURE CENTRE
375 Colborne Lodge Drive, ON

Title: APPROXIMATE BOREHOLE, MONITORING WELL AND TEST PIT LOCATION PLAN

Project no: OE231465DG

Drawing no: 1A

DRAWING 1B: NOTES ON SAMPLE DESCRIPTIONS

1. **All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Orbit Engineering Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.**

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		

0.002 0.006 0.02 0.06 0.2 0.6 2.0 6.0 20 60 200

EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. **Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc.; none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advice of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.**

3. **Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.**

ORBITENGINEERING

LOG OF BOREHOLE BH1/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834303.46 E 623897.36

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-15-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	ELEVATION
109.1 / 0.0	**Asphalt:** 50mm				
108.9 / 0.2	**Possibly Fill:** silty sand, trace gravel, brown, moist, loose	1	SS	6	
		2	SS	3	108
106.8 / 2.3		3	SS	2	
	Sandy Silt to Silty Sand: trace clay, greyish brown, moist, compact	4	SS	18	
		5	SS	19	106
	grey, dense to very dense below 4.6m	6	SS	55	104
		7	SS	54	
		8	SS	50	102
		9	SS	46	100
		10	SS	48	98
		11	SS	46	
		12	SS	55	96
		13	SS	61	94
		14	SS	52	92
90.2 / 18.9		15	SS	38	
	End of Borehole:				

Notes: MW installed upon completion of drilling, well screen depth (16.7m to 18.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
(20 40 60 80 100)

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)

	GR	SA	SI	CL
	2	85	9	4
	0	37	61	2
	0	24	68	8

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH2/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834293.55 E 623872.05

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 3

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
109.5												
109.4 / 0.1	**Topsoil:** 150mm											
	Possibly Fill: silty sand, brown, moist, loose to compact		1	SS	7		109		○			
1			2	SS	12				○			
108.0												
1.5	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact to dense		3	SS	12		108		○			
2			4	SS	19		107		○			
3			5	SS	24		106		○			
4												
5			6	SS	36		105		○			
6							104					
			7	SS	29		103		○			
7	very dense below 7.6m											
8			8	SS	61		102		○			
9							101					
99.7			9	SS	56		100		○			
9.8	**End of Borehole:**											

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ $^{\varepsilon}$=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH3/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834266.75 E 623900.86

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION
108.5							
108.4 / 0.1	**Topsoil:** 150mm						
	Possibly Fill: silty sand, brown, moist, very loose to loose		1	SS	5		108
1			2	SS	4		
107.0							107
1.5	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact to dense		3	SS	30		
2			4	SS	24		106
3			5	SS	37		105
4			6	SS	38		104
5							
6	very dense below 6.1m		7	SS	90		103
7							102
8			8	SS	85		101
9							100
98.7			9	SS	93		99
9.8	**End of Borehole:**						

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)

POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH4/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834278.12 E 623927.03

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 5

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
107.3												
107.2 / 0.1	**Topsoil:** 200mm											
	Possibly Fill: silty sand, brown, moist, very loose		1	SS	4		107					
106.5												
0.8	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact to dense		2	SS	31		106					
			3	SS	20							
			4	SS	27		105					
			5	SS	23		104					
			6	SS	45		103					
	very dense below 6.1m		7	SS	86		102					
			8	SS	92		101					
			9	SS	98		100					
97.5							99					
9.8	**End of Borehole:**						98					

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH5/MW

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834283.27 E 623935.08

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-16-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 6

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS 0.3 m	ELEVATION
106.3					
106.2	**Topsoil:** 150mm				
0.1	**Possibly Fill:** silty sand, trace gravel, brown, moist, loose to compact	1	SS	9	106
1		2	SS	10	105
104.8					
1.5	**Sandy Silt to Silty Sand:** trace clay, brown, moist, compact	3	SS	16	
2		4	SS	15	104
3	very dense below 3.1m	5	SS	53	103
4					
5		6	SS	51	102
6					101
		7	SS	65	100
7					
8		8	SS	75	99
9					98
96.5		9	SS	82	97
9.8	**End of Borehole:**				

Notes: MW installed upon completion of drilling, well screen depth (7.7m to 8.2m)
Water Levels:
(i) During Drilling: ---
(ii) At completion: Dry
(iii) Mar 6, 2023: Dry
(iv) Mar 30,2023 : Dry

DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa) (20 40 60 80 100)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH6

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834285.53 E 623905.89

DRILLING DATA
Method: Portable Drilling Equipment
Diameter: 50mm
Date: Mar-06-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 7

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
107.0												
0.0	**Possibly Fill:** silty sand, brown, loose		1	SS	7							
106.4												
0.6	**Sandy Silt to Silty Sand:** trace clay, greyish brown, moist, compact		2	SS	10		106					
1												
			3	SS	15		105					
2	dense to very dense below 2.3m		4	SS	49		104					
3			5	SS	55							
			6	SS	62		103					
4												
102.9												
4.1	**End of Borehole:**											

Notes:
Water Levels:
(i) During Drilling: --
(ii) At completion: Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε_f=3% Strain at Failure

ORBITENGINEERING

LOG OF BOREHOLE BH7

PROJECT: Geotechnical & Hydrogeological Investigation
CLIENT: City of Toronto
PROJECT LOCATION: 375 Colborne Lodge, High Park, ON
DATUM: Geodetic
BH LOCATION: Refer to Borehole Location Plan (Drawing 1A) N 4834314.33 E 623824.39

DRILLING DATA
Method: Hollow Stem Auger
Diameter: 200mm
Date: Feb-15-2023

PROJECT NO.: OE231465DG
DRAWING NO.: 8

ELEV / DEPTH (m)	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS "N" 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
110.1												
0.0 / 110.0	**Topsoil:** 150mm											
0.1	**Possibly Fill:** silty sand, brown, moist, very loose to loose		1	SS	4		110		○			
			2	SS	6		109		○			
108.6												
1.5	**Silty Sand to Sandy Silt:** trace clay, greyish brown, moist, compact		3	SS	10				○			
108.0							108					
2.1	**End of Borehole:**											

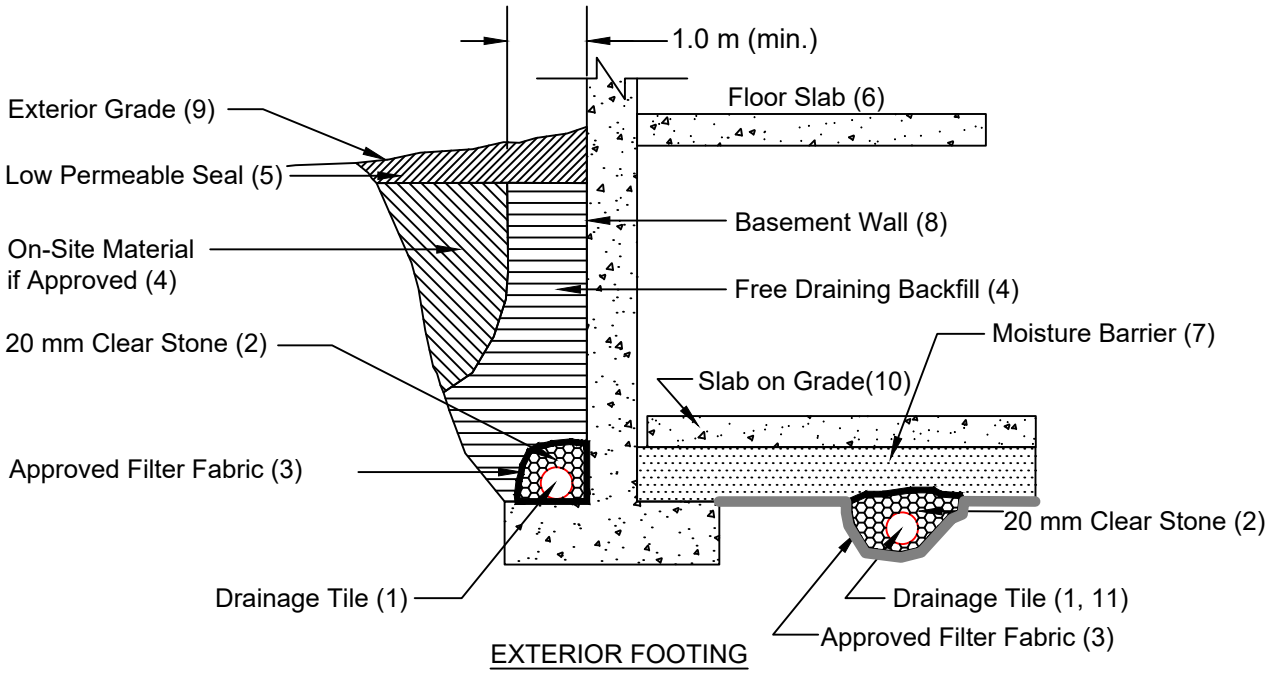
Notes:
(i) During Drilling: Dry
(ii) At completion: Dry

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

Project: OE231465DG

Drawing No. 9



EXTERIOR FOOTING

Notes

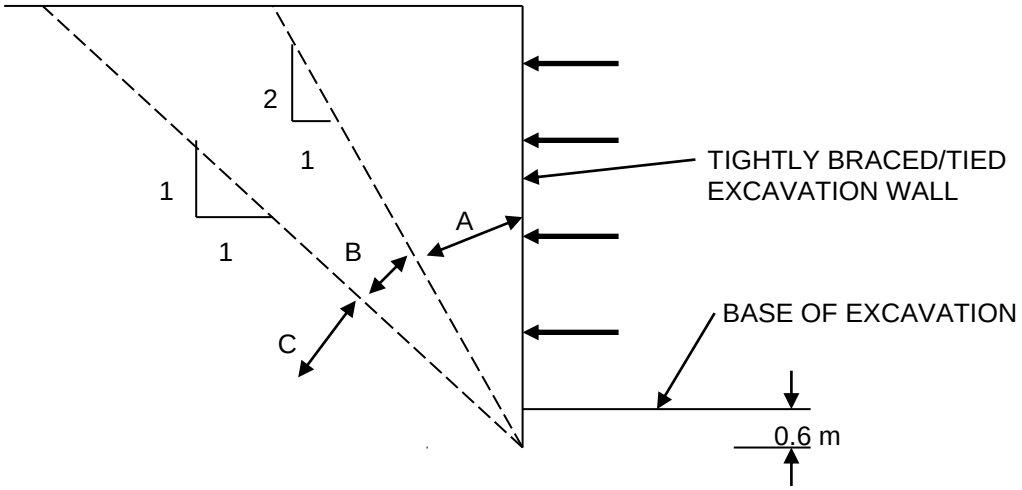
1. Drainage tile to consist of 100 mm (4") diameter weeping tile or equivalent perforated pipe leading to a positive sump or outlet.
2. 20 mm (3/4") clear stone - 150 mm (6") top and side of drain. If drain is not on footing, place100 mm (4 inches) of stone below drain .
3. Wrap the clear stone with an approved filter fabric (Terrafix 400R or equivalent).
4. Free Draining backfill - OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm (18") of the wall. Use hand controlled light compaction equipment within 1.8 m (6') of wall. The minimum width of the Granular 'B' backfill must be 1.0 m.
5. Low permeable backfill seal - compacted clay, clayey silt or paved with concrete/asphalt or equivalent. If original soil is free-draining, seal may be omitted. Maximum thickness of seal to be 0.5 m.
6. Do not backfill until wall is supported by basement and floor slabs or adequate bracing.
7. Moisture barrier to be at least 200 mm (8") of compacted clear 20 mm (3/4") stone or equivalent free draining material. A vapour barrier may be required for specialty floors.
8. Basement wall to be water proofed.
9. Exterior grade to slope away from building.
10. Typically slab on grade is not structurally connected to the wall or footing. However, if it is connected to the wall, it should be designed accordingly.
11. Underfloor drain invert to be at least 300 mm (12") below underside of floor slab.
12. Drainage tile placed in parallel rows 4 to 6 m (15 to 20') centers one way. Place drain on 100 mm (4") clear stone with 150 mm (6") of clear stone on top and sides. Enclose stone with filter fabric as noted in (3).
13. The entire subgrade to be sealed with approved filter fabric (Terrafix 400R or equivalent).
14. Do not connect the underfloor drains to perimeter drains.
15. Review the geotechnical report for specific details. Final detail must be approved before system is considered acceptable.

DRAINAGE AND BACKFILL RECOMMENDATIONS
Basement with Underfloor Drainage

(not to scale)

Project: OE231465DG **Drawing No. 10**

Guidelines for Underpinning in Soil



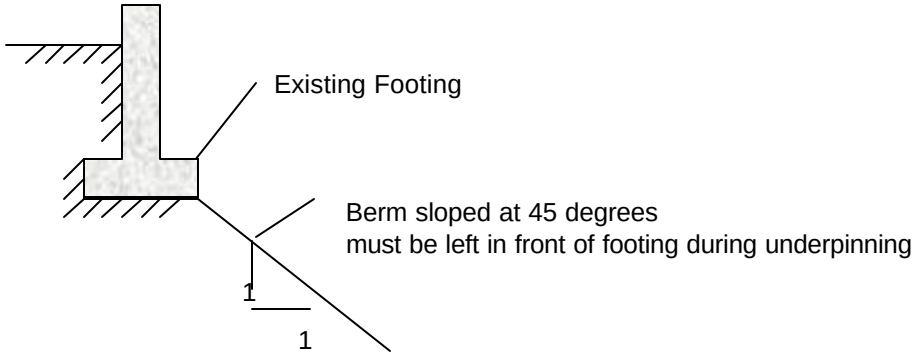
Zone A Foundations located within this zone may require underpinning. Horizontal and vertical pressures on the excavation wall of non-underpinned foundations must be considered. Horizontal and vertical deformations of foundations within this zone must be considered relative to underpinned and non-underpinned foundations.

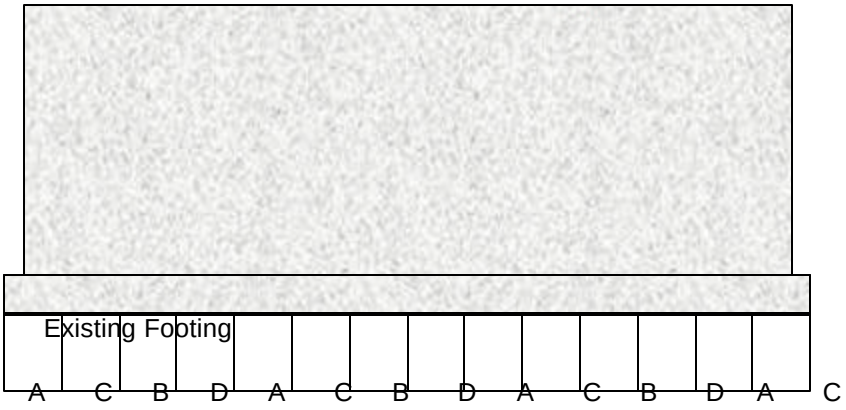
Zone B Foundations located within this zone do not normally require Under-pinning. Horizontal and vertical forces on the excavation wall for non-underpinned foundations must be considered. Horizontal and vertical deformations of foundations within this zone must be considered relative to underpinned and non-underpinned foundations.

Zone C Underpinning to structures is normally founded in this zone. Lateral pressure from underpinning is not normally considered.

(Figure 26.27 from Canadian Foundation Engineering Manual, 4th Edition)

Project: OE231465DG **Drawing No. 11**





Procedures

1. Excavate all A areas, maximum width for concrete footings is 900 mm.
   Reduce to 600 mm or less for a rubble foundation.
2. Form and backfill with concrete to about 50 to 75 mm below the underside of the footing
3. Grout remaining area with dry pack mix (sand and cement mixture)
4. Make sure that the concrete has sufficient strength to carry the loads before excavating area marked B
5. Repeat above procedure for B, C and D areas.

UNDERPINNING DETAIL

Appendix A

Limitations of Report

LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment in light of the information available to Orbit Engineering Limited at the time of preparation. Unless otherwise agreed in writing by Orbit Engineering Limited, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the testhole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the testholes may differ from those encountered at the testhole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the testhole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of testholes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Orbit Engineering Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time. Any user of this report specifically denies any right to claims against the Consultant, Sub-Consultants, their officers, agents and employees in excess of the fee paid for professional services.

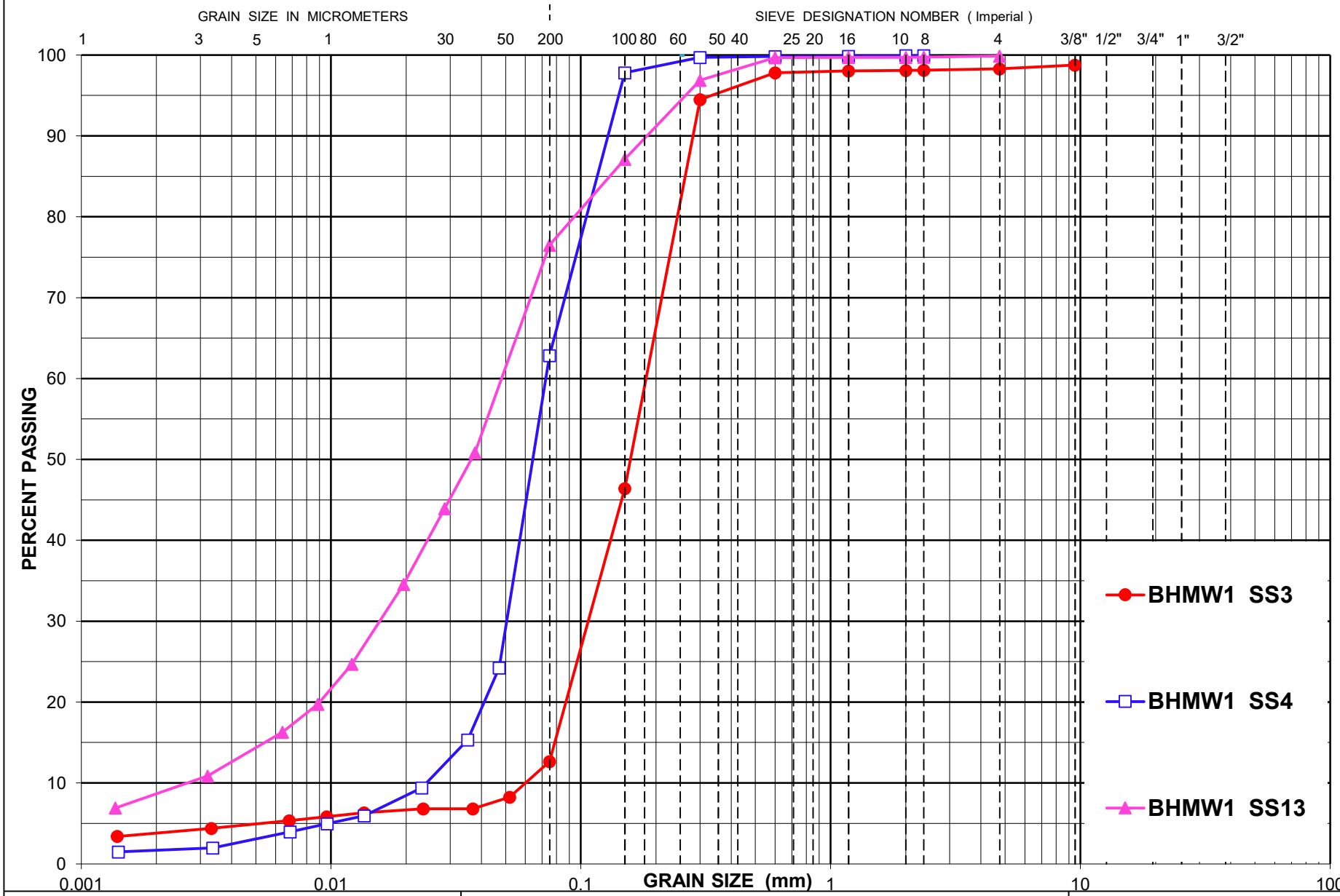
Appendix B

Geotechnical Laboratory Results

LS 702/D 422

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



ORBITENGINEERING
Consulting Engineers

GRAIN SIZE DISTRIBUTION

Figure No.:	B1
PROJECT No. :	OE231465DG
DATE :	Feb. 17, 2023

Appendix C

Corrosivity Test Results

Certificate of Analysis

Environment Testing

Client: Orbit Engineering
1900 Clark Blvd
Brampton, ON
L6T 0E9
Attention: Mr Hafiz Ahmad
Invoice to: Orbit Engineering
PO#:

Report Number: 1994300
Date Submitted: 2023-03-02
Date Reported: 2023-03-17
Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905826
Temperature (C): 6
Custody Seal:

Dear Hafiz Ahmad:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Raheleh Zafari, Environmental Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise stated
.
Eurofins Environment Testing Canada Inc. is accredited by CALA, Canadian Association for Laboratory Accreditation to ISO/IEC 17025 for tests which appear on the scope of accreditation. The scope is available at https://directory.cala.ca/

Please note: Field data, where presented on the report, has been provided by the client and is presented for informational purposes only. Guideline or regulatory limits listed on this report are provided for ease of use (informational purposes) only. Eurofins recommends consulting the official guideline or regulation as required. Unless otherwise stated, measurement uncertainty is not taken into account when determining guideline or regulatory exceedances.

Certificate of Analysis

Client: Orbit Engineering
1900 Clark Blvd
Brampton, ON
L6T 0E9
Attention: Mr Hafiz Ahmad
PO#:
Invoice to: Orbit Engineering

Report Number: 1994300
Date Submitted: 2023-03-02
Date Reported: 2023-03-17
Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905826

Exceedence Summary

Sample I.D.	Analyte	Result	Units	Criteria

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

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Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905826

Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

Redox Potential

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676394 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH1 SS4	Lab I.D. 1676395 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH3 SS4
REDOX Potential	438447		mV		310	269

Subcontract

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676394 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH1 SS4	Lab I.D. 1676395 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH3 SS4
S2-	438855		%		<0.04	<0.04

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Inorganics

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676394 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH1 SS4	Lab I.D. 1676395 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH3 SS4
Chloride	438496	0.002	%		0.016	0.005
Electrical Conductivity	438459	0.05	mS/cm	STD 0.57	0.30	0.09
pH	438459	2.00			8.19	8.48
Resistivity	438459	1	ohm-cm		3333	11111
SO4	438464	0.01	%		<0.01	<0.01

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Quality Assurance Summary

Batch No	Analyte	Blank	QC % Rec	QC Limits	Spike % Rec	Spike Limits	Dup % RPD	Duplicate Limits
438447	REDOX Potential	196 mV	101	97-103			1	
438459	Electrical Conductivity	<0.05	100	90-110			0	0-10
438459	pH	7.01	99	90-110			0	0-1
438459	Resistivity							
438464	SO4	<0.01 %	95	70-130	91		0	-50-50
438496	Chloride		107	90-110			0	
438855	S2-							

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Test Summary

Batch No	Analyte	Instrument	Prep aration Date	Analysis Date	Analyst	Method
438447	REDOX Potential	Manual	2023-03-09	2023-03-09	IP	C SM2580B
438459	Electrical Conductivity	Electrical Conductivity Mete	2023-03-09	2023-03-09	IP	Cond-Soil
438459	pH	pH Meter	2023-03-09	2023-03-09	IP	Ag Soil
438459	Resistivity	Calculation	2023-03-09	2023-03-09	IP	Resistivity - soil
438464	SO4	Manual	2023-03-09	2023-03-09	IP	AG SOIL
438496	Chloride	Manual	2023-03-09	2023-03-10	AET	C CSA A23.2-4B
438855	S2-		2023-03-17	2023-03-17	AET	SUBCONTRACT-SGS

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CWS for Petroleum Hydrocarbons in Soil - Tier 1

Notes:

1. The laboratory method complies with CCME Tier 1 reference method for PHC in soil. It is validated for laboratory use.
2. Where the F1 fraction (C6 to C10) and BTEX are both measured, F1-BTEX is reported.
3. Where the F2 fraction (C10 to C16) and naphthalene are both measured, F2-naphthalene is reported.
4. Where the F3 fraction (C16 to C34) and PAHs* are both measured, F3-PAH is reported.
5. F4G is analyzed if the chromatogram does not descend to baseline before C50. Where F4 (C34 to C50) and F4G are both reported, the higher result is compared to the standard.
6. Unless otherwise stated in the sample comments, the following criteria have been met where applicable:

   - nC6 and nC10 response factors within 30% of response factor for toluene;
   - nC10, nC16, and nC34 response factors within 10% of each other;
   - C50 response factors within 70% of nC10 + nC16 + nC34 average; and,
   - Linearity is within 15%.

7. Unless otherwise stated in the sample comments, sampling requirements and analytical holding times have been met.
8. Gravimetric heavy hydrocarbons (F4G) cannot be added to the C6 and C50 hydrocarbons.
9. *PAHs = phenanthrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene and pyrene.

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Appendix D

Chemical Analysis Results & Chemical Report

ORBIT ENGINEERING
Consulting Engineers

City of Toronto
Parks, Forestry & Recreation, Parks Development & Capital Projects
Etobicoke Civic Centre,
399 The West Mall, 2nd Floor,
Toronto, Ontario, M9C 2Y2
Email :John.Keen@toronto.ca

Attention: John Keen, Project Manager

RE: Chemical Testing
375 Colborne Lodge Drive, Toronto, ON

Dear Mr. John Keen,

As requested, we have completed the sampling and chemical analyses of soil samples collected at the captioned project and herein present our findings and recommendations.

1. Site Condition Standard

The analytical results of the soil samples were compared to the following Ministry of the Environment Conservation and Parks (MOECP) Standards:

- Table 1, Full Depth Background Site Condition Standards for Residential/Parkland/Institutional/Community/Commercial Property uses, for all textures soil, in accordance with the "Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act" (EPA), April 15, 2011(hereinafter referred to as "Table 1 RPI/ICC Standards").

- Table 2, Full Depth Generic Site Condition Standards in a Potable Ground Water Condition for Residential/Parkland/Institutional (RPI) and Industrial/Community/Commercial (ICC) Property uses, for coarse textured soil, in accordance with the "Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act" (EPA), April 15, 2011 (hereinafter referred to as "Table 2 RPI/ICC Standards").

- Table 3, Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential/Parkland/Institutional (RPI) and Industrial/Community/Commercial (ICC) Property uses, for Coarse textured soil, in accordance with the "Soil, Ground Water and Sediment Standards for Use Under Part XV.I of the Environmental Protection Act" (EPA), April 15, 2011 (hereinafter referred to as "Table 3 RPI/ICC Standards").

2. Soil Sampling and Soil Quality

Seven (7) boreholes (BH1/MW-BH5/MW & BH6-BH7) were advanced at the Project site. Soil samples were collected at depths varied from 0.8-2.1m for chemical analysis of contaminants of concerns. No evidence of potential visual contamination was documented in any of the retrieved soil samples. Head space vapour screening was also conducted for the retrieved soil samples using combustible gas detector (RKI Eagle) in methane elimination mode, having a minimum detection of 2 ppm (parts per million by volume). Soil vapour measurements were recorded to be below 50 ppm in the retrieved soil samples.

The samples were sent to Eurofins Laboratories, accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA), for chemical analysis of PHC (F1-F4), BTEX, PAH_S, and Metals and Inorganics (M+I) parameters, See **Table 1** for details.

Table 1: 38 Street Park- 351 Lake Promenade, Etobicoke, ON

Borehole No./Depths	MECP Table 1 RPI/ICC Exceedances	MECP Table 2 ICC Exceedances	MECP Table 3 ICC Exceedances	Test Conducted
BH1/MW SS2 (0.8-1.4m)	SAR	SAR	SAR	PHC (F1-F4), BTEX, PAH_S, M+I
BH2/MW SS3 (1.5-2.1m)	---	---	---	PHC (F1-F4), BTEX, PAH_S, M+I
BH3/MW SS3 (1.5-2.1m)	Napthalene	---	---	PHC (F1-F4), BTEX, PAH_S, M+I
BH4/MW SS3 (1.5-2.1m)	---	---	---	PHC (F1-F4), BTEX, PAH_S, M+I
BH5 SS2 (0.8-1.4m)	---	---	---	PHC (F1-F4), BTEX, PAH_S, M+I
BH7 SS2 (0.8-1.4m)	---	---	---	PHC (F1-F4), BTEX, PAH_S, M+I
*ppm = part per million by volume,				

3. Analytical Testing

A review of the results of the soil samples indicates that, the tested parameter at the tested locations meets **OReg.153** Table 1- Residential/Parkland/Institutional/Industrial/Commercial/Community (RPI/ICC) Property, also meets Table 2 and/or Table 3 -RPI/ICC Property uses, for coarse textured soil (See Certificate of Analysis for details) except for the parameters listed in the above table.

4. Conclusions

In general, based on the results of the testing, the soil from the project site (375 Colborne Lodge Drive, Toronto, ON) represented by the sampling meets with the quality standards established by the MOECP for the parameters tested meets Table 1 RPI/ICC land use standards, Table 2 and 3 RPI/ICC land use standard except for the parameters listed in the above table.

- The soil can be used at the project site minimum at 1.5m below the existing grade.
- The soil can be moved to Table 2 or Table 3 ICC property under the guidance of a QP as defined by the MOECP and will need to be placed 1.5m below existing grade.
- Please note that the acceptance of the soil material along with the frequency of sampling and testing are at the discretion of the receiving site.
- One must be aware that soil conditions at the subject site may vary between and beyond the sampling locations. Please note that the acceptance of the soil material along with the frequency of sampling and testing are at the discretion of the receiving site.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

For and on behalf of Orbit Engineering Limited

Aly Ahmed, Ph.D., P.Eng.
Senior Engineer

Reviewed by

Hafiz Muneeb Ahmad, M.Eng., M.Sc., P.Eng., QP$_{ESA}$
Senior Principal

Certificate of Analysis

Certificate of Analysis

Environment Testing

Client: Orbit Engineering
1900 Clark Blvd
Brampton, ON
L6T 0E9
Attention: Mr Hafiz Ahmad
Invoice to: Orbit Engineering
PO#:

Report Number: 1994298
Date Submitted: 2023-03-02
Date Reported: 2023-03-09
Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905825
Temperature (C): 6
Custody Seal:

Dear Hafiz Ahmad:

Please find attached the analytical results for your samples. If you have any questions regarding this report, please do not hesitate to call (613-727-5692).

Report Comments:

Raheleh Zafari, Environmental Chemist

All analysis is completed at Eurofins Environment Testing Canada Inc. (Ottawa, Ontario) unless otherwise stated
.
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O.Reg 153-T1-All Other Soils

Exceedence Summary

Sample I.D.	Analyte	Result	Units	Criteria
Inorganics				
BH1 SS2	Sodium Adsorption Ratio	5.79		STD 2.4
PAH				
BH3 SS3	Naphthalene	0.176	ug/g	STD 0.09

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Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

Hydrocarbons

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676387	1676388	1676389	1676390	1676391
Sample Matrix					Soil153	Soil153	Soil153	Soil153	Soil153
Sample Type									
Sample Date					2023-03-01	2023-03-01	2023-03-01	2023-03-01	2023-03-01
Sampling Time									
Sample I.D.					BH1 SS2	BH2 SS3	BH3 SS3	BH4 SS3	BH5 SS2
PHC's F1	438403	10	ug/g	STD 25	<10	<10	<10	<10	<10
PHC's F1-BTEX	438408	10	ug/g		<10	<10	<10	<10	<10
PHC's F2	438377	2	ug/g	STD 10	<2				
	438379	2	ug/g	STD 10		<2	<2	<2	<2
PHC's F2-Napth	438474	2	ug/g		<2	<2	<2	<2	<2
PHC's F3	438377	20	ug/g	STD 240	30				
	438379	20	ug/g	STD 240		<20	<20	<20	<20
PHC's F3-PAH	438475	20	ug/g		30	<20	<20	<20	<20
PHC's F4	438377	20	ug/g	STD 120	90				
	438379	20	ug/g	STD 120		<20	<20	<20	<20

Hydrocarbons

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676392
Sample Matrix					Soil153
Sample Type					
Sample Date					2023-03-01
Sampling Time					
Sample I.D.					BH7 SS2
PHC's F1	438403	10	ug/g	STD 25	<10
PHC's F1-BTEX	438408	10	ug/g		<10
PHC's F2	438379	2	ug/g	STD 10	<2
PHC's F2-Napth	438474	2	ug/g		<2
PHC's F3	438379	20	ug/g	STD 240	<20
PHC's F3-PAH	438475	20	ug/g		<20
PHC's F4	438379	20	ug/g	STD 120	<20

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Metals

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676387	1676388	1676389	1676390	1676391
					Sample Matrix Soil153	Soil153	Soil153	Soil153	Soil153
					Sample Type				
					Sample Date 2023-03-01	2023-03-01	2023-03-01	2023-03-01	2023-03-01
					Sampling Time				
					Sample I.D. BH1 SS2	BH2 SS3	BH3 SS3	BH4 SS3	BH5 SS2
Antimony	438452	1	ug/g	STD 1.3	<1	<1	<1	<1	<1
Arsenic	438452	1	ug/g	STD 18	2	2	1	2	2
Barium	438452	1	ug/g	STD 220	10	7	5	10	10
Beryllium	438452	1	ug/g	STD 2.5	<1	<1	<1	<1	<1
Boron (Hot Water Soluble)	438414	0.5	ug/g		<0.5	<0.5	<0.5	<0.5	<0.5
Boron (total)	438452	5	ug/g	STD 36	<5	<5	<5	<5	<5
Cadmium	438452	0.4	ug/g	STD 1.2	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium Total	438452	1	ug/g	STD 70	8	7	5	7	7
Chromium VI	438457	0.20	ug/g	STD 0.66	<0.20	<0.20	<0.20	<0.20	<0.20
Cobalt	438452	1	ug/g	STD 21	2	2	2	3	3
Copper	438452	1	ug/g	STD 92	7	7	5	8	10
Lead	438452	1	ug/g	STD 120	3	2	2	3	4
Mercury	438452	0.1	ug/g	STD 0.27	<0.1	<0.1	<0.1	<0.1	<0.1
Molybdenum	438452	1	ug/g	STD 2	<1	<1	<1	<1	<1
Nickel	438452	1	ug/g	STD 82	6	5	3	5	5
Selenium	438452	0.5	ug/g	STD 1.5	<0.5	<0.5	<0.5	<0.5	<0.5
Silver	438452	0.2	ug/g	STD 0.5	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	438452	1	ug/g	STD 1	<1	<1	<1	<1	<1
Uranium	438452	0.5	ug/g	STD 2.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	438452	2	ug/g	STD 86	18	16	12	16	16
Zinc	438452	2	ug/g	STD 290	10	10	8	13	14

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Metals

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676392 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH7 SS2
Antimony	438452	1	ug/g	STD 1.3	<1
Arsenic	438452	1	ug/g	STD 18	1
Barium	438452	1	ug/g	STD 220	4
Beryllium	438452	1	ug/g	STD 2.5	<1
Boron (Hot Water Soluble)	438414	0.5	ug/g		<0.5
Boron (total)	438452	5	ug/g	STD 36	<5
Cadmium	438452	0.4	ug/g	STD 1.2	<0.4
Chromium Total	438452	1	ug/g	STD 70	4
Chromium VI	438457	0.20	ug/g	STD 0.66	<0.20
Cobalt	438452	1	ug/g	STD 21	1
Copper	438452	1	ug/g	STD 92	4
Lead	438452	1	ug/g	STD 120	2
Mercury	438452	0.1	ug/g	STD 0.27	<0.1
Molybdenum	438452	1	ug/g	STD 2	<1
Nickel	438452	1	ug/g	STD 82	4
Selenium	438452	0.5	ug/g	STD 1.5	<0.5
Silver	438452	0.2	ug/g	STD 0.5	<0.2
Thallium	438452	1	ug/g	STD 1	<1
Uranium	438452	0.5	ug/g	STD 2.5	<0.5
Vanadium	438452	2	ug/g	STD 86	10
Zinc	438452	2	ug/g	STD 290	7

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PAH

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676387	1676388	1676389	1676390	1676391
					Sample Matrix Soil153	Soil153	Soil153	Soil153	Soil153
					Sample Type				
					Sample Date 2023-03-01	2023-03-01	2023-03-01	2023-03-01	2023-03-01
					Sampling Time				
					Sample I.D. BH1 SS2	BH2 SS3	BH3 SS3	BH4 SS3	BH5 SS2
1+2-methylnaphthalene	438434	0.05	ug/g		<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthene	438289	0.05	ug/g	STD 0.072	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	438289	0.05	ug/g	STD 0.093	<0.05	<0.05	<0.05	<0.05	<0.05
Anthracene	438289	0.05	ug/g	STD 0.16	<0.05	<0.05	<0.05	<0.05	<0.05
Benz[a]anthracene	438289	0.05	ug/g	STD 0.36	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo[a]pyrene	438289	0.05	ug/g	STD 0.3	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo[b]fluoranthene	438289	0.05	ug/g	STD 0.47	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo[ghi]perylene	438289	0.05	ug/g	STD 0.68	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo[k]fluoranthene	438289	0.05	ug/g	STD 0.48	<0.05	<0.05	<0.05	<0.05	<0.05
Chrysene	438289	0.05	ug/g	STD 2.8	<0.05	<0.05	<0.05	<0.05	<0.05
Dibenz[a h]anthracene	438289	0.05	ug/g	STD 0.1	<0.05	<0.05	<0.05	<0.05	<0.05
Fluoranthene	438289	0.05	ug/g	STD 0.56	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	438289	0.05	ug/g	STD 0.12	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno[1 2 3-cd]pyrene	438289	0.05	ug/g	STD 0.23	<0.05	<0.05	<0.05	<0.05	<0.05
Methlynaphthalene, 1-	438289	0.05	ug/g	STD 0.59	<0.05	<0.05	<0.05	<0.05	<0.05
Methlynaphthalene, 2-	438289	0.05	ug/g	STD 0.59	<0.05	<0.05	<0.05	<0.05	<0.05
Naphthalene	438289	0.013	ug/g	STD 0.09	0.060	0.078	0.176*	<0.013	<0.013
Phenanthrene	438289	0.05	ug/g	STD 0.69	<0.05	<0.05	<0.05	<0.05	<0.05
Pyrene	438289	0.05	ug/g	STD 1	<0.05	<0.05	<0.05	<0.05	<0.05

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Client: Orbit Engineering
1900 Clark Blvd
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Attention: Mr Hafiz Ahmad
PO#:
Invoice to: Orbit Engineering

Report Number: 1994298
Date Submitted: 2023-03-02
Date Reported: 2023-03-09
Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905825

Guideline = O.Reg 153-T1-All Other Soils - Res/Par/Ins/Ind/Com/Prop

PAH

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676392 Sample Matrix Soil153 Sample Type Sample Date 2023-03-01 Sampling Time Sample I.D. BH7 SS2
1+2-methylnaphthalene	438434	0.05	ug/g		<0.05
Acenaphthene	438289	0.05	ug/g	STD 0.072	<0.05
Acenaphthylene	438289	0.05	ug/g	STD 0.093	<0.05
Anthracene	438289	0.05	ug/g	STD 0.16	<0.05
Benz[a]anthracene	438289	0.05	ug/g	STD 0.36	<0.05
Benzo[a]pyrene	438289	0.05	ug/g	STD 0.3	<0.05
Benzo[b]fluoranthene	438289	0.05	ug/g	STD 0.47	<0.05
Benzo[ghi]perylene	438289	0.05	ug/g	STD 0.68	<0.05
Benzo[k]fluoranthene	438289	0.05	ug/g	STD 0.48	<0.05
Chrysene	438289	0.05	ug/g	STD 2.8	<0.05
Dibenz[a h]anthracene	438289	0.05	ug/g	STD 0.1	<0.05
Fluoranthene	438289	0.05	ug/g	STD 0.56	<0.05
Fluorene	438289	0.05	ug/g	STD 0.12	<0.05
Indeno[1 2 3-cd]pyrene	438289	0.05	ug/g	STD 0.23	<0.05
Methlynaphthalene, 1-	438289	0.05	ug/g	STD 0.59	<0.05
Methlynaphthalene, 2-	438289	0.05	ug/g	STD 0.59	<0.05
Naphthalene	438289	0.013	ug/g	STD 0.09	<0.013
Phenanthrene	438289	0.05	ug/g	STD 0.69	<0.05
Pyrene	438289	0.05	ug/g	STD 1	<0.05

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Volatiles

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676387	1676388	1676389	1676390	1676391
Sample Matrix					Soil153	Soil153	Soil153	Soil153	Soil153
Sample Type									
Sample Date					2023-03-01	2023-03-01	2023-03-01	2023-03-01	2023-03-01
Sampling Time									
Sample I.D.					BH1 SS2	BH2 SS3	BH3 SS3	BH4 SS3	BH5 SS2
Benzene	438403	0.0068	ug/g	STD 0.02	<0.0068	<0.0068	<0.0068	<0.0068	<0.0068
Ethylbenzene	438403	0.018	ug/g	STD 0.05	<0.018	<0.018	<0.018	<0.018	<0.018
Toluene	438403	0.08	ug/g	STD 0.2	<0.08	<0.08	<0.08	<0.08	<0.08
Xylene Mixture	438407	0.05	ug/g	STD 0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Xylene, m/p-	438403	0.05	ug/g		<0.05	<0.05	<0.05	<0.05	<0.05
Xylene, o-	438403	0.05	ug/g		<0.05	<0.05	<0.05	<0.05	<0.05

Volatiles

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. 1676392
Sample Matrix					Soil153
Sample Type					
Sample Date					2023-03-01
Sampling Time					
Sample I.D.					BH7 SS2
Benzene	438403	0.0068	ug/g	STD 0.02	<0.0068
Ethylbenzene	438403	0.018	ug/g	STD 0.05	<0.018
Toluene	438403	0.08	ug/g	STD 0.2	<0.08
Xylene Mixture	438407	0.05	ug/g	STD 0.05	<0.05
Xylene, m/p-	438403	0.05	ug/g		<0.05
Xylene, o-	438403	0.05	ug/g		<0.05

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Inorganics

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sample Date / Sampling Time / Sample I.D.				
					1676387 Soil153 2023-03-01 BH1 SS2	1676388 Soil153 2023-03-01 BH2 SS3	1676389 Soil153 2023-03-01 BH3 SS3	1676390 Soil153 2023-03-01 BH4 SS3	1676391 Soil153 2023-03-01 BH5 SS2
Cyanide (CN-)	438404	0.005	ug/g	STD 0.051	<0.005	<0.005	<0.005	<0.005	<0.005
Electrical Conductivity	438388	0.05	mS/cm	STD 0.57	0.27	0.10	0.09	0.10	0.11
pH - CaCl2	438450	2.00			7.46	7.44	7.60	7.74	7.72
Sodium Adsorption Ratio	438413	0.01		STD 2.4	5.79*	0.37	0.19	0.26	0.19

Inorganics

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sample Date / Sampling Time / Sample I.D.	
					1676392 Soil153 2023-03-01 BH7 SS2	
Cyanide (CN-)	438404	0.005	ug/g	STD 0.051	<0.005	
Electrical Conductivity	438388	0.05	mS/cm	STD 0.57	0.10	
pH - CaCl2	438450	2.00			7.71	
Sodium Adsorption Ratio	438413	0.01		STD 2.4	0.38	

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Moisture

Analyte	Batch No	MRL	Units	Guideline	Lab I.D.	1676387	1676388	1676389	1676390	1676391
					Sample Matrix	Soil153	Soil153	Soil153	Soil153	Soil153
					Sample Type					
					Sample Date	2023-03-01	2023-03-01	2023-03-01	2023-03-01	2023-03-01
					Sampling Time					
					Sample I.D.	BH1 SS2	BH2 SS3	BH3 SS3	BH4 SS3	BH5 SS2
Moisture-Humidite	438377	0.1	%			8.5				
	438379	0.1	%				3.2	2.5	9.2	11.1

Moisture

Analyte	Batch No	MRL	Units	Guideline	Lab I.D.	1676392
					Sample Matrix	Soil153
					Sample Type	
					Sample Date	2023-03-01
					Sampling Time	
					Sample I.D.	BH7 SS2
Moisture-Humidite	438379	0.1	%			5.2

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PHC Surrogate

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sample Date / Sampling Time / Sample I.D.				
					1676387 Soil153 2023-03-01 BH1 SS2	1676388 Soil153 2023-03-01 BH2 SS3	1676389 Soil153 2023-03-01 BH3 SS3	1676390 Soil153 2023-03-01 BH4 SS3	1676391 Soil153 2023-03-01 BH5 SS2
Alpha-androstrane	438377	0	%		86				
	438379	0	%			65	66	79	63

PHC Surrogate

Analyte	Batch No	MRL	Units	Guideline	Lab I.D. / Sample Matrix / Sample Type / Sample Date / Sampling Time / Sample I.D.
					1676392 Soil153 2023-03-01 BH7 SS2
Alpha-androstrane	438379	0	%		73

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VOCs Surrogates

Analyte	Batch No	MRL	Units	Guideline	Lab I.D.	1676387	1676388	1676389	1676390	1676391
					Sample Matrix	Soil153	Soil153	Soil153	Soil153	Soil153
					Sample Type					
					Sample Date	2023-03-01	2023-03-01	2023-03-01	2023-03-01	2023-03-01
					Sampling Time					
					Sample I.D.	BH1 SS2	BH2 SS3	BH3 SS3	BH4 SS3	BH5 SS2
Toluene-d8	438403	0	%			92	90	94	79	92

VOCs Surrogates

Analyte	Batch No	MRL	Units	Guideline	Lab I.D.	1676392
					Sample Matrix	Soil153
					Sample Type	
					Sample Date	2023-03-01
					Sampling Time	
					Sample I.D.	BH7 SS2
Toluene-d8	438403	0	%			91

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COC #: 905825

Quality Assurance Summary

Batch No	Analyte	Blank	QC % Rec	QC Limits	Spike % Rec	Spike Limits	Dup % RPD	Duplicate Limits
438289	Methlynaphthalene, 1-	<0.05 ug/g	82	50-140	55	50-140	0	0-40
438289	Methlynaphthalene, 2-	<0.05 ug/g	87	50-140	60	50-140	0	0-40
438289	Acenaphthene	<0.05 ug/g	82	50-140	54	50-140	0	0-40
438289	Acenaphthylene	0.07 ug/g	79	50-140	52	50-140	0	0-40
438289	Anthracene	<0.05 ug/g	91	50-140	61	50-140	0	0-40
438289	Benz[a]anthracene	<0.05 ug/g	85	50-140	59	50-140	0	0-40
438289	Benzo[a]pyrene	<0.05 ug/g	84	50-140	62	50-140	0	0-40
438289	Benzo[b]fluoranthene	<0.05 ug/g	91	50-140	66	50-140	0	0-40
438289	Benzo[ghi]perylene	<0.05 ug/g	57	50-140	50	50-140	0	0-40
438289	Benzo[k]fluoranthene	<0.05 ug/g	97	50-140	70		0	0-40
438289	Chrysene	<0.05 ug/g	86	50-140	57	50-140	0	0-40
438289	Dibenz[a h]anthracene	<0.05 ug/g	54	50-140	52	50-140	0	0-40
438289	Fluoranthene	<0.05 ug/g	93	50-140	64	50-140	0	0-40
438289	Fluorene	<0.05 ug/g	84	50-140	55	50-140	0	0-40
438289	Indeno[1 2 3-cd]pyrene	<0.05 ug/g	52	50-140	52	50-140	0	0-40
438289	Naphthalene	<0.013 ug/g	81	50-140	54	50-140	0	0-40
438289	Phenanthrene	<0.05 ug/g	77	50-140	53	50-140	0	0-40
438289	Pyrene	<0.05 ug/g	95	50-140	65	50-140	0	0-40
438377	PHC's F2	<2 ug/g	107	80-120	98	60-140	0	0-30
438377	PHC's F3	<20 ug/g	108	80-120	98	60-140	0	0-30
438377	PHC's F4	<20 ug/g	108	80-120	98	60-140	0	0-30
438377	Moisture-Humidite	<0.1 %	100	80-120			8	
438379	PHC's F2	<2 ug/g	114	80-120	116	60-140	0	0-30
438379	PHC's F3	<20 ug/g	112	80-120	116	60-140	0	0-30
438379	PHC's F4	<20 ug/g	112	80-120	116	60-140	0	0-30
438379	Moisture-Humidite	<0.1 %	100	80-120			8	
438388	Electrical Conductivity	<0.05	99	90-110			6	0-10
438403	Benzene	<0.0068	94	60-130	81	50-140	0	0-50
438403	Ethylbenzene	<0.018 ug/g	90	60-130	100	50-140	0	0-50
438403	PHC's F1	<10 ug/g	101	80-120	98	60-140	0	0-30
438403	Xylene, m/p-	<0.05 ug/g	97	60-130	109	50-140	0	0-50
438403	Xylene, o-	<0.05 ug/g	92	60-130	93	50-140	0	0-50

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Quality Assurance Summary

Batch No	Analyte	Blank	QC % Rec	QC Limits	Spike % Rec	Spike Limits	Dup % RPD	Duplicate Limits
438403	Toluene	<0.08 ug/g	89	60-130	99	50-140	0	0-50
438404	Cyanide (CN-)	<0.005 ug/g	86	75-125	87	70-130	0	0-20
438407	Xylene Mixture							
438408	PHC's F1-BTEX							
438413	Sodium Adsorption Ratio	<0.01					1	
438414	Boron (Hot Water Soluble)	<0.5 ug/g	99	70-130	96	60-140	0	0-30
438434	1+2-methylnaphthalene							
438450	pH - CaCl2	6.12	99	90-110			0	
438452	Silver	<0.2 ug/g	99	70-130	89	70-130	0	0-20
438452	Arsenic	<1 ug/g	98	70-130	104	70-130	0	0-20
438452	Boron (total)	<5 ug/g	95	70-130	119	70-130	0	0-20
438452	Barium	<1 ug/g	91	70-130	104	70-130	1	0-20
438452	Beryllium	<1 ug/g	96	70-130	102	70-130	0	0-20
438452	Cadmium	<0.4 ug/g	96	70-130	95	70-130	0	0-20
438452	Cobalt	<1 ug/g	89	70-130	89	70-130	0	0-20
438452	Chromium Total	<1 ug/g	97	70-130	116	70-130	5	0-20
438452	Copper	<1 ug/g	94	70-130	96	70-130	3	0-20
438452	Mercury	<0.1 ug/g	90	70-130	100	70-130	0	0-20
438452	Molybdenum	<1 ug/g	88	70-130	89	70-130	0	0-20
438452	Nickel	<1 ug/g	95	70-130	93	70-130	3	0-20
438452	Lead	<1 ug/g	91	70-130	87	70-130	0	0-20
438452	Antimony	<1 ug/g	72	70-130	87	70-130	0	0-20
438452	Selenium	<0.5 ug/g	107	70-130	99	70-130	0	0-20
438452	Thallium	<1 ug/g	92	70-130	89	70-130	0	0-20
438452	Uranium	<0.5 ug/g	85	70-130	88	70-130	0	0-20
438452	Vanadium	<2 ug/g	95	70-130	119	70-130	6	0-20
438452	Zinc	<2 ug/g	103	70-130	106	70-130	0	0-20
438457	Chromium VI	<0.20 ug/g	104	70-130	85	70-130	0	0-35
438474	PHC's F2-Napth							
438475	PHC's F3-PAH							

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Certificate of Analysis

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Test Summary

Batch No	Analyte	Instrument	Prep aration Date	Analysis Date	Analyst	Method
438289	Methlynaphthalene, 1-	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Methlynaphthalene, 2-	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Acenaphthene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Acenaphthylene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Anthracene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Benz[a]anthracene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Benzo[a]pyrene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Benzo[b]fluoranthene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Benzo[ghi]perylene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Benzo[k]fluoranthene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Chrysene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Dibenz[a h]anthracene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Fluoranthene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Fluorene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Indeno[1 2 3-cd]pyrene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Naphthalene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Phenanthrene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438289	Pyrene	GC-MS	2023-03-08	2023-03-08	C_M	P 8270
438377	PHC's F2	GC/FID	2023-03-07	2023-03-07	SS	CCME
438377	PHC's F3	GC/FID	2023-03-07	2023-03-07	SS	CCME
438377	PHC's F4	GC/FID	2023-03-07	2023-03-07	SS	CCME
438377	Moisture-Humidite	Oven	2023-03-07	2023-03-07	SS	ASTM 2216
438379	PHC's F2	GC/FID	2023-03-07	2023-03-07	SS	CCME
438379	PHC's F3	GC/FID	2023-03-07	2023-03-07	SS	CCME
438379	PHC's F4	GC/FID	2023-03-07	2023-03-07	SS	CCME
438379	Moisture-Humidite	Oven	2023-03-07	2023-03-07	SS	ASTM 2216
438388	Electrical Conductivity	Electrical Conductivity Mete	2023-03-08	2023-03-08	Z_S	Cond-Soil
438403	Benzene	GC-MS	2023-03-07	2023-03-08	PJ	V 8260B
438403	Ethylbenzene	GC-MS	2023-03-07	2023-03-08	PJ	V 8260B
438403	PHC's F1	GC/FID	2023-03-07	2023-03-07	PJ	CCME
438403	Xylene, m/p-	GC-MS	2023-03-07	2023-03-08	PJ	V 8260B
438403	Xylene, o-	GC-MS	2023-03-07	2023-03-08	PJ	V 8260B

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Certificate of Analysis

Client: Orbit Engineering
1900 Clark Blvd
Brampton, ON
L6T 0E9
Attention: Mr Hafiz Ahmad
PO#:
Invoice to: Orbit Engineering

Report Number: 1994298
Date Submitted: 2023-03-02
Date Reported: 2023-03-09
Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905825

Test Summary

Batch No	Analyte	Instrument	Prep aration Date	Analysis Date	Analyst	Method
438403	Toluene	GC-MS	2023-03-07	2023-03-08	PJ	V 8260B
438404	Cyanide (CN-)	Skalar CN Analyzer	2023-03-08	2023-03-08	AaN	MOECC E3015
438407	Xylene Mixture	GC-MS	2023-03-08	2023-03-08	PJ	V 8260B
438408	PHC's F1-BTEX	GC/FID	2023-03-08	2023-03-08	PJ	CCME
438413	Sodium Adsorption Ratio	iCAP OES	2023-03-08	2023-03-08	AaN	Ag Soil
438414	Boron (Hot Water Soluble)	iCAP OES	2023-03-08	2023-03-08	Z_S	MOECC E3470
438434	1+2-methylnaphthalene	GC-MS	2023-03-09	2023-03-09	C_M	P 8270
438450	pH - CaCl2	pH Meter	2023-03-09	2023-03-09	IP	Ag Soil
438452	Silver	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Arsenic	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Boron (total)	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Barium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Beryllium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Cadmium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Cobalt	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Chromium Total	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Copper	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Mercury	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Molybdenum	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Nickel	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Lead	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Antimony	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Selenium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Thallium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Uranium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Vanadium	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438452	Zinc	ICAPQ-MS	2023-03-09	2023-03-09	SD	EPA 200.8/6020
438457	Chromium VI	FAA	2023-03-08	2023-03-09	MW	M US EPA 3060A
438474	PHC's F2-Napth	GC/FID	2023-03-09	2023-03-09	QL	CCME
438475	PHC's F3-PAH	GC/FID	2023-03-09	2023-03-09	QL	CCME

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Client: Orbit Engineering
1900 Clark Blvd
Brampton, ON
L6T 0E9
Attention: Mr Hafiz Ahmad
PO#:
Invoice to: Orbit Engineering

Report Number: 1994298
Date Submitted: 2023-03-02
Date Reported: 2023-03-09
Project: OE231465DG (375 Colborne Lodge Dr)
COC #: 905825

CWS for Petroleum Hydrocarbons in Soil - Tier 1

Notes:

1. The laboratory method complies with CCME Tier 1 reference method for PHC in soil. It is validated for laboratory use.
2. Where the F1 fraction (C6 to C10) and BTEX are both measured, F1-BTEX is reported.
3. Where the F2 fraction (C10 to C16) and naphthalene are both measured, F2-naphthalene is reported.
4. Where the F3 fraction (C16 to C34) and PAHs* are both measured, F3-PAH is reported.
5. F4G is analyzed if the chromatogram does not descend to baseline before C50. Where F4 (C34 to C50) and F4G are both reported, the higher result is compared to the standard.
6. Unless otherwise stated in the sample comments, the following criteria have been met where applicable:

   - nC6 and nC10 response factors within 30% of response factor for toluene;
   - nC10, nC16, and nC34 response factors within 10% of each other;
   - C50 response factors within 70% of nC10 + nC16 + nC34 average; and,
   - Linearity is within 15%.

7. Unless otherwise stated in the sample comments, sampling requirements and analytical holding times have been met.
8. Gravimetric heavy hydrocarbons (F4G) cannot be added to the C6 and C50 hydrocarbons.
9. *PAHs = phenanthrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-c,d)pyrene and pyrene.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Appendix E

Documents Provided By Client

Proposed Floor Plan – Level 1 (upper)

Proposed Floor Plan – Level 0 (lower)

RECORD OF LOCATING UNDERGROUND PLANT

PRIVATE LOCATE MARKED TO THE BEST OF OUR ABILITIES AND IS NOT GUARANTEED

Request for Stake-Out Should be at least 48 hours Prior to Digging

Date 15-02-23	Company: ORBIT Contact Name: ABDUL	Request# 23020591
Method of Marking Flags/Stakes ☐ Chalk/Paint ● Other ☐	Location and Nature of Work #375 COLBORNE LODGE DR.TORONTO ONT.	Phone# 647-786-3641
Page 1 of 2	Remarks/Additional Instructions LOCATED PRIVATE UTILITIES ONLY FOR BOREHOLES	Fax# Email

CAUTION: Hand dig 1 meter on either side of markings to full depth of excavation. Depth of plant varies and must be determined by digging by hand - Valid for 30 days

CAUTION: Stakes or markings may disappear or be displaced. If any delays should occur in acting on the locate information as given, or should sketch and markings not coincide, a new stake-out must be obtained. This stake-out is based on information given at the time. Any changes to location or nature of work requires a new stake-out.

SKETCH IS NOT DRAWN TO SCALE

PRIVATE LOCATE IS NOT VALID WITHOUT AN ACTIVE ONTARIO 1 CALL LOCATE.

LOCATE IS MARKED TO THE BEST OF OUR ABILITIES. UTILITY MARX AND ITS EMPLOYEES ARE NOT RESPONSIBLE FOR ANY MISSED PLANT, DAMAGES OR INJURIES THAT MAY OCCUR AS A RESULT OF THIS LOCATE.

ANY STRIKE OR DAMAGE MUST BE REPORTED TO UTILITY MARX INC. WITHIN 24 HOURS OF THE INCIDENT.

THE ABOVE COMPANY SHALL DEFEND, INDEMNIFY, AND HOLD UTILITY MARX, ITS OFFICERS, AND EMPLOYEES HARMLESS FROM ANY AND ALL CLAIMS, INJURIES, DAMAGES, LOSSES, OR SUITS ARISING OUT OF, OR IN CONNECTION WITH THE PERFORMANCE OF THIS AGREEMENT, EXCEPT FOR INJURIES OR DAMAGES CAUSED BY THE SOLE NEGLIGENCE OF UTILITY MARX.

Locate Log

SEE PG.2 FOR DISCLAMER'S
LOCATED WITHOUT ANY PRIVATE RECORDS!

Ontario One Call # N/A

Work To Begin Date

Locator DAVE ROOTH	**Utility Marx**	Signature EMAILED COPY
Time IN 1030AM	**Phone: 905-538-6408**	Print
Time OUT 100PM	**Fax: 905-538-6258**	Unit #

CONTRACTOR TO RETAIN 1 COPY ON JOB SITE ☐ 2 Hour Min.

☐ One Call ● Private ☐ Water Services ☐ Home Owner ☐ QA Audit

LOCATED PRIVATE UTILITIES ONLY, REFER TO ONT.1CALL PAPERWORK FOR PUBLIC UTILITIES
NOTE MAYBE INACTIVE & OR ABONDONED UTILITIES NOT MARKED OR LOCATED

UTILITY MARX

Auxiliary Locate Sheet

RECORD OF LOCATING UNDERGROUND PLANT

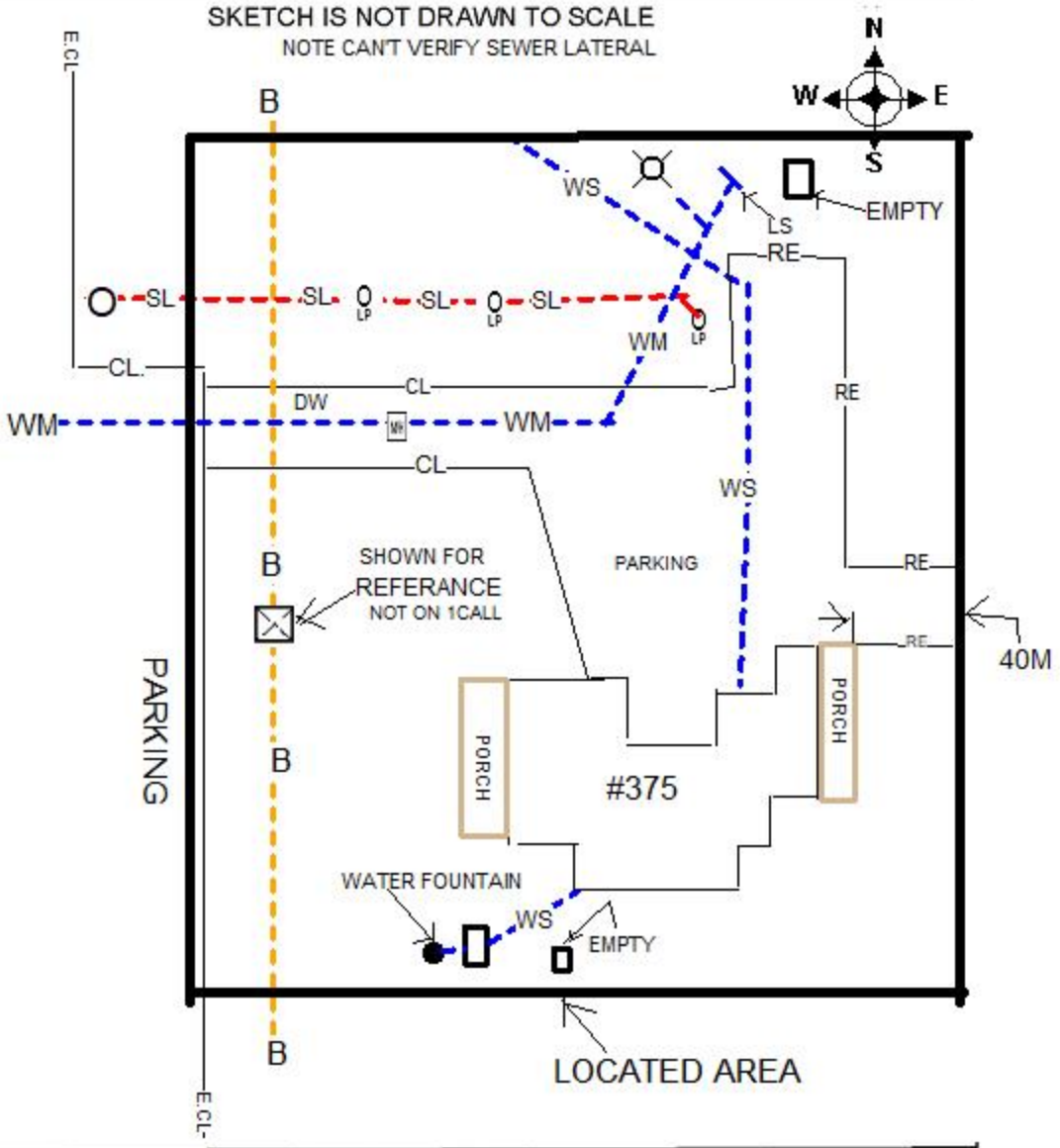
PRIVATE LOCATE MARKED TO THE BEST OF OUR ABILITIES AND IS NOT GUARANTEED. PRIVATE LOCATE NOT VALID WITHOUT ACTIVE ONTARIO 1CALL LOCATE.

Request for Stake-Out Should be at least 48 hours Prior to Digging

Page 2 OF 2	UM Ticket #: 23020591	Requested By: ORBIT
This form is valid only with the Primary Locate form.	**CAUTION: Hand dig 1 meter on either side of markings to full depth of excavation. Depth of plant varies and must be determined by digging by hand - Valid for 30 days**	
	CAUTION: Stakes or markings may disappear, or be displaced if any delays should occur in acting on the locate information as given, or should sketch and markings not coincide a new stake-out must be obtained. This stake-out is based on information given at the time. Any changes to location or nature of work requires a new stake-out.	
From: SEE LIMITS BELOW		To:
From:		To:

Hydrant	
Pole	O
Sewer	S
Catch Basin	CB
Railroad	
Fence Line	FL
Fibre Optics	FO
Manhole	MH
Buried Electric	BE
Bell Pedestal	
Storm Sewer	STM
Bell Telephone Cable	B
Conduit	C
Buried Service Wire	BSW
Building Line	BL
Curb Line	CL
Road Edge	RE
Driveway	DW
Hydro	H
Hydro Service	HS
Street Light	SL
Transformer	
Valve	
Gas Main	GM
Gas Service	GS
Water Main	WM
Water Service	WS

SKETCH IS NOT DRAWN TO SCALE
NOTE CAN'T VERIFY SEWER LATERAL



Utility Marx
Phone: 905-538-6408
Fax: 905-538-6258

Are Overhead Utilities present? Yes ● No ☐ OVERHEAD NOT NEEDED
If yes, are Overhead Utilities Marked on sketch? Yes ☐ No ● (If no, note on Primary)

LS = LOST SIGNAL !!! **CONTRACTOR TO RETAIN 1 COPY ON JOB SITE**

Site Contact: ABDUL Phone #: 647-786-3641

From: solutions@on1call.com
Sent: January 20, 2023 4:06 PM
To: Sahil Makwa
Subject: Request 20230312193

LOCATE REQUEST CONFIRMATION

REQUEST #: 20230312193 **REQUEST PRIORITY:** STANDARD **REQUEST TYPE:** REGULAR **WORK TO BEGIN DATE:** 01/27/2023

Update of Request # **Project #:** **Call Date:** 01/20/2023 03:49:22 PM **Transmit Date:** 01/20/2023 04:04:49 PM

REQUESTOR'S CONTACT INFORMATION	
Contractor ID: 433461	
Contact Name: SAHIL MAKWA	**Alternate Contact Name:** JARI PEIKARI
Company Name: ORBIT ENGINEERING LIMITED	**Alternate Contact #:** (905) 494-0074
Address: 1900 CLARK BLVD, BRAMPTON, ON, L6T 0N8	
Email: sahil.makwa@orbitengineering.ca	
Primary Phone #: (437) 228-7896	
Cell Phone #: (647) 786-3641	

DIG INFORMATION		
Region/County: TORONTO	**Work Done for:** CITY OF TORONTO	**Pre-Marked:** Area Not Pre-Marked
Community:	**Reason for Work:** GEOTECHNICAL DRILLING	**Property Type:** Private Property, Public Property
City: TORONTO	**Dig Method:** Machine Dig	**Site Meeting:** No
Address: 375, COLBORNE LODGE DR	**Depth:** Up to 15 Feet	**Work End Date:**
Intersecting Street 1: BLOOR STREET W		
Intersecting Street 2: PARKSIDE DR.		

ADDITIONAL INFORMATION	QUALIFYING INFORMATION
WE WILL BE DRILLING 7 BOREHOLES UPTO 15 FEET DEEP AND 1 TEST PIT (5 FEET DEEP) AT THE SPECIFIED LOCATION . PLEASE PROVIDE THE NECESSARY LOCATES ASAP. THANKYOU	

MEMBERS NOTIFIED: The following owners of underground infrastructure in the area of your excavation site have been notified.

Member Name	Station Code	Initial Status
PVS FOR TORONTO WATER (TORWW01)	TORWW01	Notification sent
TORONTO SEWER (TORWW07)	TORWW07	Notification sent
PVS FOR ENBRIDGE GAS (ENTW01S)	ENTW01S	Notification sent
PVS FOR TORONTO HYDRO (THTW01S)	THTW01S	Notification sent
PVS FOR BELL CANADA (BCTW01S)	BCTW01S	Notification sent

MAP SELECTION: Map Selection provided by the excavator through Ontario One Call's map tool or through agent interpretation by phone

Name: BH1 **Area: 78.12sq. m**	**Name: BH2** **Area: 78.12sq. m**	**Name: BH3** **Area: 78.12sq. m**	**Name: BH4** **Area: 78.12sq. m**
Name: BH5 **Area: 78.12sq. m**	**Name: BH6** **Area: 78.12sq. m**	**Name: BH7** **Area: 78.12sq. m**	**Name: TEST PIT** **Area: 78.12sq. m**

IMPORTANT INFORMATION: Please read.

Defining "NC" - Non-Compliant

- Non-compliant members have not met their obligations under section 5 of the Ontario Underground Infrastructure Notification Act. ON1Call has notified these members to ensure they are aware of your excavation. In this circumstance, should the member not respond, the excavator should contact the member directly to obtain their locates or request a status. ON1Call will not be provided with a locate status from the member regarding this request and therefore, cannot provide further information at this time. For locate status contact information please refer to our website.

You have a valid locate when...

- You have reviewed your locate request information for accuracy. UPDATE your request IMMEDIATELY if changes are needed and obtain a corrected locate request confirmation.

NOTE: Intersecting streets are often suggested by Ontario One Call's system, in some circumstances they may not reflect the closest intersecting streets to your excavation. You can change the intersecting streets before submitting the request by going through the "Review" page of your locate request, and editing any inaccurate information. Intersecting streets are for reference only, and unless you change the streets manually, you will not be asked to correct them if they are chosen by the system. If you don't agree with a street name, make sure to edit the request before you submit it, if you found a mistake after submitting the request, update your requests immediately on the web portal.

- You have obtained locates or clearances from all ON1Call members listed in this request before beginning your dig.

You've met your obligations when...

- You respect the marks and instructions provided by the locators and dig with care; the marks and locator instructions MUST MATCH. You must wait for responses from all members notified on your locate request before beginning to dig..
- You have obtained any necessary permits from the municipality in which you are digging.
- You have made Ontario One Call aware if you have come across any new or unlisted infrastructure in the public right of way AND stopped digging to prevent damages while we review.
- You have arranged for locates for your private lines on your private property - where applicable.

What does "Cleared" mean in the "Initial Status" section?

1. The information that you have provided about your dig will not affect that member's underground infrastructure and they have provided you with a clearance, if anything about your excavation changes, please ensure that you update your request immediately.

What are the images under "Map Selection"?

1. A drawing created by an excavator directly within Ontario One Call's Web request tool, this is expected to be an accurate rendition of the dig site, and it is the excavator's responsibility to ensure the location matches the information they provide under the 'Dig Location'; section OR;

2. A drawing created by an Ontario One Call agent, this drawing is based on a verbal description by phone of the area by the excavator. Agents may create drawings that are larger than the proposed dig to minimize risk of interpretation. It is the excavator's responsibility to review these map selections for accuracy. Changes can be made by the excavator through the Web request tool, to learn how visit www.ontarioonecall.ca.

3. All drawings dictate which members are notified.

Primary Locate Sheet

Line Location Request

20230312193-2844507

Phone: 905-984-5197 Fax: 905-984-5367 Toll-Free: 877-558-5569

Standard

Locating For: Toronto Hydro (THTW01S),	Revised Excavation Date: 27-Jan-23	Excavation Date: 27-Jan-23	Status: LOCATE COMPLETED
Requested by: SAHIL MAKWA	Company: ORBIT ENGINEERING LIMITED	Phone: 4372287896	Fax:
Appt. Date:	Received Date: 20-Jan-23	Type of Work: GEOTECHNICAL DRILLING	Requestor Type: CONTRACTOR

Locate Address: 375 COLBORNE LODGE DR, TORONTO

Excavator Address: 1900 CLARK BLVD , BRAMPTON

Caller's Remarks:

WE WILL BE DRILLING 7 BOREHOLES UPTO 15 FEET DEEP AND 1 TEST PIT (5 FEET DEEP) AT THE SPECIFIED LOCATION . PLEASE PROVIDE THE NECESSARY LOCATES ASAP. THANKYOUALTERNATE_ CONTACT_TYPE::Alternate Contact

Gas	Bell	CATV	Hydro	Water	Sewer	Street Lighting	Fibre
			Office Clear-1				

LOCATED AREA: EXCAVATOR SHALL NOT WORK OUTSIDE THE LOCATED AREA WITHOUT OBTAINING ANOTHER LOCATE

DPT Remarks:

☐ Third Party Notification

Records Referenced:

☐ Utility Map

☐ Multiviewer Datapak # _____

Atlas Plates:

Field Notes:

Other:

TORONTO HYDRO ONLY

TORONTO HYDRO IS CLEAR WITHIN THE REQUESTED AREA AS PER CALLERS REMARKS ON ONTARIO ONE CALL REQUEST

IF YOU REQUIRE EXCAVATION OUTSIDE THE REQUESTED AREA PLEASE CONTACT ONTARIO ONE CALL FOR A NEW LOCATE.

Diameter of Main:

Excavator shall notify and receive a clearance from Regional Contacts Prior to excavation for the following:

Gas: ☐ End Thrust ☐ Vital Main ☐ Valve

Telephone: ☐ High Priority Cables ☐ Central Office Vicinity

Material Types

Gas: ☐ Cast Iron ☐ Steel ☐ Plastic

Telephone: ☐ Cable ☐ Conduit ☐ Telephone Fibre

CATV: ☐ TV Fibre

Hydro: ☐ Primary ☐ Direct Buried ☐ Secondary ☐ Duct ☐ Street Lighting

Water: ☐ Locate is Approximate Due to Non-metallic Pipe

Method of Field Marking: ☐ Paint ☐ Stakes ☐ Flags ☐ Offset Stakes ☐ Chalk ☐ Steel

Caution: Locate is VOID after 60 days. See attached for Bell Canada. Enbridge Locates VOID after 60 days (see attached document for details). Alectra, Burlington Hydro, Canadian Niagara Power, Town of Caledon, Cogeco, Grimsby Power, City of Hamilton Wentworth Water, City of St. Catherines, Oakville hydro, Town of Oakville, Welland Hydro, Toronto Hydro, Toronto BIA and Traffic/Rescue, TTC-Electrical, TTC-Communications Locates valid for 60 days. TTC-Structures, Rogers valid for 90 days, Halton Region are valid for 120 days. Toronto Water valid for project. For locate requests or remarks, contact Ontario One Call 1-800-400-2255

Caution: The markings may disappear or be misplaced. Should sketch markings not coincide, a new locate must be obtained. This is based on information given at the time. Any changes to location or nature of work requires a new locate. The EXCAVATOR must not work outside the indicated Located Area without a further locate by the company. Privately owned facilities may be present in the Locate Area.

Documents given to be used with this locate:

☐ None

☐ NEB Excavation/Construction Booklet

☐ Gas Excavation Guidelines

☐ Hydro Electric Excavation Guidelines

☐ Bell Guidelines for Excavation

ID Number: 969 Elis S.

Date/Time: 21-Jan-2023 7:55 pm

In/Out:

Accepted By:

Print:

☑ Mark and Fax/Email ☐ Left on Site

A copy of this Primary Locate Report and the Auxiliary Locate Sheet(s) must be on site and in the hands of the machine operator during work operations. Should sketch and markings not coincide, a new locate must be obtained.

Sahil Makwa

From: agt_comm@irth.com
Sent: January 20, 2023 6:57 PM
To: Sahil Makwa
Subject: Ticket 20230312193 - Response to Dig Request

Bell Plant - TW01S CLEARANCE

CLEARANCE # 20230312193

ONE CALL TICKET #: 20230312193

Issued By: Bell Plant - TW01S

For Station Code: BCTW01S

Location: 375 COLBORNE LODGE DR

Work Type: GEOTECHNICAL DRILLING

Date Issued: 01/20/2023 04:05:43 PM

Primary Contact: SAHIL MAKWA

Email Address: sahil.makwa@orbitengineering.ca

Fax:

Additional Notes:

CONDITION(S)

BASED ON THE INFORMATION YOU HAVE PROVIDED THE ONE CALL CENTRE, BELL APPROVES

THIS EXCAVATION TO PROCEED. THIS CLEARANCE PERTAINS TO BELL ONLY.

As there may be other buried utilities in your dig area, you are advised to contact all buried utility owners for your work area and obtain the necessary locates/clearances.

Please pay special attention to who/what this Clearance is for. Please review the document carefully and compare it to your locate request to ensure you understand what you are being cleared for. We are not responsible for any damages that result from misunderstanding what utility you are cleared for on this paperwork.

If you have any questions, concerns regarding your clearance or to report a damage on Bell structures

please call the Bell Screening Centre at **866-480-5901.**

Sahil Makwa

From: torontowaterlocates <torontowaterlocates@toronto.ca>
Sent: January 23, 2023 7:19 AM
To: Sahil Makwa
Subject: 20230312193 - 375 COLBORNE LODGE DR
Attachments: 20230312193 - 375 COLBORNE LODGE DR.PNG

Hello **Sahil,**

The sewer portion of the ticket has been cleared conditional to the instructions and drawing(s) attached.

The excavation must maintain:
A minimum of 1 m separation on both sides of the catchbasin leads,
A minimum of 1.5 m separation on both sides of sewers up to 300 mm in size,
A minimum of 2 m separation on both sides of sewers 301 to 600 mm in size,
A minimum of 4 m separation on both sides of sewers 601 to 1000 mm in size,
A minimum of 6 m separation on both sides of sewers 1000 + mm or unknown (UNK) in size, and
A minimum of 10 m separation on both sides of any Storm Sanitary Combined Trunk Sewer.

Catchbasin leads - green thin lines (not always shown)
Storm Sewer - bright green solid lines
Sanitary Sewer - red solid lines
Combined Sewer - purple solid lines
Overflow Sewer (Combined or Sanitary) - olive green solid lines
Abandoned Sewer - black dotted lines
Storm Lateral Connections - bright green dotted lines (not always shown)
Sanitary Lateral Connections - red dotted lines (not always shown)
Note: The City does not provide locates within private property*
*Unless major City-owned infrastructure is present within private property

Do not excavate within the separation limits above. If you absolutely need to excavate within the separation limits, you will assume all liability as result of damages and/or environmental hazards that may occur. Daylighting is mandatory prior to drilling activities within the separation limits. Daylighting is also mandatory to confirm sewer lateral connection locations.

Note that all drawings and any associated layouts provided are property of the City of Toronto and are intended for reference purposes only.

Thank you,

Mohammad
Toronto Water Locates
torontowaterlocates@toronto.ca


Colborne Lodge Dr
Colborne Lodge Dr
375
SL1450791 (300 VCP)
SL1450787 (225 VCP)
SL1450788 (225 VCP)
SL1450786 (225 VCP)
SL1450785 (225 VCP)
This and any associated layouts are intended for reference purposes only Property of the City of Toronto - Toronto Water Locates

TORONTO Water

Locate Completion Form

Request #:	Call Date:	Excavation Date:	Call Type:
20230312193	20-Jan-2023	27-Jan-2023	Standard

Requested by:	Phone:	Fax:	Email:
	4372287896		sahil.makwa@orbitengineering.ca

Company Name:	Company Address:	Depth:
ORBIT ENGINEERING LIMITED	1900 CLARK BLVD , BRAMPTON	Up to 15 Feet

Locate Address:	Type of Work:
375 COLBORNE LODGE DR	GEOTECHNICAL DRILLING

Description of Work and Work Limits

WE WILL BE DRILLING 7 BOREHOLES UPTO 15 FEET DEEP AND 1 TEST PIT (5 FEET DEEP) AT THE SPECIFIED LOCATION . PLEASE PROVIDE THE NECESSARY LOCATES ASAP. THANKYOU

LOCATED AREA: EXCVATOR SHALL NOT WORK OUTSIDE THE LOCATED AREA WITHOUT OBTAINING ANOTHER LOCATE.

Utilities and Station Codes

Water (TORWW01),

Message to Excavator

Private Property

Please be advised that Toronto Water does not own any water infrastructure within private property at the site.

Additional Comments:

Please contact Helen Sousa, General Supervior ward 4 at 416-392-6599

Completed By:	Date Completed:	Time Completed:
0	January 23, 2023	7:25 am

This form revised February 2016

TORONTO Water

Locate Completion Form

Request #:	Call Date:	Excavation Date:	Call Type:
20230312193	20-Jan-2023	27-Jan-2023	Standard

Requested by:	Phone:	Fax:	Email:
	4372287896		sahil.makwa@orbitengineering.ca

Company Name:	Company Address:	Depth:
ORBIT ENGINEERING LIMITED	1900 CLARK BLVD , BRAMPTON	

Locate Address:	Type of Work:
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LOCATED AREA: EXCVATOR SHALL NOT WORK OUTSIDE THE LOCATED AREA WITHOUT OBTAINING ANOTHER LOCATE.

Utilities and Station Codes

SEWER (TORWW07),

Message to Excavator

Conditional Clear

Clear as per work instructions provided

Additional Comments:

Clear as per e-mail sent. This Toronto sewer locate ticket is valid for the life of the excavation project. The locate is void after 60 days if the excavation has not occurred.

Completed By:	Date Completed:	Time Completed:
0	January 23, 2023	7:19 am

This form revised February 2016

Auxiliary Locate Sheet

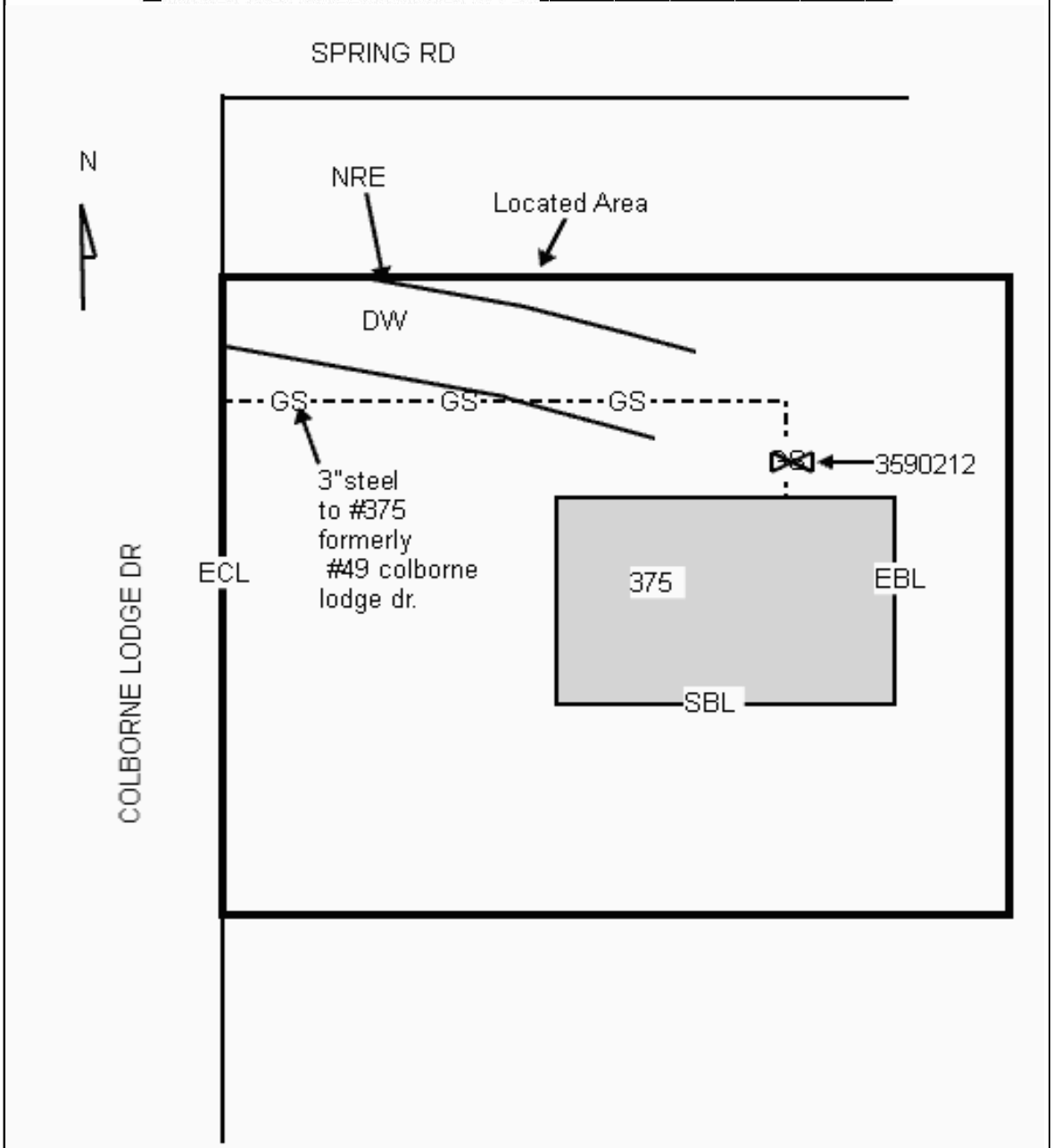
Phone: 905-984-5197 Toll Free: 877-558-5569 Fax: 905-984-5367

Utilities Located: Enbridge Gas (ENTW01S),	Request #: 20230312193-2844348	Requested by: ORBIT ENGINEERING LIMITED
Number of Services Marked (Specify Building Numbers): 1GS TO 375 COLBORNE LODGE DR		
LOCATED AREA: EXCAVATOR SHALL NOT WORK OUTSIDE THE LOCATED AREA WITHOUT OBTAINING ANOTHER LOCATE.		
From: ECL OF COLBORNE LODGE DR	To: 10.0M E/EBL OF 375 COLBORNE LODGE DR	
From: NRE OF DRIVEWAY ENTRANCE TO 375 COLBORNE LODGE DR	To: 10.0M S/SBL OF 375 COLBORNE LODGE DR	

LEGEND:

Building Line	BL
Fence Line	FL
Face of Curb	CL
Road Edge *Pavement edge of asphalt or road surface*	RE
Driveway	DW
Manhole	M/H
Catch Basin	CB
Sidewalk	SW
Pole	
Limit of utility owned facilities	OM
Transformer	
Railway	
Gas Valve	
Pedestal	
Hydrant	
Buried Service Wire	-BSW-
Fiber Optic Cable	-FO-
Gas Main	-GM-
Gas Service	-GS-
Hydro Service	-HS-
Telephone Cable	-B-
Conduit	-C-
Hydro	-H-
Water	-W-
Cable TV	-TV-
Traffic Signal	-TS-
Street Light	-SL-
Sanitary Sewer	-SAN-
Storm Sewer	-ST-

HAND DIG WITHIN 1M (3.28ft) AS MEASURED HORIZONTALLY FROM THE FIELD MARKINGS
DEPTH VARIES AND MUST BE VERIFIED BY HAND DIGGING
☐ **LOCATED AREA HAS BEEN ALTERED AS PER:**_____



This form is valid only with the primary locate sheet. This sketch is not to scale. Measurements are in metres.
Any privately owned services within the located area have not been marked – check with service/property owner

A Copy of this Auxiliary Locate Sheet and the Primary Locate Sheet must be on site and in the hands of the machine operator during work operations. Should sketch and markings not coincide, a new locate must be obtained.

This form revised November 2015

Warning!

The excavator must have a copy of this locate on the job site during excavation.

Located Area: The excavator must not work outside the area indicated by the Located Area in the diagram overleaf without a further locate by the Company.

Locate the plant: The plant location information provided is the best we have available but constitutes only an estimate. Depth of underground plant varies and the exact location must be determined by hand digging prior to excavation with mechanical equipment.

Mechanical equipment must not be used within one metre of the estimated location of the plant.

Expose the plant: Once the plant has been located by hand digging, it must be exposed along its length adjacent to or in the immediate vicinity of the proposed excavation. For this purpose, mechanical equipment must not be used within 0.5 metres of the plant.

Digging around the exposed plant: When the plant has been exposed, any further excavation within 0.3 metres, must only be done by hand digging and not with mechanical equipment.

Support Requirements: If the underground plant is exposed over a distance of more than 1.25 metres, the utility company must be notified; underground plant must be supported at all times.

---

0. Reg. 210/01 Oil and Gas Pipeline Systems EXCERPTS

9. (1) No person shall dig, bore, trench, grade, excavate or break ground with mechanical equipment or explosives without first ascertaining the location of any pipeline that may be interfered with.

10. No person shall interfere with or damage any pipeline without authority to do so.

Technical Standards & Safety Act 2000 EXCERPT

37 (1) Every person who contravenes or fails to comply with any provision of this act or the regulations; etc. ... is guilty of an offense and on conviction is liable to a fine of not more than $50,000 or to imprisonment for a term of not more than one year, or to both.

Caution: The markings may disappear or be misplaced. Should sketch markings not coincide, a new locate must be obtained. This is based on information given at the time. Any changes to location or nature of work require a new locate. The EXCAVATOR must not work outside the indicated Located Area without a further locate by the company. Privately owned facilities may be present in Locate Area, check with property owner.

Locate is VOID after 30 days; Bell has exceptions, see attached letter.
For remarks contact Ontario One 1-800-400-2255.

Shown on this locate form and within the located area are only the underground facilities, gas or utility lines, which we were able to locate using conventional technology. There may be other lines, including but not limited to, customer owned lines, such as lines for a pool or a gas barbeque ("Customer Lines"), which we were not able to locate. Often customer owned facilities are installed in such a way as to make location impossible. Depth and location of these facilities is not known. Locate company or utility is not responsible or liable for any errors on this locate for Customer Lines and it is to be relied upon at your own risk.

Planning to Dig ... CALL US FIRST

Members of Ontario ONE CALL

Phone **1-800-400-2255**
or
Fax **1-800-400-8876**

Typical metric Conversions:
(m = metre, ft = foot)

0.5 ft = 0.15 m	0.15 m = 0.5 ft
1 ft = 0.3 m	1 m = 3.3 ft
2 ft = 0.6 m	2 m = 6.6 ft
3 ft = 0.9 m	3 m = 9.8 ft
4 ft = 1.2 m	4 m = 13.1 ft
5 ft = 1.5 m	5 m = 16.4 ft
6 ft = 1.8 m	6 m = 19.7 ft
7 ft = 2.1 m	7 m = 23.0 ft
8 ft = 2.4 m	8 m = 26.2 ft
9 ft = 2.7 m	9 m = 29.5 ft
10 ft = 3.0 m	

Here is the locate you requested. If you have any questions please feel free to contact our office at 1-905-984-5414 for assistance.

Please note that privately owned utilities are typically not covered under your Ontario One Call locate request.

If you suspect that there are privately owned utilities within your work area, PVS is available to provide private locate services. Please contact us to request a quote and discuss in greater detail. Visit www.pvslocates.com to learn more about our suite of services.

EXCAVATION GUIDELINES DISCLAIMER

Hand Digging
Means excavation using only a shovel with a wooden or an insulated handle. No picks, bars or other devices shall be used.

Mechanical Excavation
Means boring or open cut excavation by means of powered mechanical equipment, hand held augers, picks or bars.

General Conditions
All work shall be carried out in accordance with the most current version of:

a) the Occupational Health and Safety Act (O.H.S.A.) and Regulations which apply under the act, and
b) All other pertinent and local regulations or conditions.

Locate Boundaries/Accuracy

- The excavator shall not dig outside the area covered by the locate form without obtaining a further locate.
- Locate accuracy shall be considered to be one metre on either side of the surface centre lines unless the locate instructions specifically indicate other boundary limits.
- Where the underground plant is wider than two metres (e.g. subsurface chambers), special instructions shall be included on the locate form.
- Where underground plant is uncovered in a place other than where the locate indicates, the excavator shall cease further excavation in the immediate area and contact the Utility immediately.

Duration
Unless otherwise noted, locates are valid for 30 days. For remarks please contact Ontario One Call @ 1-800-400-2255.

Initial Exposure
At no time shall a contractor or subcontractor use mechanical means of excavation within the boundary limits of the locate without first digging test hole(s) to determine the plant's exact location and depth of cover. The test holes shall be dug using only hand digging methods at periodic intervals along the plant as specified by the Utility. Hand digging shall be by the use of a shovel with a wooden or an insulated handle only. When digging in frost conditions, the excavator shall first contact the Utility for instructions.

Undermining the Plant
Where underground plant must be undermined for more than one metre, the excavator shall contact the Utility for supporting procedures and required clearances.

Moving of Underground Plant
No plant shall be moved even slightly to accommodate the excavation work. The local Utility shall be contacted for instructions if moving is required.

Work Around Exposed Plant
Once the plant has been exposed, no further work shall be carried out within the excavation until the work area has been made safe in accordance with utility practices. For example, barriers or protective covering may be required to protect the plant from damage or to prevent accidental contact with exposed energized plant. If the excavation results in any damage to the underground plants or any related personal injury, the excavator shall cease all work within the excavation and contact the Utility immediately.

Enbridge Excavator Checklist

Prior to site arrival

- [ ] Ensure you have received all locate sheets (total of package is found on page 1).
- [ ] If required, print additional copies of locate package for crews at various locations on site.
- [ ] If required, ensure all clearances have been received, printed and included in locate package.

Upon site arrival

- [ ] Review the sketch and the located area limits. Do you have what was requested? If not, do not excavate outside what was issued until the locate service provider has been contacted and the locate corrected.
- [ ] Review the markings on site. Is the entire plant identified on the locate form marked in the field? If not, contact the locate service provider.
- [ ] Ensure a plan is in place to protect and preserve the original yellow paint markings. White paint can be used to preserve and maintain the markings but should be placed beside or at the top or bottom of the original markings, ensuring not to replace the yellow paint.

Prior to excavation

- [ ] Ensure appropriate safeguards to expose all marked gas lines will be used. Hand dig or hydro excavation method must be used within 1 m (3.3 ft) (or as directed by Enbridge Gas Inc.) of any marked lines.
- [ ] If hydro-excavation will be used, ensure equipment is operated per Enbridge requirements.
- [ ] If support of gas lines or trench protection will be required through the course of excavation, ensuring approved methods and materials are readily available.

During Excavation

- [ ] Ensure no mechanical equipment is used within 1 m (3.3 ft) (or as directed by Enbridge Gas Inc.) of locate marks.
- [ ] Once gas lines are fully exposed (top, sides, bottom) ensure no mechanical equipment is used within 0.3 m (1 ft) (or greater if directed by Enbridge) of exposed pipe.
- [ ] Ensure all locate marks are verified. Expose per locate mark. Do not assume a gas line found away from the mark is what the locator was actually marking; you may have found an abandoned line or a missed line.
- [ ] Ensure all exposed gas identified in your excavation match the description on the auxiliary sheet of your locate (i.e., size and material). Any discrepancies should be reported to the locate service provider.

Additional information for Excavators can be found in the
Enbridge Third-Party Requirements in the Vicinity of Natural Gas Facilities Standard

enbridgegas.com/~/media/Extranet-Pages/Safety/Before-you-dig/Third-Party-Requirements-in-the-Vicinity-of-Natural-Gas-Facilities

Enbridge Gas Inc.
500 Consumers Road
North York, Ontario M2J 1P8
Canada

Attention Excavators

Thank you for calling for a locate prior to starting your excavation and/or project.

Enbridge Gas Distribution & Storage continues to promote safe excavating through our Damage Prevention Program. Highly trained Locate Service Provider(s) or Internal Locators deliver accurate and reliable locates for all active buried gas infrastructure to ensure excavators can safely complete their projects without interfering with our pipelines.

If during your excavation you encounter any unmarked or unlocated pipeline(s), there is a possibility you may have uncovered an abandoned pipeline. If you are unable to safely continue with your excavation due to these pipelines, please contact our Damage Prevention Office at 1-866-922-3622. We will schedule a site visit from our Operations Team to confirm the status of the pipeline(s) before you are able to safely continue with your excavation.

Damage Prevention Office

Enbridge Gas Distibution & Storage

Primary Locate Sheet

Line Location Request

20230312193-2844348

Phone: 905-984-5197 Fax: 905-984-5367 Toll-Free: 877-558-5569

Standard

Locating For: Enbridge Gas (ENTW01S),		Revised Excavation Date: 27-Jan-23	Excavation Date: 27-Jan-23	Status: LOCATE COMPLETED
Requested by: SAHIL MAKWA	Company: ORBIT ENGINEERING LIMITED	Phone: 4372287896	Fax:	Requestor Type: CONTRACTOR
Appt. Date:	Received Date: 20-Jan-23	Type of Work: GEOTECHNICAL DRILLING		

Locate Address: 375 COLBORNE LODGE DR, TORONTO

Excavator Address: 1900 CLARK BLVD , BRAMPTON

Caller's Remarks:

WE WILL BE DRILLING 7 BOREHOLES UPTO 15 FEET DEEP AND 1 TEST PIT (5 FEET DEEP) AT THE SPECIFIED LOCATION . PLEASE PROVIDE THE NECESSARY LOCATES ASAP. THANKYOUALTERNATE_ CONTACT_TYPE::Alternate Contact

Gas	Bell	CATV	Hydro	Water	Sewer	Street Lighting	Fibre
M-1							

LOCATED AREA: EXCAVATOR SHALL NOT WORK OUTSIDE THE LOCATED AREA WITHOUT OBTAINING ANOTHER LOCATE

DPT Remarks:

☐ Third Party Notification

Records Referenced:

☐ Utility Map

☐ Multiviewer Datapak # 0052

Atlas Plates: 125

Field Notes: 0474-032,1N0175-6

Other:

Diameter of Main: 3"STEEL

Material Types

Gas:	☐ Cast Iron	☐ Steel	☐ Plastic
Telephone:	☐ Cable	☐ Conduit	☐ Telephone Fibre
CATV:	☐ TV Fibre		
Hydro:	☐ Primary	☐ Direct Buried	
	☐ Secondary	☐ Duct	☐ Street Lighting
Water:	☐ Locate is Approximate Due to Non-metallic Pipe		

Excavator shall notify and receive a clearance from Regional Contacts Prior to excavation for the following:

Gas: ☐ End Thrust ☐ Vital Main ☐ Valve

Telephone: ☐ High Priority Cables ☐ Central Office Vicinity

Method of Field Marking: ☑ Paint ☐ Stakes ☐ Flags ☐ Offset Stakes ☐ Chalk ☐ Steel

Caution: Locate is VOID after 60 days. See attached for Bell Canada. Enbridge Locates VOID after 60 days (see attached document for details). Alectra, Burlington Hydro, Canadian Niagara Power, Town of Caledon, Cogeco, Grimsby Power, City of Hamilton Wentworth Water, City of St. Catherines, Oakville hydro, Town of Oakville, Welland Hydro, Toronto Hydro, Toronto BIA and Traffic/Rescue, TTC-Electrical, TTC-Communications Locates valid for 60 days. TTC-Structures, Rogers valid for 90 days, Halton Region are valid for 120 days. Toronto Water valid for project. For locate requests or remarks, contact Ontario One Call 1-800-400-2255

Caution: The markings may disappear or be misplaced. Should sketch markings not coincide, a new locate must be obtained. This is based on information given at the time. Any changes to location or nature of work requires a new locate. The EXCAVATOR must not work outside the indicated Located Area without a further locate by the company. Privately owned facilities may be present in the Locate Area.

Documents given to be used with this locate:

☑ None

☐ NEB Excavation/Construction Booklet

☐ Gas Excavation Guidelines

☐ Hydro Electric Excavation Guidelines

☐ Bell Guidelines for Excavation

ID Number: 924 Murphy A.

Date/Time: 08-Feb-2023 12:09 pm

In/Out: 11:14 am 12:02 pm

Accepted By:

Print:

☑ Mark and Fax/Email ☐ Left on Site

A copy of this Primary Locate Report and the Auxiliary Locate Sheet(s) must be on site and in the hands of the machine operator during work operations. Should sketch and markings not coincide, a new locate must be obtained.

Kongats Architects

Report: Air Tightness Testing of High Park Nature Centre

June 27, 2023

Prepared By:

BUILDING KNOWLEDGE CANADA INC.

50 Fleming Drive, Unit 6
Cambridge, ON N1T 2B1

P: 1-800-267-6830 / 519-658-6232
F: 519-658-6103

DATE:	June 27, 2023
TO:	Tymea Sarkozy, Kongats Architects 2-23 Morrow Avenue, Toronto ON M6R 2H9 416-504-8998 x08 tsarkozy@kongatsarchitects.com
FROM:	Kyle Anders, Building Knowledge Canada Inc. 50 Fleming Drive, Unit 6, Cambridge ON N1T 2B1 226-220-2391 kyle@buildingknowledge.ca
RE:	Air Tightness Testing of High Park Nature Centre

BACKGROUND

Building air tightness testing is a process in which the entire building enclosure is pressure tested to quantify the air tightness of the building. The test measures air leakage rates through a building enclosure under controlled (+/-) pressurization conditions. The process provides quality assurance of a building's air barrier system. A high performance air barrier system is fundamental to ensuring healthy, comfortable, durable and efficient buildings.

The restriction of air movement by the continuous attachments of air barrier components is one of the most important functions of the building enclosure. Air is a transport mechanism for water, vapor, heat, and airborne contaminants. Uncontrolled leakage can lead to condensation moisture issues, bulk water ingress, excessive space heating and cooling loads, and poor indoor air quality.

BKC uses calibrated fans to induce a negative or positive pressure across the building enclosure, and measures air flow through the fans at various pressure differentials to indicate the building's air infiltration characteristics. Air tightness test results are presented in various metrics, including Air Change per Hour (ACH, normalized to building's interior volume), and Normalized Leakage Area (NLR, normalized to the building's exterior envelope surface area). Depending on the test and building type, the results are referenced to 50 Pa (for smaller buildings, homes), or 75 Pa (for larger commercial buildings).

PROJECT OVERVIEW

Building Knowledge Canada (BKC) conducted whole building air tightness testing at the High Park Nature Centre building located 375 Colborne Lodge Drive, Toronto, Ontario (see Figure 1). The building is planned to undergo a deep energy retrofit, and pre-retrofit testing was done to measure its baseline level of air tightness prior to future energy upgrades.

+

Figure 1: Street view and aerial photo of the High Park Nature Centre.

AIR TIGHTNESS TEST DATA

The air tightness test data for this project is summarized below in Table 1.

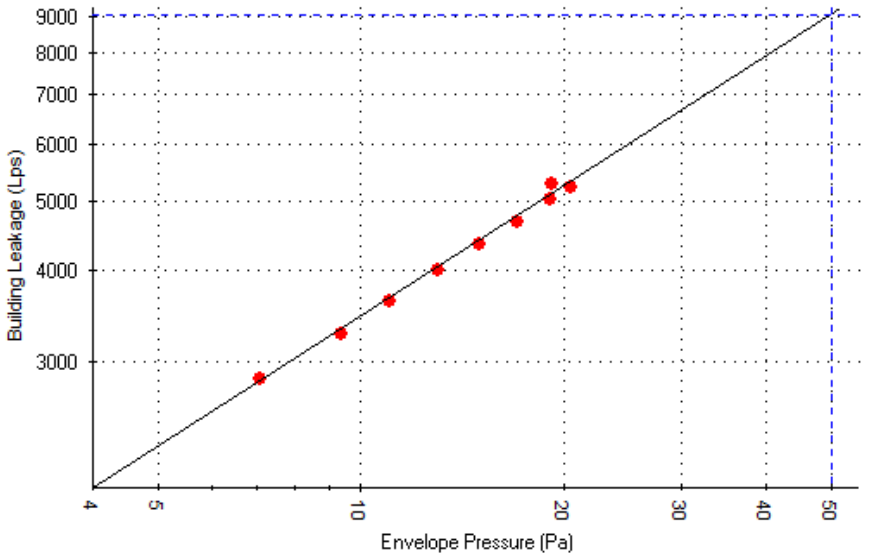
Table 1: Summary of air tightness test data

Testing Agency:		Building Knowledge Canada
Client:		Tymea Sarkozy Kongats Architects 2-23 Morrow Avenue, Toronto ON M6R 2H9
Tested by:		➢ Kyle Anders (primary contact): 226-220-2391, kyle@buildingknowledge.ca ➢ Michael Gilezan: mike@buildingknowledge.ca ➢ Alan Schmutz: alan@buildingknowledge.ca
Testing Site	Building Description:	1-storey institutional / school building, with 1 level partially below grade of mechanical and storage space. All 4 sides of the building are exposed (detached).
	Address:	375 Colborne Lodge Drive, Toronto, Ontario
	Elevation Above Sea Level:	76 m (249 ft.)
	Test Zone Description, Dimensions:	Test zone was the whole building, consisting of 2 levels: ➢ Basement level: mechanical and storage space ➢ Ground floor: pavilion, offices, kitchen, washrooms, coat room See Figure 2 for plan view drawings showing test zone boundary. The following dimensions of the test zone were computed by Kyle Anders, based on the floor plans provided in addition to on-site measurements. ➢ Conditioned volume: 78,887 ft^3 ➢ Exterior building envelope surface area (incl. slab floor, ceiling, exterior walls): 19,394 ft^2
Test Configurations	Test Zone(s):	Single zone whole building test. Rooms within test zone were interconnected with each other by propping open interior doors to maintain consistent pressure conditions during testing (Figure 4). The basement level door leading to storage room x012 was closed off to exclude that area from the test zone. This space was not served by the heating system and portions of it were below insulated floors, thus it was considered outside of the thermal boundary.
	Openings in the Test Envelope:	➢ All exterior doors and windows were closed during the test (Figure 3)

		➢ Other intentional penetrations were kept as-is (e.g., vents, grilles, etc.)
	HVAC Equipment Settings:	➢ Forced air heating system was turned off for duration of the test (Figure 4) ➢ No exhaust fans operating during test
Test Objectives	Purpose:	Establish baseline air tightness performance of the building envelope prior to a major retrofit of the building.
	Test Procedure:	ASTM E770-19 *Standard Test Method for Determining Air Leakage Rate by Fan Pressurization*
	Test Type:	Single-zone test, depressurization, conducted using the regression method.
	Test Deviations:	Due to the leakiness of the building enclosure and limited equipment capacity available during testing, an induced pressure of for the tests, a maximum test pressure difference of only -21 Pa could be induced across the building enclosure. Measurements were taken within a partial range encompassing 9 data points between -21 Pa and -7 Pa to create a linear regression model to determine the airflow at -50 Pa.
Test Equipment:		One (x1) Minneapolis Blower Door™ Double Fan System (x2 Model 3 110V fan) with DG-1000 digital pressure and flow gauge, located in the north-west entrance to the ground floor. (Figure 5)
Test Conditions	Date:	June 12th, 2023 (time: 4:00-4:30pm)
	Weather:	Cloudy with a moderate breeze
	Temperature:	18°C (outdoor), 22°C (indoor)
	Wind Speed:	21 km/h

Test Results

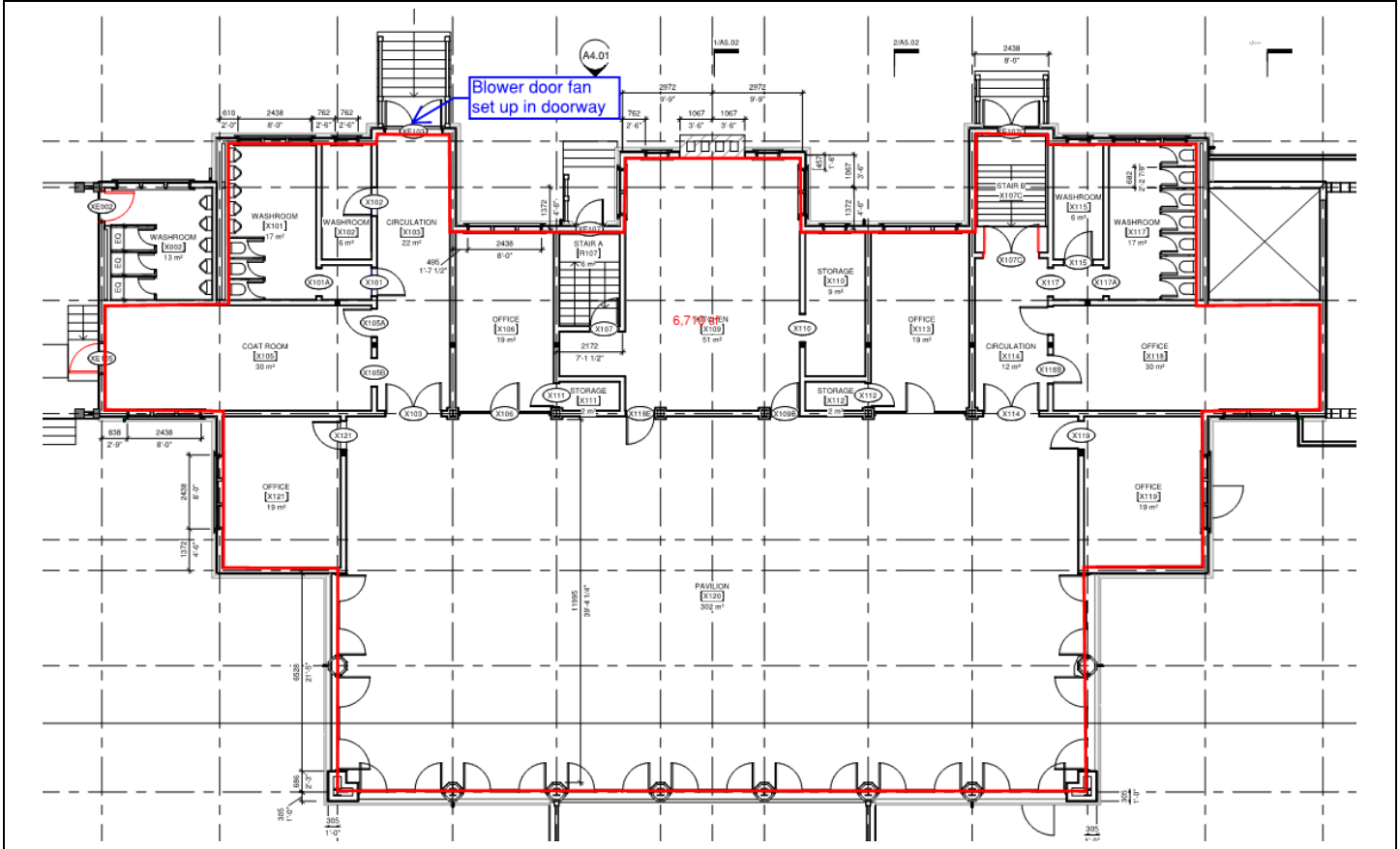
Airflow vs. Pressure Readings:



Label	Base?	start	end	nobs	Nominal Avg Pressure	Nominal Total Flow
BASELINE	TRUE	64	181	118	-0.18	0
-21	FALSE	807	835	29	-20.5	5301.949
-21	FALSE	862	890	29	-19.27	5334.597
-19	FALSE	1789	1818	30	-19.2	5097.806
-17	FALSE	1830	1858	29	-17.11	4734.458
-15	FALSE	1871	1899	29	-15.08	4423.116
-13	FALSE	1919	1948	30	-13.07	4061.058
-11	FALSE	1967	1996	30	-11.12	3674.66
-9	FALSE	2014	2043	30	-9.42	3314.811
-7	FALSE	2067	2095	29	-7.21	2877.247
POST BASE	TRUE	2130	2247	118	-0.1	0

Airflow (Q) @ 50 Pa:	9054 L/s (+/- 4.9%)
Air Changes per Hour (ACH) @ 50 Pa:	14.6
Normalized Leakage Rate (NLR) @ 50 Pa:	5.02 L/s per m^2
Equivalent Leakage Area (ELA) @ 10 Pa:	13,920 cm^2 (+/- 1.7%)
Flow Coefficient (C):	876.8 L/s/Pa^n (+/- 9.7%)
Exponent (n):	0.597 (+/- 0.037)

BASEMENT LEVEL:



GROUND FLOOR:

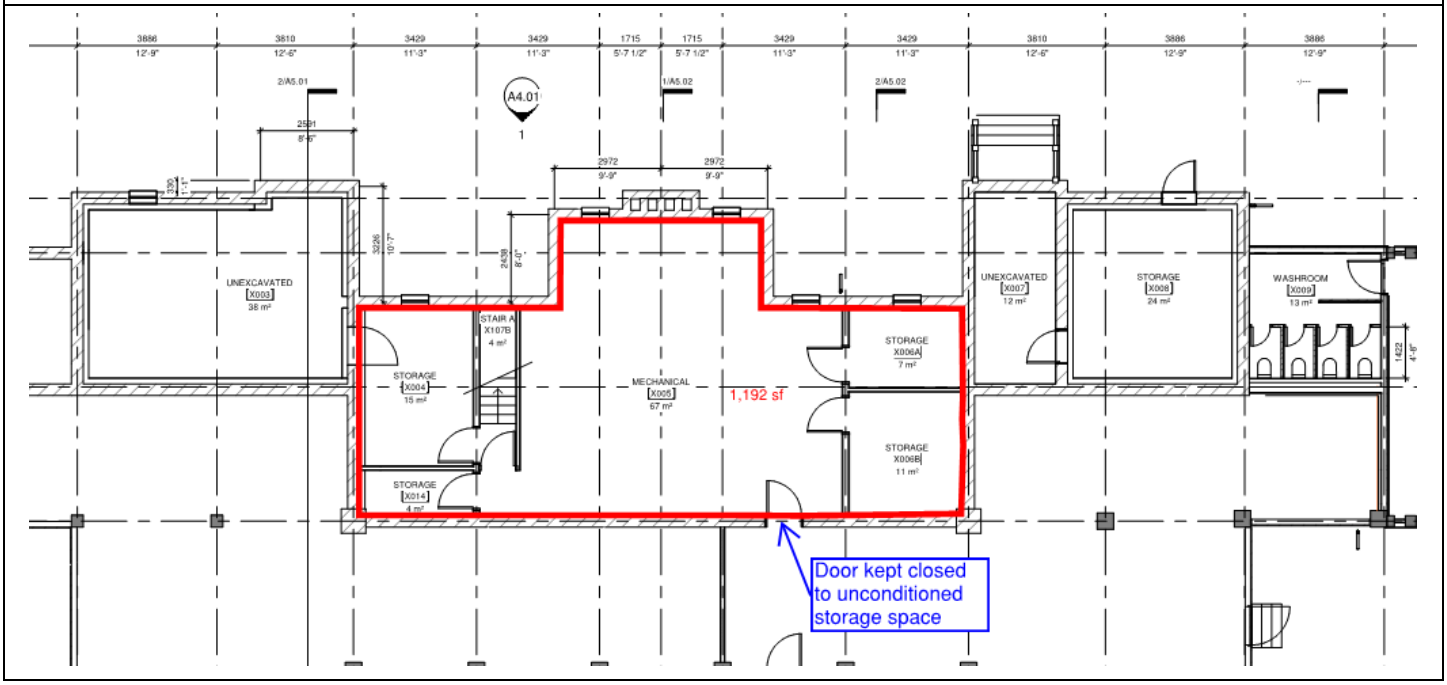


Figure 2: Plan view drawings showing the test zone boundary, outlined in red.

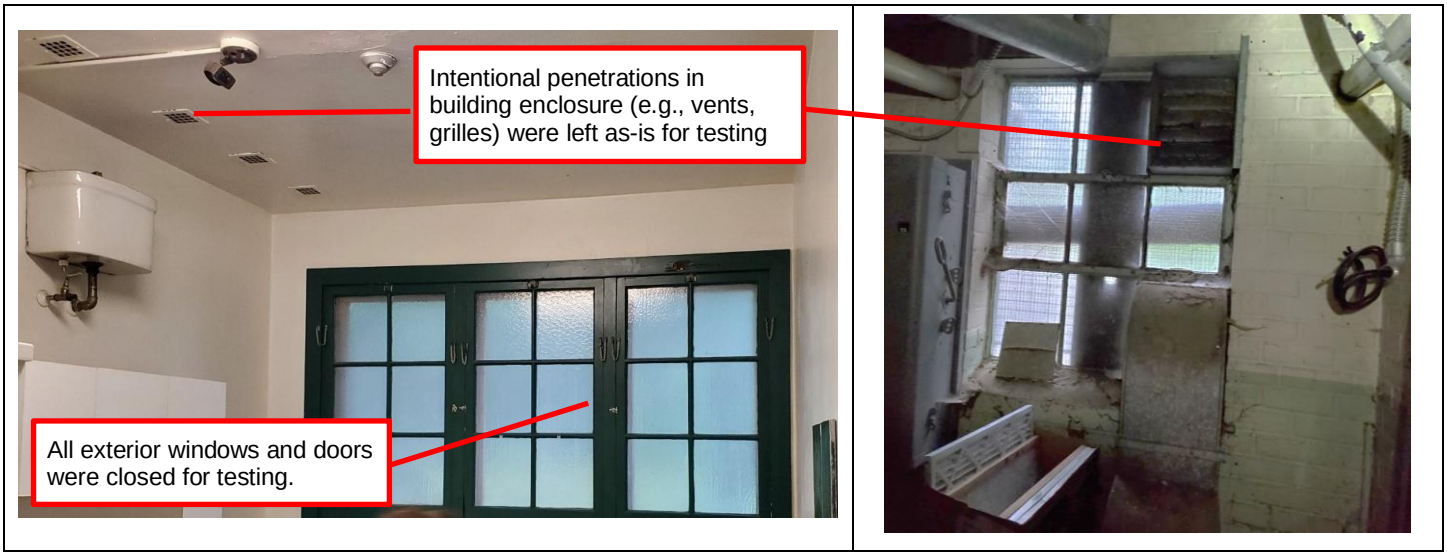


Figure 3: Exterior windows and doors were closed during testing, whereas intentional openings (grilles, vents) were left as-is.

Figure 4: During testing interior doors within the test zone were propped open and forced air heating system was turned off.

.

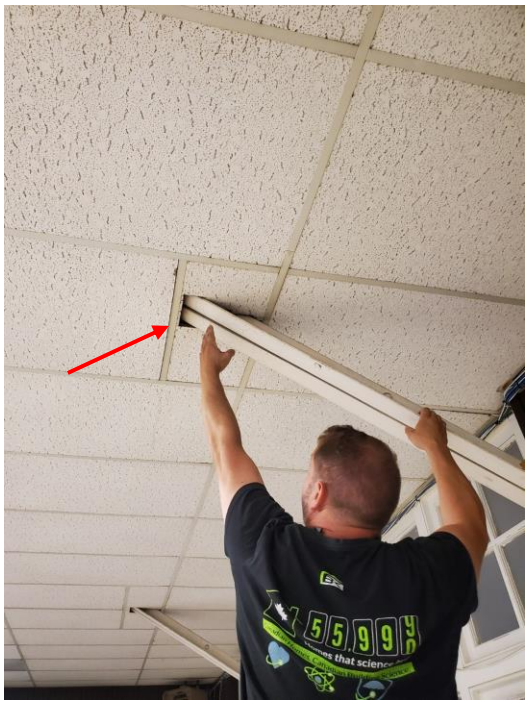
Figure 5: Blower door fan set up at the ground floor entrance on the north-west side.

AIR LEAKAGE LOCATIONS

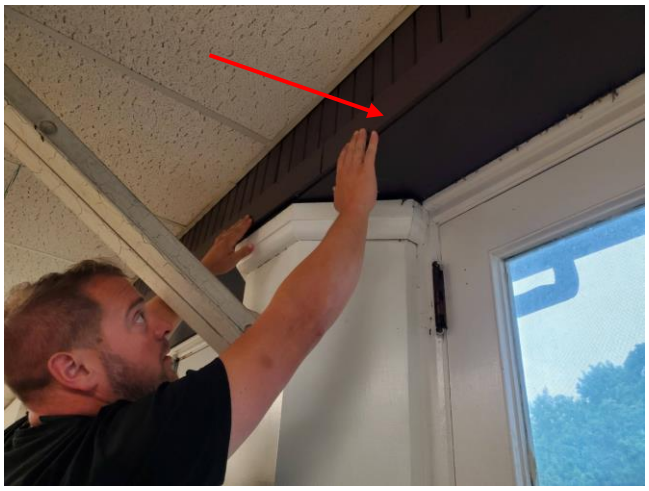
During building depressurization, air leakage locations were observed using sense of touch in the locations below. These are presented not as an exhaustive list of air leakage locations, but rather to provide examples of observed locations:

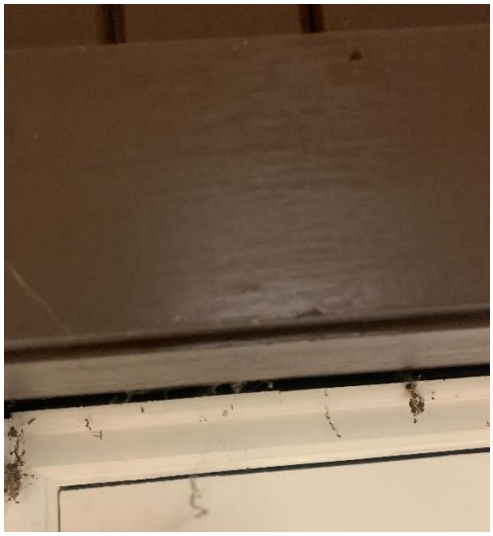
In the corners of the pavilion, along the seams and edges of the tongue and groove columns.

At the structural support penetrations throughout the pavilion, running from the outer columns to the roof



Along the top trim of the pavilion windows/doors





Certain areas of exterior doors (e.g. missing doorsweep, gap near old locking hardware)

From service penetrations in basement stairwell

SUMMARY

In summary, whole building air tightness testing of High Park Nature Centre (pre-renovation) was conducted to determine the baseline air tightness of the building. The building was depressurized in accordance with ASTM E770-19 *Standard Test Method for Determining Air Leakage Rate by Fan Pressurization*, using a 2-fan blower door system mounted in north-west entrance to the ground floor. Due to the excessive leakiness in the building, a test pressure difference of only -21 Pa could be induced.

The Air Changes per Hour (ACH) at 50 Pa was calculated to be 14.6, with a Normalized Leakage Rate (NLR) at 50 Pa of 5.02 L/s per m^2. To put these results in context, Table 2 below summarizes NLR levels across various codes and performance standards:

Table 2: Whole Building Air Tightness Testing Performance Targets

Air Changes Per Hour @ 50 Pa	**Normalized Leakage Rate (NLR @ 50Pa)**		**Performance Level**	**Codes, Performance Standards**
	(cfm/ft^2)	**($L/s•m^2$)**		
10.0			Loose	
4.6			Average	
3.2			Code	New code-built home
2.5	0.18	0.93	Good	ENERGY STAR® for New Homes v17.1
1.5	0.11	0.57	Excellent	CHBA Net Zero Home v1.3 (attached dwellings)
-	0.06	0.30	Best	PHIUS+ 2018
0.6	-	-		Passive House International

Significant air leakage was observed at various locations within the building using sense of touch to feel the air moving inwards while the building was under depressurization. Significant air was coming up from the basement, despite the door to unconditioned storage room 012 being closed. Significant air leakage was also coming from the roof, evident by air pouring through each of the truss penetrations extending through the pavilion ceiling. Along the tops of the pavilion windows/doors (through the header) there was also leakage detected, as well at the pavilion corners around the built-out portions of tongue-and-groove.

BUILDING KNOWLEDGE

BUILDING KNOWLEDGE CANADA INC.

Building Knowledge Canada (BKC) originally began in 1986 as a division of Air Solutions, then incorporated interdependently in 2009. BKC is the largest residential energy evaluation/home performance company in Canada with over 43,000+ high performance home evaluations/ratings completed across Canada since it's creation.

The firm specializes in practical building sciences for residential buildings/homes including energy modeling, enclosure and HVAC design and forensics, indoor air quality & thermal comfort design, air tightness testing & air barrier design and forensics, HVAC residential commissioning, enclosure water management detailing & forensics; All with the clear goal of achieving energy efficiency, envelope durability and occupant health and comfort.

Building Knowledge Canada is a leader in building performance strategies and an expert on the industry's cutting-edge initiatives. BKC's credentials include qualifications in the following areas:

- Recognized Building Science Trainers: Natural Resources Canada
- High Performance Building Science Training for Builders, Trade Contractors, Architects, Sales/Marketing Teams, Real Estate Industry, Building Officials
- Building Science/Building Envelope Diagnostics & Testing
- Energy Software Modeling and Design Analysis Including HOT 2000, REM/Rate, and RETScreen
- Building Code Compliance – NBC and OBC Energy Compliance: Performance/Prescriptive/Comparative
- Air Barrier/Tightness Detailing, Diagnostics and Evaluations
- CMHC Trained Indoor Air Quality Investigators: Training and Audits
- HVAC Design Review, System Diagnostics (HRAI Accredited Staff)
- NET ZERO Home Design Analysis, Modeling and Testing
- LEED
- ENERGY STAR®

BKC contributes its expertise in Building Science Training and Building Code Analysis for several industry partners including both Federal & Provincial public institutions and private manufacturers of construction material and HVAC equipment. Currently BKC is providing Building Science/Energy Efficiency Training and Consultation for the following clients:

- CMHC Canadian Mortgage & Housing Corp
- CHBA Canadian Home Builders Association
- Natural Resources Canada
- NRCan LEEP Division
- ENBRIDGE
- EnerQuality Corporation
- Dupont / Dow
- Owens Corning
- Venmar VanEE
- Jeld-Wen
- EEBA Energy & Environmental Building Alliance
- New Brunswick Power
- BC British Columbia Housing
- OBOA Ontario Building Officials Association
- OHBA Ontario Homebuilders Association

BKC team members have been instrumental in the development of numerous industry standards (NRC, CSA, etc.) and participate on various building code and advanced housing program committees:

- CHBA Net Zero Home Council and Program Management Committee
- National Building Code -Standing Committee Energy and Buildings
- ASHRAE 90.2 Residential Low-Rise Energy Efficiency Standing committee.
- ENERGY STAR® for New Homes Advisory Committee and TAC Committee Chair
- CSA F280 -2012 Development and Committee Chair
- CSA TC 424: Energy Systems in buildings and homes
- Ontario Building Code Part 9 2012 Advisory Committee, Part 7, 3 and 12 Review committees
- LEED for Homes Canadian Technical Review Committee

THE HOME THAT SCIENCE BUILT

BUILDING KNOWLEDGE CANADA INC.

Reference: 2487A-24

January 30th, 2025

Ms. Tymea Sarkozy
Associate, Hon. B.Sc., M.Arch., OAA
KONGATS ARCHITECTS
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Geoexchange Systems
High Park Visitors Nature Centre.

High Park Visitors Nature Centre (HPVNC) is an updated municipal facility currently under design and contemplation at High Park in Toronto. This project is currently proceeding through the detailed design phase in order to define the overall design basis for the project. HPVNC is approximately a 14,000 sq. ft. dedicated municipal/commercial building located 375 Colborne Lodge Drive, Toronto. RCEL has reviewed the site plan and architectural drawings for this development.

It is understood that the mechanical systems designed to heat, cool and ventilate the spaces will be a combination of variable refrigerant technology and energy recovery ventilation. It is understood that no supplemental means of heating and cooling is being considered. Therefore, the geothermal borefield has been sized for 100% load of this commercial space.

Technical opportunities to produce optimal economic results, giving consideration to site layout and space, building energy load aggregation, simultaneous energy loads and mechanical integration that captures energy conservation and increased energy efficiency were given a priority.

Technical feasibility examines the possibility of installing a ground heat exchanger as part of the site area and the revisions to the current design that would need to be made to the building HVAC equipment in order to provide adequate, reliable and effective supply of heating and cooling to the building.

Background

"Geoexchange" is an application, which uses the earth to provide both heating and cooling in homes and buildings. The geoexchange process makes use of specialized heat pumps, which take advantage of the fact that the temperature in the ground beneath the frost line remains relatively constant throughout the year, whereas temperatures on the earth's surface fluctuate greatly across the seasons.

Pipes are installed in the ground in a loop connected to the heat pump, circulating a liquid to exchange energy with the earth. In the colder months, the liquid extracts heat from the ground, which is transmitted to the building. In the warmer months, the system is reversed by sending heat into the cool ground more efficiently than can be done with conventional air conditioning systems, which have to be exposed to hot ambient outdoor air. These ground loops can be installed both horizontally as well as vertically depending on existing site conditions. In more congested areas such as Downtown Toronto, a vertical ground loop would be installed due to space constrictions.

The benefits of geoexchange in commercial buildings include operating cost savings, greater comfort, lower greenhouse gas emissions, lower maintenance and equipment life cycle costs, and individual zone control. The underlying reason this technology is so attractive is that for every unit of energy used to operate the heat pumps, the systems extract 3 to 4 times the equivalent in free and clean energy from the earth.

1.0 Assumptions

Financial modeling is dependent on a number of assumptions as well as project specific data. Any of these factors can be changed to deliver updated results which makes this financial model either a predictive tool that can be updated as new or specific information becomes available, or a means to vary alternative factors to test the sensitivity of factors.

In the preparation of the financial model for this study, assumptions and project data used are supported by public and third-party sources where possible, software analysis and reasonable estimates, based on prior project experience. All assumptions and estimates have been chosen conservatively, by incorporating future expectations that are similar or nearly similar, to what is experienced today. No material future event has been anticipated, such as a substantial change in natural gas supply or a return to historical volatility in natural gas prices. The following assumptions and project specific data were used in preparation of the financial model prepared for each project site:

- Expected life of traditional HVAC equipment – 25 years
- Expected rate of geothermal HVAC equipment – 35 years
- Expected life of the geothermal bore field – 50 to 100 years
- Cost of Electricity in year 1 (2018) - $0.147 / kWh
- Cost of Natural Gas in year 1 (2018) - $0.281 / m^3
- Schedule for project construction – 18 months

2.0 Thermal Conductivity

The surficial geological information means that for geothermal installations, there is enough overburden depth at all sites, to accommodate horizontal tie-ins of vertical borefields, with normal excavation of unconsolidated material. It also means that the lower thermal conductivity value (K) of 1.73 W/m °K[1] (1.0 BTUh / ft.°F[2]) of unconsolidated material is not a large proportion of a proposed vertical borehole depth (183 m., 600 ft.) and will only marginally affect the thermal conductivity available from completed borehole assemblies installed into the ground.

K ≈ 2.1 to 2.2 W/m °K or 1.25 to 1.30 BTUh / ft.°F

These levels of Thermal Conductivity indicate that approximately 53 metres (175 ft.) of vertical geothermal pipe installation will be required to produce one ton of geothermal heating and cooling energy capacity. Therefore, one borehole installed to a depth of 183 metres (600 ft.) will produce a capacity of conservatively 3.13 tons of geothermal energy.

RCEL has found that the integrity of this desktop study information is usually quite reasonable, when compared to actual test bore holes and thermal conductivity tests. Therefore, it is expected that in-situ testing required for construction, will not influence the preliminary sizing of the prescribed geothermal systems by more than plus or minus 10%.

[1] W/m °K means watts per metre per degree Kelvin, meters refer to the length of the vertical geothermal closed-loop installation

[2] BTUh/ft.°F means British Thermal Unit hours per foot per degree Fahrenheit, feet refer to the length of the vertical geothermal closed-loop installation

3.0 Operations and Maintenance Costs

The annual operations and maintenance costs of a geothermal system are likely less than for a comparable capacity conventional natural gas boiler and electric chiller equipment. The geothermal central mechanical equipment is all contained inside the building and not exposed to weather. There is no combustion to cause humidity or excess temperature changes within the equipment and no carbon by-product either as solids in the system or air particles in the exhaust.

A geothermal system is composed mainly of water circulation pumps driven by electricity, which may from time to time require repair or replacement. The anti-freeze level of the geothermal loop field should be monitored and adjusted if required, however the system is entirely sealed, with no input or output, and so is not subject to excess evaporation or depletion. Sensors can be installed to monitor system performance on-site or by internet connection.

4.0 Technical Analysis

4.1 Heat Gain, Heat Loss Calculations

RCEL calculated the heat gain and heat loss of the building using Carrier's Hourly Analysis Program (HAP). The software provides a true hour by hour energy analysis, using measured weather data, for all 8760 hours of the year to calculate building heat transfer and peak loads. Hourly energy consumption by HVAC and non-HVAC components is tabulated to determine the total building energy use profile as well as daily and monthly totals.

In order to achieve accurate results from the software, the building architecture was separated into 11 distinct heating and cooling zones for analysis.

A monthly summary of the results of the independent building analysis are illustrated in Table 8 below:

Table 1. Predicted monthly building heating/cooling peak loads and GSHP energy production

Month	GSHP Cooling Coil Load (kBTU)	Building Peak Cooling Load (kBTU/hr)	GSHP Heating Coil Load (kBTU)	Building Peak Heating Load (kBTU/hr)
January	180	3.32	62820	403.48
February	242	4.7	53162	371.12
March	2286	319.6	38796	322.24
April	7332	63.38	24376	177
May	16620	126.88	13052	159.44
June	28820	219.76	3750	82.94
July	37006	310.68	1028	43.48
August	29080	237.34	1810	47.08
September	19060	201.36	7032	108.04
October	8669	100.3	18616	184.26
November	1208	29.14	31126	266.48
December	260	3.7	53970	391.86

4.2 Ground Source Heat Pump Energy Production Modeling

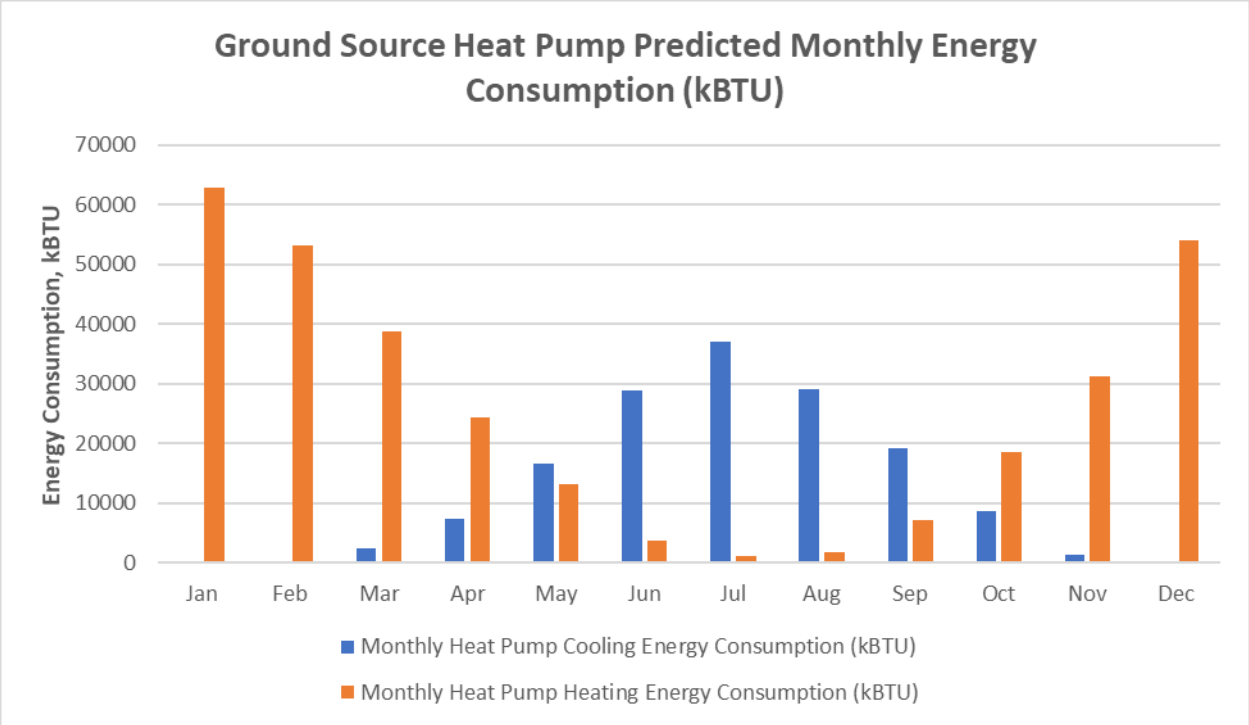


Figure 1: GSHP Monthly Heating/Cooling Energy Production

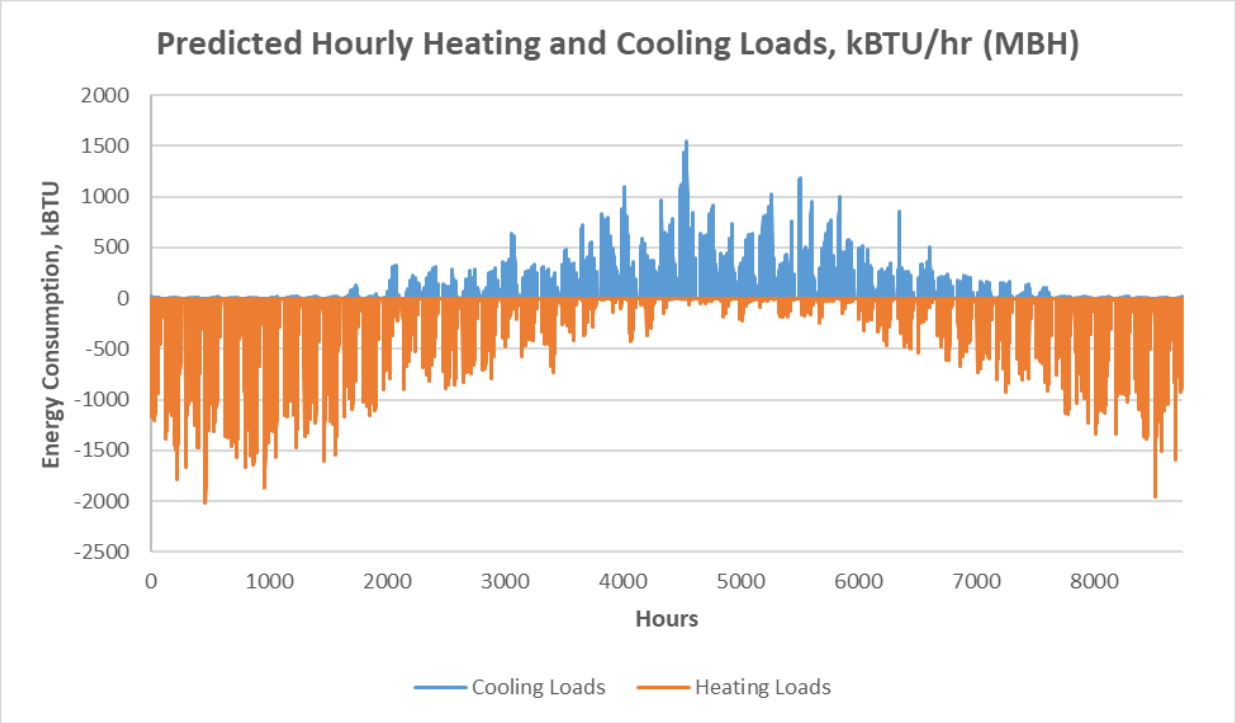


Figure 2: Hourly Building Heating/Cooling Loads

5.0 Ground Source Heat Pump Energy Production Modeling

The Ground Loop Design (GLD) software was used to size the borehole field using the following design parameters:

- Spacing between borehole centres: 4.6 m (15 ft)
- Borehole diameter: 98 mm (4") in bedrock; 140 mm (5 ½") in overburden
- 32 mm (1 ¼") U-loop, HDPE 4710, SDR-11
- Antifreeze solution: 20% ethanol
- Ground thermal conductivity: 2.25 W/m.K (1.30 BTU / hr.ft.^{o}F)
- Ground thermal diffusivity: 0.074 m^2/day (0.80 ft^2/day)
- Deep earth temperature: 11.3 ^{o}C (52.4 ^{o}F)
- Modeling time (prediction time): 20 years

5.1 Geoexchange Retrofit Concept Design

We have considered the land space under the proposed parking lot in order to install the ground heat exchanger.

- The estimated thermal conductivity under the Project Dodge site, is approximately K ≈ 2.1 to 2.2 W/m °K or 1.25 to 1.30 BTUh / ft.°F

To produce geoexchange energy from ground with this thermal conductivity to satisfy the heating and cooling requirements for HPVNC , a vertical closed loop ground heat exchanger of approximately 6,400 ft in length is required. With relatively low levels of ground water and shale bedrock known to be at this site, drillers should achieve boreholes of 183 m depth (600 ft.), with no difficulty. Therefore, 8 boreholes in a 4 by 2 grid, evenly spaced approximately 15 feet apart will be required to heat and cool the space with geoexchange energy.

NO SUPPLEMENTARY HEATING OR COOLING SHALL BE NECESSARY.

We trust this technical memorandum satisfies your immediate requirements. If you have any questions or require further clarification, please do not hesitate to contact our office.

Yours truly,

Remy Consulting Engineers Ltd.

Mark Greenhill, P.Eng.
Senior Mechanical Engineer

NORRIS FIRE
CONSULTING

Professional Engineers
Ontario

Limited Engineering Licensee

Name: M B J Norris
Number: 100229827
Limitations: Specifying and reviewing of fire protection and fire alarm systems as per OBC, OFC and NFPA (13, 14, 17A, 20, 22, 24, 30, 70, 101, 2001 & 5000)

Association of Professional Engineers of Ontario

JAN 6 2025

Job Name	:	HIGH PARK VISITOR AND NATURE CENTRE
Drawing	:	FP-4
Location	:	375 COLBOURNE LODGE DRIVE
Remote Area	:	1
Contract	:	24-0243
Data File	:	HIGH PARK Area 1 rev 2.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME HIGH PARK VISITOR AND NATURE CENTRE
Location 375 COLBOURNE LODGE DRIVE
Drawing # FP-4
Contract # 24-0243
Date DEC 7 '24

DESIGN
Remote area # 1
Remote area location ATTIC
Occupancy classification LIGHT
Density 0.1 - Gpm/SqFt
Area of application NA - SqFt
Coverage/sprinkler 120 - SqFt
Type of sprinkler calculated Q.R K=4.2
 # Sprinklers calculated 18
In-rack demand NA - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 305.457 - GPM @ 28.938 - Psi
Type of system DRY
Volume of system (dry or pre-action) 190 - Gal

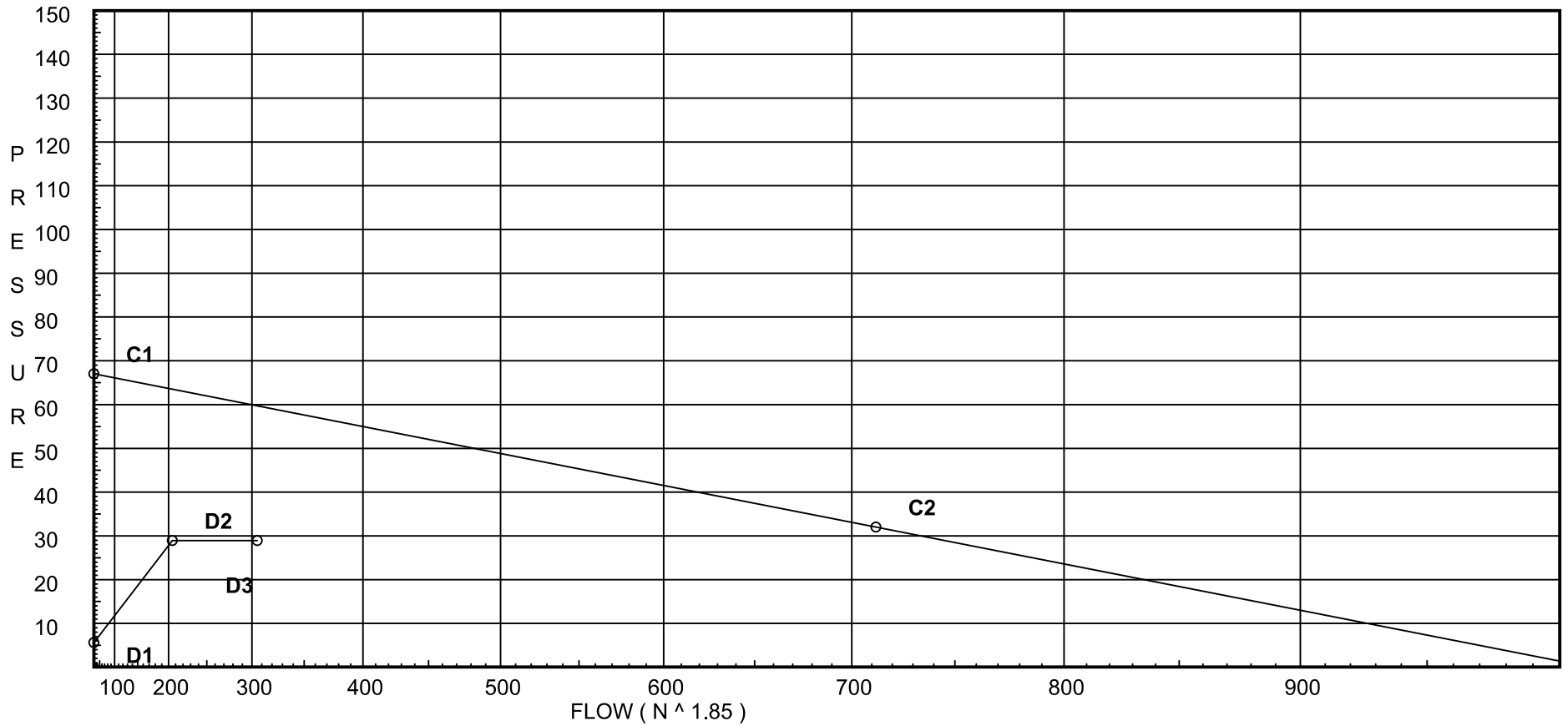
WATER SUPPLY INFORMATION
Test date MAY 2 2023
Location HYDRANT ON SITE
Source of info HYDRANT FLOW TEST

CONTRACTOR INFO NORRIS FIRE CONSULTING
Address 1840 CLEMENTS RD SUITE 202 / PICKERING ON
Phone # 905 669 5154
Name of designer M.T
Authority having jurisdiction CITY OF TORONTO
NOTES:

text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 67
- C2 - Residual Pressure: 32
- C2 - Residual Flow : 712

Demand:
- D1 - Elevation : 5.630
- D2 - System Flow : 205.457
- D2 - System Pressure : 28.938
- Hose (Demand) : 100
- D3 - System Demand : 305.457
- Safety Margin : 30.748



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
D	Dry Rel D								28		28		47								
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
L	NFPA 13 Long Turn Elbow	0.5	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zwh	Watts 757DCDA Horiz	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.
The diameter modification was turned off by the operator when the job was calculated.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
HYD	67.0	32	712.0	59.686	305.46	28.938

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
S101	9.5	4.2	7.82	11.75	0.1	100
S102	9.5	4.2	7.88	11.79	0.1	100
S103	9.5	4.2	8.07	11.93	0.1	100
S104	9.5	4.2	8.5	12.24	0.1	100
S105	9.5	4.2	9.23	12.76	0.1	100
S106	12.5	4.2	7.71	11.66	0.1	100
S107	12.5	4.2	7.77	11.7	0.1	100
S108	12.5	4.2	7.96	11.85	0.1	100
S109	12.5	4.2	8.38	12.16	0.1	100
S110	9.5	4.2	8.31	12.11	0.1	100
S111	9.5	4.2	8.37	12.15	0.1	100
S112	9.5	4.2	8.58	12.3	0.1	100
S113	9.5	4.2	9.02	12.62	0.1	100
S114	9.5	4.2	9.8	13.15	0.1	100
S115	9.5	4.2	8.67	12.37	0.1	100
S116	13.0	4.2	7.0	11.11	0.1	100
S117	11.0	4.2	7.92	11.82	0.1	100
106	9.5		8.74			
S118	9.5		8.81			
105	9.5		11.51			
103	9.5		11.53			
101	9.5		10.86			
102	9.5		10.99			
104	9.5		13.76			
107	9.5		16.47			
108	14.0		15.87			
109	14.0		17.81			
ATC	14.0		18.07			
FLG	-6.0		31.35			
HYD	0.0		28.94	100.0		

Node1 / to / Node2	Elev1 / Elev2	K / Fact	Qa / Qt	Nom / Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact / Pf/Ft	Pt Pe Pf	******* Notes ******
*EQUIVALENT K'S										
S101	9.500	4.20	11.75	1.5			8.000	100	7.821	
to									0.0	
S102	9.500		11.75	1.682			8.000	0.0068	0.054	Vel = 1.70
S102	9.500	4.20	11.78	1.5			8.000	100	7.875	
to									0.0	
S103	9.500		23.53	1.682			8.000	0.0248	0.198	Vel = 3.40
S103	9.500	4.20	11.94	1.5			8.000	100	8.073	
to									0.0	
S104	9.500		35.47	1.682			8.000	0.0528	0.422	Vel = 5.12
S104	9.500	4.20	12.24	1.5			8.000	100	8.495	
to									0.0	
S105	9.500		47.71	1.682			8.000	0.0914	0.731	Vel = 6.89
S105	9.500	4.20	12.75	1.5	E	2.855	3.000	100	9.226	
to					T	5.71	8.565		0.0	
101	9.500		60.46	1.682			11.565	0.1416	1.638	Vel = 8.73
			0.0							
101			60.46						10.864	K Factor = 18.34
S106	12.500	4.20	11.66	1.5			8.000	100	7.712	
to									0.0	
S107	12.500		11.66	1.682			8.000	0.0068	0.054	Vel = 1.68
S107	12.500	4.20	11.71	1.5			8.000	100	7.766	
to									0.0	
S108	12.500		23.37	1.682			8.000	0.0244	0.195	Vel = 3.37
S108	12.500	4.20	11.85	1.5			8.000	100	7.961	
to									0.0	
S109	12.500		35.22	1.682			8.000	0.0521	0.417	Vel = 5.09
S109	12.500	4.20	12.16	1.5	E	2.855	6.000	100	8.378	
to					T	5.71	8.565		1.299	
102	9.500		47.38	1.682			14.565	0.0902	1.314	Vel = 6.84
			0.0							
102			47.38						10.991	K Factor = 14.29
S110	9.500	4.20	12.11	1.5			8.000	100	8.309	
to									0.0	
S111	9.500		12.11	1.682			8.000	0.0072	0.058	Vel = 1.75
S111	9.500	4.20	12.15	1.5			8.000	100	8.367	
to									0.0	
S112	9.500		24.26	1.682			8.000	0.0261	0.209	Vel = 3.50
S112	9.500	4.20	12.30	1.5			8.000	100	8.576	
to									0.0	
S113	9.500		36.56	1.682			8.000	0.0559	0.447	Vel = 5.28
S113	9.500	4.20	12.61	1.5			8.000	100	9.023	
to									0.0	
S114	9.500		49.17	1.682			8.000	0.0966	0.773	Vel = 7.10
S114	9.500	4.20	13.15	1.5	E	2.855	3.000	100	9.796	
to					T	5.71	8.565		0.0	
103	9.500		62.32	1.682			11.565	0.1498	1.732	Vel = 9.00
			0.0							

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
103			62.32						11.528	K Factor = 18.35
S115	9.500	4.20	12.37	1.5			8.000	100	8.675	
to									0.0	
106	9.500		12.37	1.682			8.000	0.0075	0.060	Vel = 1.79
			0.0							
106			12.37						8.735	K Factor = 4.19
S116	13	4.20	11.11	1.5			8.000	100	7.000	
to									0.866	
S117	11		11.11	1.682			8.000	0.0062	0.050	Vel = 1.60
S117	11	4.20	11.82	1.5	T	5.71	1.500	100	7.916	
to							5.710		0.650	
106	9.500		22.93	1.682			7.210	0.0234	0.169	Vel = 3.31
106	9.500		12.37	1.5			1.500	100	8.735	
to									0.0	
S118	9.500		35.3	1.682			1.500	0.0527	0.079	Vel = 5.10
S118	9.500		0.0	1.5	E	2.855	43.000	100	8.814	
to					T	5.71	8.565		0.0	
105	9.500		35.3	1.682			51.565	0.0523	2.698	Vel = 5.10
105	9.500		0.0	2.5			2.750	100	11.512	
to									0.0	
103	9.500		35.3	2.635			2.750	0.0058	0.016	Vel = 2.08
103	9.500		170.16	2.5	T	8.564	6.000	100	11.528	
to							8.564		0.0	
104	9.500		205.46	2.635			14.564	0.1529	2.227	Vel = 12.09
			0.0							
104			205.46						13.755	K Factor = 55.40
101	9.500		60.46	2.5			8.000	100	10.864	
to									0.0	
102	9.500		60.46	2.635			8.000	0.0159	0.127	Vel = 3.56
102	9.500		47.38	2.5	T	8.564	3.000	100	10.991	
to							8.564		0.0	
103	9.500		107.84	2.635			11.564	0.0464	0.537	Vel = 6.34
			0.0							
103			107.84						11.528	K Factor = 31.76
104	9.500		205.46	2.5	E	4.282	13.500	100	13.755	
to							4.282		0.0	
107	9.500		205.46	2.635			17.782	0.1529	2.719	Vel = 12.09
107	9.500		0.0	2.5	E	4.282	4.500	100	16.474	
to							4.282		-1.949	
108	14		205.46	2.635			8.782	0.1529	1.343	Vel = 12.09
108	14		0.0	4	E	7.137	110.000	100	15.868	
to					T	14.274	21.411		0.0	
109	14		205.46	4.26			131.411	0.0147	1.937	Vel = 4.62
109	14		0.0	4	T	14.274	3.470	100	17.805	
to							14.274		0.0	
ATC	14		205.46	4.26			17.744	0.0148	0.262	Vel = 4.62
ATC	14		0.0	4	D	19.984	20.000	100	18.067	
to					B	8.564	28.548		12.566	* * Fixed Loss = 3.904
FLG	-6		205.46	4.26	Zwh	0.0	48.548	0.0147	0.715	Vel = 4.62

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
FLG	-6		0.0	6	4L	54.398	50.000	150	31.348	
to					T	45.332	104.263		-2.599	
HYD	0		205.46	6.09	G	4.533	154.263	0.0012	0.189	Vel = 2.26
			100.00							Qa = 100.00
HYD			305.46						28.938	K Factor = 56.78

NORRIS FIRE
CONSULTING

Professional Engineers
Ontario

Limited Engineering Licensee

Name: M B J Norris
Number: 100229827
Limitations: Specifying and reviewing of fire protection and fire alarm systems as per OBC, OFC and NFPA (13, 14, 17A, 20, 22, 24, 30, 70, 101, 2001 & 5000)

Association of Professional Engineers of Ontario

JAN 6 2025

Job Name	:	HIGH PARK VISITOR AND NATURE CENTRE
Drawing	:	FP-4
Location	:	375 COLBOURNE LODGE DRIVE
Remote Area	:	1
Contract	:	24-0243
Data File	:	HIGH PARK Area 1 rev 2.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME HIGH PARK VISITOR AND NATURE CENTRE
Location 375 COLBOURNE LODGE DRIVE
Drawing # FP-4
Contract # 24-0243
Date DEC 7 '24

DESIGN
Remote area # 1
Remote area location ATTIC
Occupancy classification LIGHT
Density 0.1 - Gpm/SqFt
Area of application NA - SqFt
Coverage/sprinkler 120 - SqFt
Type of sprinkler calculated Q.R K=4.2
 # Sprinklers calculated 18
In-rack demand NA - GPM
Hose streams 100 - GPM
Total water required (including hose streams) 305.457 - GPM @ 28.938 - Psi
Type of system DRY
Volume of system (dry or pre-action) 190 - Gal

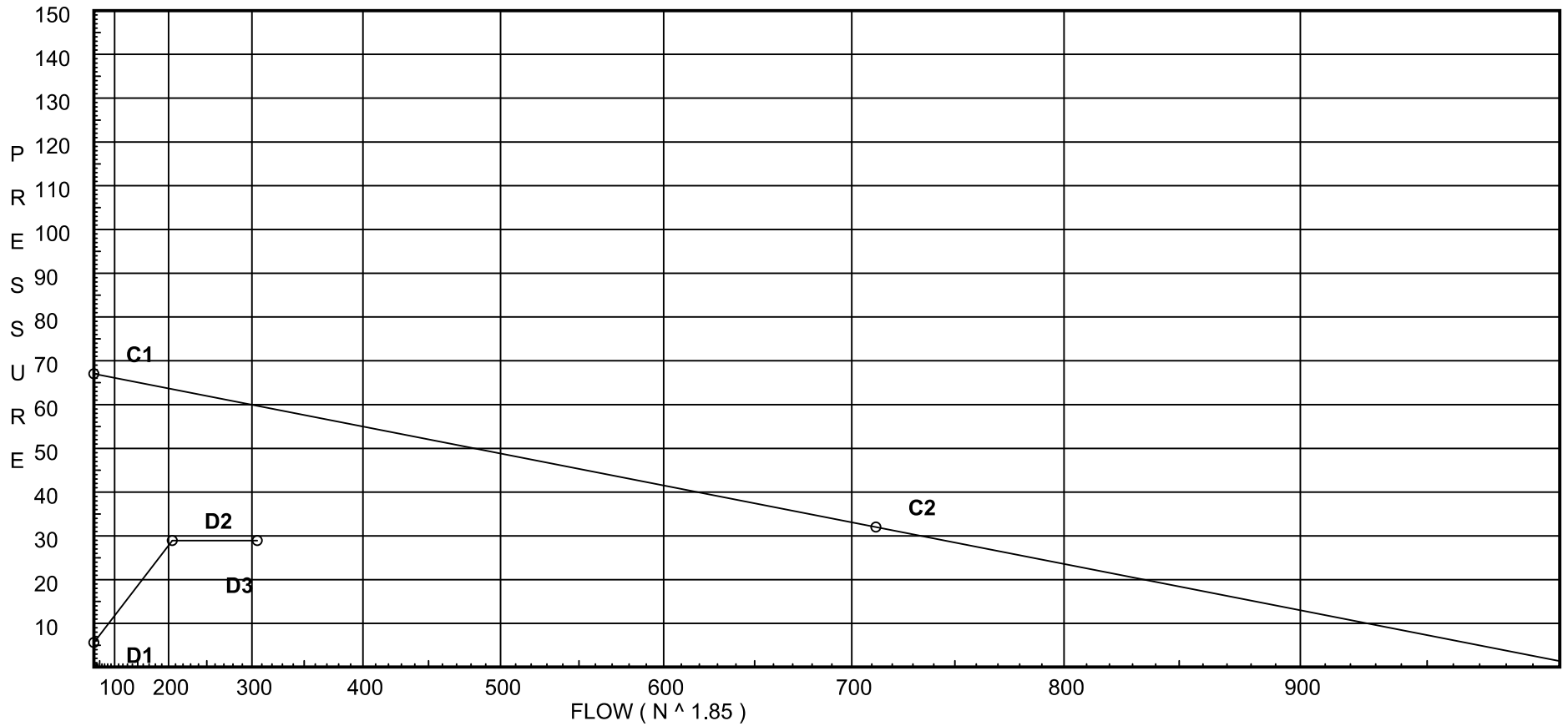
WATER SUPPLY INFORMATION
Test date MAY 2 2023
Location HYDRANT ON SITE
Source of info HYDRANT FLOW TEST

CONTRACTOR INFO NORRIS FIRE CONSULTING
Address 1840 CLEMENTS RD SUITE 202 / PICKERING ON
Phone # 905 669 5154
Name of designer M.T
Authority having jurisdiction CITY OF TORONTO
NOTES:

text1(35) - invisible

City Water Supply:
- C1 - Static Pressure : 67
- C2 - Residual Pressure: 32
- C2 - Residual Flow : 712

Demand:
- D1 - Elevation : 5.630
- D2 - System Flow : 205.457
- D2 - System Pressure : 28.938
- Hose (Demand) : 100
- D3 - System Demand : 305.457
- Safety Margin : 30.748



Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
D	Dry Rel D								28		28		47								
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
L	NFPA 13 Long Turn Elbow	0.5	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
Zwh	Watts 757DCDA Horiz	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.
The diameter modification was turned off by the operator when the job was calculated.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
HYD	67.0	32	712.0	59.686	305.46	28.938

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
S101	9.5	4.2	7.82	11.75	0.1	100
S102	9.5	4.2	7.88	11.79	0.1	100
S103	9.5	4.2	8.07	11.93	0.1	100
S104	9.5	4.2	8.5	12.24	0.1	100
S105	9.5	4.2	9.23	12.76	0.1	100
S106	12.5	4.2	7.71	11.66	0.1	100
S107	12.5	4.2	7.77	11.7	0.1	100
S108	12.5	4.2	7.96	11.85	0.1	100
S109	12.5	4.2	8.38	12.16	0.1	100
S110	9.5	4.2	8.31	12.11	0.1	100
S111	9.5	4.2	8.37	12.15	0.1	100
S112	9.5	4.2	8.58	12.3	0.1	100
S113	9.5	4.2	9.02	12.62	0.1	100
S114	9.5	4.2	9.8	13.15	0.1	100
S115	9.5	4.2	8.67	12.37	0.1	100
S116	13.0	4.2	7.0	11.11	0.1	100
S117	11.0	4.2	7.92	11.82	0.1	100
106	9.5		8.74			
S118	9.5		8.81			
105	9.5		11.51			
103	9.5		11.53			
101	9.5		10.86			
102	9.5		10.99			
104	9.5		13.76			
107	9.5		16.47			
108	14.0		15.87			
109	14.0		17.81			
ATC	14.0		18.07			
FLG	-6.0		31.35			
HYD	0.0		28.94	100.0		

Node1 / to / Node2	Elev1 / Elev2	K / Fact	Qa / Qt	Nom / Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact / Pf/Ft	Pt Pe Pf	******* Notes ******
*EQUIVALENT K'S										
S101	9.500	4.20	11.75	1.5			8.000	100	7.821	
to									0.0	
S102	9.500		11.75	1.682			8.000	0.0068	0.054	Vel = 1.70
S102	9.500	4.20	11.78	1.5			8.000	100	7.875	
to									0.0	
S103	9.500		23.53	1.682			8.000	0.0248	0.198	Vel = 3.40
S103	9.500	4.20	11.94	1.5			8.000	100	8.073	
to									0.0	
S104	9.500		35.47	1.682			8.000	0.0528	0.422	Vel = 5.12
S104	9.500	4.20	12.24	1.5			8.000	100	8.495	
to									0.0	
S105	9.500		47.71	1.682			8.000	0.0914	0.731	Vel = 6.89
S105	9.500	4.20	12.75	1.5	E	2.855	3.000	100	9.226	
to					T	5.71	8.565		0.0	
101	9.500		60.46	1.682			11.565	0.1416	1.638	Vel = 8.73
			0.0							
101			60.46						10.864	K Factor = 18.34
S106	12.500	4.20	11.66	1.5			8.000	100	7.712	
to									0.0	
S107	12.500		11.66	1.682			8.000	0.0068	0.054	Vel = 1.68
S107	12.500	4.20	11.71	1.5			8.000	100	7.766	
to									0.0	
S108	12.500		23.37	1.682			8.000	0.0244	0.195	Vel = 3.37
S108	12.500	4.20	11.85	1.5			8.000	100	7.961	
to									0.0	
S109	12.500		35.22	1.682			8.000	0.0521	0.417	Vel = 5.09
S109	12.500	4.20	12.16	1.5	E	2.855	6.000	100	8.378	
to					T	5.71	8.565		1.299	
102	9.500		47.38	1.682			14.565	0.0902	1.314	Vel = 6.84
			0.0							
102			47.38						10.991	K Factor = 14.29
S110	9.500	4.20	12.11	1.5			8.000	100	8.309	
to									0.0	
S111	9.500		12.11	1.682			8.000	0.0072	0.058	Vel = 1.75
S111	9.500	4.20	12.15	1.5			8.000	100	8.367	
to									0.0	
S112	9.500		24.26	1.682			8.000	0.0261	0.209	Vel = 3.50
S112	9.500	4.20	12.30	1.5			8.000	100	8.576	
to									0.0	
S113	9.500		36.56	1.682			8.000	0.0559	0.447	Vel = 5.28
S113	9.500	4.20	12.61	1.5			8.000	100	9.023	
to									0.0	
S114	9.500		49.17	1.682			8.000	0.0966	0.773	Vel = 7.10
S114	9.500	4.20	13.15	1.5	E	2.855	3.000	100	9.796	
to					T	5.71	8.565		0.0	
103	9.500		62.32	1.682			11.565	0.1498	1.732	Vel = 9.00
			0.0							

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
103			62.32						11.528	K Factor = 18.35
S115	9.500	4.20	12.37	1.5			8.000	100	8.675	
to									0.0	
106	9.500		12.37	1.682			8.000	0.0075	0.060	Vel = 1.79
			0.0							
106			12.37						8.735	K Factor = 4.19
S116	13	4.20	11.11	1.5			8.000	100	7.000	
to									0.866	
S117	11		11.11	1.682			8.000	0.0062	0.050	Vel = 1.60
S117	11	4.20	11.82	1.5	T	5.71	1.500	100	7.916	
to							5.710		0.650	
106	9.500		22.93	1.682			7.210	0.0234	0.169	Vel = 3.31
106	9.500		12.37	1.5			1.500	100	8.735	
to									0.0	
S118	9.500		35.3	1.682			1.500	0.0527	0.079	Vel = 5.10
S118	9.500		0.0	1.5	E	2.855	43.000	100	8.814	
to					T	5.71	8.565		0.0	
105	9.500		35.3	1.682			51.565	0.0523	2.698	Vel = 5.10
105	9.500		0.0	2.5			2.750	100	11.512	
to									0.0	
103	9.500		35.3	2.635			2.750	0.0058	0.016	Vel = 2.08
103	9.500		170.16	2.5	T	8.564	6.000	100	11.528	
to							8.564		0.0	
104	9.500		205.46	2.635			14.564	0.1529	2.227	Vel = 12.09
			0.0							
104			205.46						13.755	K Factor = 55.40
101	9.500		60.46	2.5			8.000	100	10.864	
to									0.0	
102	9.500		60.46	2.635			8.000	0.0159	0.127	Vel = 3.56
102	9.500		47.38	2.5	T	8.564	3.000	100	10.991	
to							8.564		0.0	
103	9.500		107.84	2.635			11.564	0.0464	0.537	Vel = 6.34
			0.0							
103			107.84						11.528	K Factor = 31.76
104	9.500		205.46	2.5	E	4.282	13.500	100	13.755	
to							4.282		0.0	
107	9.500		205.46	2.635			17.782	0.1529	2.719	Vel = 12.09
107	9.500		0.0	2.5	E	4.282	4.500	100	16.474	
to							4.282		-1.949	
108	14		205.46	2.635			8.782	0.1529	1.343	Vel = 12.09
108	14		0.0	4	E	7.137	110.000	100	15.868	
to					T	14.274	21.411		0.0	
109	14		205.46	4.26			131.411	0.0147	1.937	Vel = 4.62
109	14		0.0	4	T	14.274	3.470	100	17.805	
to							14.274		0.0	
ATC	14		205.46	4.26			17.744	0.0148	0.262	Vel = 4.62
ATC	14		0.0	4	D	19.984	20.000	100	18.067	
to					B	8.564	28.548		12.566	* * Fixed Loss = 3.904
FLG	-6		205.46	4.26	Zwh	0.0	48.548	0.0147	0.715	Vel = 4.62

Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	******* Notes ******
FLG	-6		0.0	6	4L	54.398	50.000	150	31.348	
to					T	45.332	104.263		-2.599	
HYD	0		205.46	6.09	G	4.533	154.263	0.0012	0.189	Vel = 2.26
			100.00							Qa = 100.00
HYD			305.46						28.938	K Factor = 56.78