Project Manual

MAG Justice Video Technology Program
Phase 3 – Perth Courthouse

NORR Project No. JU1024-0033
IO Project No. 230601

13 June 2025

Issued For Tender and Permit

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MAG Justice Video Technology Program
Phase 3 – Perth Courthouse

The professional seals and signatures below apply to documents, specifications and schedules prepared by the respective architectural and engineering professionals.

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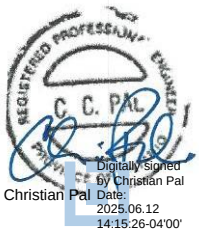

Christian Pal

Electrical Engineer

Project Manual
For
MAG Justice Video Technology Program
Phase 3 – Perth Courthouse
IO Project # 230601

SPECIFICATIONS

1 SUMMARY OF WORK

1.1 Work covered under this Contract

.1 Work of this Contract includes furnishing labour, materials, equipment, services and other related expenses to execute complete construction of facility specified under Contract Documents.

.2 Perth Courthouse:

.1 Install a new Privacy Booth/ Interview Room (1-01) in existing Interview Room.

.2 Power/voice/data to support JVN installation in Courtroom 1.

.3 Facilitate installation of A/V equipment and device (by others) in courtroom 1 in areas indicated on Drawings including but not limited to:

.4 Installation of new wall assembly, acoustic wall panels, new door & room sign in new Privacy Booth/ Interview Room (1-01).

.3 Special attention is brought to the following requirements:

.1 All Work must be done exclusively after hours.

.2 The Contractor is to coordinate and provide security escorts for the duration of completion of the scope as defined in the Contract Documents. More than one security escort will be required if the Work is taking place in more than one area of the Courthouse at any one time. For clarity, security escorts must accompany workers at each area of the Courthouse where Work is being completed. All costs associated with security escort services is to be included in the Contract Price.

.3 Infrastructure work in Courtrooms must be scheduled prior to work in Interview rooms to mitigate impact of long lead time items.

.4 In accepting award of this Contract, Contractor hereby reaffirms that it is fully informed regarding all conditions affecting Work and further accepts to complete Work for purpose intended in accordance with Contract Documents.

1.2 Notwithstanding that the Contract Documents are complementary and what is required by any one shall be as binding as if required by all, this Section shall be read in conjunction with the following Section in particular and each shall supplement the other as applicable:

.1 Section 01 14 00 – Work Restrictions.

.2 Section 01 50 00 – Temporary Facilities and Controls.

1.3 Work provided by Owner or performed under separate contracts

.1 The term "NIC" means that work of this Project which is not being performed or provided by the Contract; the term means "Not In This Contract" or "Not a Part of The Work to be Performed or Provided by The Contractor".

.2 "NIC" work is specified and/or indicated on the Drawings as an aid to the Contractor in scheduling the amount of time and materials necessary for the completion of the Contract.

.3 Hazardous Material Assessment:

.1 A Hazardous Material Assessment has been performed by Safetech Environmental Limited. Refer to the Appendices for project-specific Designated Substance and Hazardous Materials Assessment reports:

.1 Designated Substances and Hazardous Materials Assessment (DSHM) – TBD

.2 Prepare the site for safe construction operations and safely remove and dispose of designated substances and hazardous materials in areas affected by the Work and in accordance with governing legislation and the requirements of authorities having jurisdiction.

.3 Information on existing conditions is included in the Bid Documents for information purposes only.

.4 The Owner and Consultant assume no responsibility for the scope and accuracy of the information contained in the documents listed as a part of this sub-section.

.5 The Contractor shall be responsible for conducting an on-site evaluation of conditions which can be observed and for correlation of these conditions with the information included under this Section.

.6 Information contained in documents listed here may be used by the Contractor to assist in an assessment of existing conditions. Evaluation of the information shall remain the responsibility of the Contractor.

.7 Refer to the following Sections for applicable procedures for handling and removal of hazardous materials:

.1 02 80 00 - Silica Disturbance

.2 02 82 01 - Type 1 Asbestos Abatement

.3 02 82 02 - Type 2 Asbestos Abatement

.4 02 82 03 - Type 3 Asbestos Abatement

.5 02 82 04 - Glove Bag Asbestos Abatement

.6 02 83 00 - Lead Remediation

.7 02 84 16 - Mercury Removal

.8 02 84 33 - PCB Ballast Removal & Handling

.9 02 85 01 - Level 1 Mould Remediation

.10 02 85 02 - Level 2 Mould Remediation

.11 02 85 03 - Level 3 Mould Remediation

2 SPECIFICATIONS

2.1 Specifications are not intended as detailed description of installation methods but serve to indicate particular requirements in completed Work.

2.2 Where Contract Documents do not provide sufficient information for complete installation of item, then as supplement, comply with manufacturer's written instructions for quality of work.

2.3 Portions of Specifications are written in short form. Therefore, it shall be understood that where item of Work is stated in heading followed by material, equipment, component, or operation, words "shall be", "shall consist of" or similar words or phrases are implied which denote supply, fabricate and supply, install, Provide or commission of such materials, equipment or operations for component of Work designated by heading.

2.4 Where the Contract Documents refer to the singular, Provide as many as required to complete Work. Words used in one gender only shall mean females and as well as males and conversely.

2.5 Whenever used in Specifications following definitions shall apply:

.1 Supply: Procurement or fabrication of standard components not to special design of materials, equipment, or components, or performance of services to extent indicated. Where used with respect to materials, equipment, or components, term shall include delivery to Site but is not intended to include installation of item, either temporary or final.

.2 Fabricate and Supply: Fabrication of materials, equipment, or component, to special customized design to extent indicated including delivery to Site, assisting in form of supervision to those Section(s) installing materials, equipment or component. Term does not include installation of item either temporary or final.

.3 Install: Placement of materials, equipment, or components, including receiving, unloading, transporting, storage, uncrating and installing, and performance of such testing and finish work as is compatible with degree of installation specified complete ready for use.

.4 Provide: To Supply and Install, complete and in place, including accessories, finishes, tests and services as required to render item so specified complete ready for use.

.5 Commission: Start-up and initial operation of equipment as required and/or as specified in respective Sections, to demonstrate satisfactory operation of components and entire system including calibration of any control instrumentation as required to maintain operations.

2.6 Drawings, Lists or Schedules of Items are intended to show scope and arrangement of work. For location of item described refer to such Drawings, Lists or Schedules unless location stipulated in Specifications.

2.7 Wherever words "acceptable", "approved", "reviewed", "satisfactory", "selected", "directed", "designated", "permitted", "inspected", "instructed", "clarification", "required", "report", "submit", "obtain", "consult", "advise", or similar words or phrases are used in Standards or in Contract Documents, it shall be understood that, unless context provides otherwise words "by/to/with/from the Consultant" shall follow them as applicable.

3 DIVISION OF WORK

3.1 Work specified in the Specifications is divided into Sections for reference purposes only. Division of work between Contractor and Subcontractors is the Contractor's responsibility. The Owner and Consultant assume no responsibility to act as an arbitrator to establish subcontract limits between Sections or Divisions of the Work.

4 STANDARDS AND CODES

4.1 Contract forms, codes, specifications, standards, manuals and installation, application and maintenance instructions, referred to in the Specifications unless otherwise specified and unless otherwise stated in the governing building code, shall be the latest published editions at the date of the Contractor's bid submission.

4.2 Conform to standards, in whole or in part, as stated in the Specifications.

4.3 If there is question as to whether any Product or system is in conformance with applicable standards, the Owner reserves the right to have such Products or systems tested at the Contractor's cost to prove conformance.

4.4 The cost for such testing will be borne by the Owner in the event of conformance with the Contract Documents or by the Contractor in the event of non-conformance.

5 COORDINATION & RESPONSIBILITY OF THIRD PARTY VENDORS ON PROJECT SITE

5.1 Refer also to GC 3.2.

5.2 Owner Responsibilities:

.1 Delivery of third party vendor's materials to site;

.2 Inspect third party deliveries as required;

.3 Arrange with third party vendors for replacement of damaged, defective or missing items;

.4 Assist the Contractor in the coordination of all third party vendors and access to the site and coordination in the staging of work; and

.5 Arrange for third party vendors field services; arrange for and deliver manufacturer's warranties.

5.3 Contractor’s Responsibilities:

.1 The Contractor is to carry all additional insurance coverage to allow for third party vendors to have access to the Site and remain the Constructor on the Project Site. Third party vendors are as follows:

.1 Government IT Services & Support to the Ministry of the Attorney General and ITSS’ vendors of record:

.1 Bell; and

.2 ET Group.

.2 Provide health and safety training on Site prior to allowing access of ITSS and third party vendor staff within construction Site area including any updated requirements from the Authorities Having Jurisdiction as a result of COVID-19.

.3 Protect third party equipment from damage, and from exposure to areas from dust and moisture.

.4 Ensure the Site is secure following the daily work period and as required lock rooms with new third party vendor equipment that has been installed.

.5 Prior to the start of third party vendor work, coordinate with vendor to review level of completion requirements prior to installation. Coordinate with and allow access by Vendor to the Site, installation location and adjacent areas as required. Be responsible for coordination with Vendor and scheduling of the Work. Assume overall responsibility for compliance with all aspects of the applicable health and safety legislation of the Place of Work, including all responsibilities of the "constructor" under the Occupational Health & Safety Act (Ontario).

.6 All installation(s) of A/V active equipment are to be completed by the A/V installation certified vendor and only the costs to be carried in the Contract Price are for coordination of delivery on Site, coordination of installation to align with the approved Drawings and coordination and installation of Contractor disciplines as it relates to electrical and communication infrastructure as detailed in other Sections of the Specifications. Supply and installation of A/V active equipment are not part of this Contract.

.7 Coordinate with Owner's third party vendor(s) temporary laydown and storage areas within the Project Site to allow for the delivery of products in anticipation of scheduling of the Work. These temporary measures are not to interfere with the completion of work and or its scheduling of work.

6 SECURITY OF DOCUMENTS

6.1 Maintain security of Construction Documents during the construction period.

6.2 Avoid reproduction of Construction Documents where possible and maintain a record of reproduced documents and return all such copies to the Owner at Substantial Performance.

7 DOCUMENTS ON SITE

7.1 Keep on the Site, one copy of the Drawings and Specifications, including a Consultant's reviewed and stamped set of all Shop Drawings.

.1 Documents cannot be kept on Site outside of working hours.

8 EXISTING OCCUPANTS

8.1 The Courthouses are currently fully operational justice facilities. The Courthouses are in a third-party lease.

8.2 The Contractor is to follow all requirements of the Contract Documents to minimize the disruption to staff currently occupying the buildings in accordance with Section 01 14 00 - Work Restrictions including allowable work periods for Work including noisy work, shutdowns, and procedures for connecting new work to existing services.

9 CONTRACTOR'S USE OF PREMISES

9.1 Cooperate and coordinate Work with the Owner and the building manager to minimize conflict and facilitate usage.

9.2 Contractor is required to coordinate storage of material for construction. There will be no storage of materials at the Project Site other than construction areas or areas designated by the Owner.

9.3 Requirements related to designated temporary location(s) for garbage and recycling bin(s) will be confirmed with the Contractor at the Project kick off meeting.

10 **PROJECT MEETINGS**

10.1 Schedule and administer project progress meetings throughout progress of Work.

10.2 Distribute written notice of each meeting four days in advance of meeting date to Consultant and Owner.

10.3 Provide physical space and make arrangements for meetings.

10.4 Record minutes. Include significant proceedings and decisions. Identify 'action by' parties.

10.5 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.

11 **CONSTRUCTION SCHEDULE**

11.1 Submit a critical path construction schedule indicating milestone dates of major activities of the Work. Provide sufficient details of critical events and their inter-relationship for successful performance within the Contract Time.

11.2 Submit schedule within 15 days after award of Contract.

11.3 Within ten Working Days of Contract Award, submit detailed breakdown of cost of Work in form acceptable to Consultant, divided to coincide with organization of Specifications into Sections, per month and coincident with approved construction schedule

12 **EXAMINATION OF SITE AND DOCUMENTS**

12.1 Make a careful examination of the Place of the Work, and investigate, at no cost or risk to the Owner, matters relating to the nature of The Project to be undertaken, the means of access and egress thereto and there from, the obstacles to be met with and the rights and interests which may be interfered with during the performance of the Work.

12.2 Make a careful examination of the extent of the Work to be performed and any and all matters which are referred to in the Contract Documents, or which are necessary for the full and proper construction of The Project and the conditions under which it will be performed.

13 **EXAMINATION OF SURFACES AND CONDITIONS**

13.1 Ensure each Subcontractor examines job conditions and the Work to which his work is to be applied, anchored or connected.

14 **ACCEPTANCE OF CONDITIONS**

14.1 Examine existing conditions, surfaces and substrata upon which your work depends. Drawings are, in part, diagrammatic and are intended to convey scope of Work and indicate general and approximate location, arrangement and sizes of fixtures, equipment, ducts, piping, conduit and outlets and similar items. Obtain more accurate information about locations, arrangement and sizes from study and coordination of Drawings, including Shop Drawings and manufacturers' literature and become familiar with conditions and spaces affecting these matters before proceeding with Work.

14.2 Ensure each Sub-Contractor has full understanding of extent of its work. Report in writing defects in such work and notify Sub-Contractors responsible for unfavourable and unsatisfactory conditions. Make sure unsatisfactory conditions are corrected and verify corrected work prior to commencing the particular work. Execution and application of your work shall be deemed acceptance of Work upon which your work depends.

15 COOPERATION

15.1 Ensure that all Subcontractors examine Drawings and Specifications covering The Work which may affect the performance of their own work.

15.2 Ensure that all Subcontractors cooperate with each other in order that work will be carried out expeditiously, and will be satisfactory in all respects at completion of The Project.

15.3 From time to time, examine the work of all Subcontractors and have corrected, defects and deficiencies which may adversely affect The Work.

15.4 Ensure that The Work is in compliance with the Contract Documents and accept responsibility for delays or costs resulting from failure to inspect, and any replacement required.

15.5 Be responsible for damage of any kind to The Work. Replace any materials or work so damaged that cannot be repaired or restored to the Consultant's satisfaction. Such repairs or replacements shall be made by the trade that performed the original work.

15.6 Ensure that all Subcontractors cooperate with other Subcontractors whose work attaches to or is affected by their own work, and ensure that minor adjustments are made to make adjustable work fit to fixed work.

15.7 Ensure that Subcontractors requiring foundations or openings to be left for the installation of their work furnish the necessary information to the Subcontractors concerned in ample time.

15.8 Items to be built-in shall be supplied as and when required by the Subcontractor building in the items together with forms, templates, anchors, sleeves, inserts, measurements, Shop Drawings and accessories required to be fixed to or inserted in the Work and set in place or instruct the related Subcontractors as to their location.

15.9 Pay the cost of extra work caused by, and make up time lost as the result of, failure to provide the necessary cooperation, information or items to be fixed to or built into the Work in adequate time.

16 PROTECTION AND SECURITY

16.1 Perform the Work in a manner to avoid damage. Remove and replace at no expense to the Owner, any work and materials damaged that cannot be repaired or restored to the Consultant's satisfaction.

16.2 Owner's personnel will be occupying the existing building(s) during construction and alterations. Provide for the safety of occupants and for the security of occupied areas. Provide protection and keep clear areas that are required for access to, and exit from, occupied areas. Maintain clear and safe fire exit routes.

16.3 Where construction operations must be executed or traffic routed over finished floors, lay minimum 6 mm thick plywood coverings tightly fitted over surface in such areas. Secure plywood to prevent movement in a manner which will not damage finished surfaces.

16.4 Keep floors free from oil or other contaminants at all times. Clean up all contaminating liquids where same are likely to damage surfaces.

16.5 Cover openings in equipment, ducts and pipes until final connections are made.

16.6 Wherever practical lock or barricade finished areas.

16.7 As soon as construction is sufficiently advanced, enclose accessible openings to provide security. Provide temporary doors with security hardware.

16.8 Ensure continuous security of the Work and construction equipment.

17 **FIRE SAFETY DURING CONSTRUCTION**

17.1 Provide fire prevention and protection measures to existing building as required by all authorities having jurisdiction.

17.2 Maintain exits, including stairways and exterior doors to the outside. Provide acceptable alternative exits where an existing exit is blocked off or deleted due to construction activities.

17.3 Where access to an exit through construction area is absolutely necessary, clearly define, protect and separate access from the construction area by a smoke tight fire separation equivalent to minimum 3/4 hour fire resistance rating.

18 **SAFETY MEASURES**

18.1 Comply with the safety regulations of the Occupational Health and Safety Act and authorities having jurisdiction for the safety of the Work.

18.2 Safety Wear: Provide in the field office a minimum of four CSA approved safety helmets and four pair green label safety boots available for the exclusive use of authorized visitors.

19 **DIMENSIONS**

19.1 Wall thicknesses shown on the Drawings are nominal only. In all cases, determine the actual sizes at the building.

19.2 Dimensions of shop fabricated portions shall be verified on the Site before Shop Drawings and fabrication is commenced.

19.3 Where dimensions are not available before fabrication is commenced, the dimensions required shall be agreed upon between the various trades concerned.

19.4 Owner will not accept claims for extra expense on the part of the Contractor by reason of non-compliance with this article.

19.5 Location of plumbing, heating and electrical fixtures and outlets, ducts, conduits and pipes shown or specified but not dimensioned shall be considered approximate. Consult with the Consultant to determine the actual location of items not dimensioned as may be required to suit the job conditions. Relocation caused by failure to determine the actual locations shall be executed without charge to the Owner.

20 **NUMBER OF ITEMS**

20.1 In cases where an item or part of materials or equipment is referred to in the singular number, it is intended that such reference shall apply to as many items or parts as are required to complete the Work.

21 **RECONSTRUCTION, ALTERATIONS AND MAKING GOOD**

21.1 Work consists of additions to the existing building and certain alterations to the existing building.

21.2 Execute Work with least possible interference or disturbance to occupants, public and normal use of premises. Arrange with Owner's representative to facilitate execution of work.

21.3 Where security has been reduced by work of Contract, provide temporary means to maintain security.

21.4 Provide temporary dust screens, barriers, warning signs in locations where renovation and alteration work is adjacent to areas used by public or Owner's personnel.

21.5 Where new work connects with existing work and where existing work is altered, carry out all necessary cutting and fitting required to make satisfactory connections with the existing work under this contract so as to leave the project in a finished and workmanlike condition.

21.6 Unless otherwise specified or required by codes or By-laws to meet a certain requirement or both, make good new work to match existing work.

21.7 Make good concrete, masonry, steel, roofing, plaster, drywall ceilings, flooring and other materials and finishes which are damaged or disturbed during the progress of additions and re-construction under the Contract.

21.8 Disconnect and relocate existing services, where necessary, and reconnect as required to complete the Work.

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

21.10 Carefully drill or cut existing work, leaving a clean hole no larger than required.

21.11 Wherever it becomes necessary to cut or interfere in any manner with existing equipment or service lines for short periods of time, do such work at times agreed upon by the Owner.

21.12 Coordinate the Work of the various trades, taking into account the existing installations to assure the best arrangement of pipes, conduit, ducts and mechanical, electrical and other equipment, in the available space.

21.13 Prepare interference or installation drawings or both, showing the Work of the various trades as well as the existing installations. Submit to the Consultant for review before the commencement of the Work.

22 **LOCATION OF EQUIPMENT AND FIXTURES**

22.1 Location of plumbing, heating and electrical fixtures and outlets, ducts, conduits and pipes shown or specified but not dimensioned shall be considered approximate.

22.2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space, and in accordance with manufacturer's recommendations for safety, access and maintenance.

22.3 Consult with the Consultant to determine the actual location of items not dimensioned as may be required to suit the job conditions.

22.4 Obtain Consultant’s acceptance for precise locations of fixtures, access panels, outlets, mechanical, electrical and security items. Relocation caused by failure to determine the actual locations shall be executed without charge to the Owner.

22.5 Consultant reserves the right to relocate fixtures, access panels, outlets, mechanical, electrical and security items at a later date, but prior to installation, without additional cost, provided that the relocation per outlet or fixture does not exceed 3050 mm (10 feet) from the original location.

End of Section

1 **RELATED DOCUMENTS**

1.1 Notwithstanding that the Contract Documents are complementary and what is required by any one shall be as binding as if required by all, this Section shall be read in conjunction with the following Section in particular and each shall supplement the other as applicable:

.1 Section 01 10 10 - Summary of Work.

.2 Section 01 50 00 – Temporary Facilities and Controls.

2 **WORK RESTRICTIONS**

2.1 Work must be done exclusively after hours. Existing premises will maintain operation during business hours. Do not perform any work during business hours on any days that the premises is in operation. Be responsible for any overtime work required after business hours.

.1 Provide a methodology for phasing and staging of the Work, and indicating safety and fire escape routes for the occupants of the building during construction.

2.2 Hours of Operation

.1 Perth Courthouse:

.1 Building Operations 8:00 a.m. – 5:00 p.m., Monday to Friday. Work on weekends may be permitted but must be coordinated with Owner and building maintenance in advance.

2.3 No construction activity shall impact day-to-day functioning of the courthouse.

.1 In the event court proceedings continue past the stated hours of operation work may commence so long as the work is quiet and does not impact the function of the courthouse:

.1 Work shall be deemed quiet as long as it does not affect Court Record (noise is not picked by the court recording equipment). The Ministry of Attorney General (MAG) shall be the sole judge of fulfillment of this requirement.

.2 Before entering existing premises to carry out Work or to obstruct or take out of use any area of existing premises, or to cause any other interference, request meeting with Consultant and Owner in order to reach agreement as to time and length of time you may interfere, possess, obstruct or remove from use any such area or services.

.3 Co-ordinate construction activities and use of premises with Owner and building management.

.4 Maintain operations of building services, data, telephone and alarm. Ensure no interruptions of these services during execution of the Work.

.5 Provide adequate protection against dust, water and other damages to Owner's electronic and computer equipment, fittings and furniture. Use covers acceptable to the Owner. Remove protection after each work period.

2.4 Access to Existing Building(s)

.1 Access to existing building for construction purposes to be coordinated through the Owner.

.2 Existing building will not be accessed by Contractor for any other reason other than as required to execute the work. Existing facilities are not to be used by the Contractor or their sub-trades.

.3 Contractor's use of the Place of the Work is limited to permit use of existing building's facilities to continue with the least amount of interference and disruptions possible during regular business hours.

.4 Provide roads, walks, ramps, stairs and such other means of access as required. Maintain temporary entrances to building(s) including enclosed hoardings as required. Maintain access to existing service entrance(s) at all times, including ready access for delivery vehicles.

.5 Do not block or otherwise compromise access to the existing building and access to the neighbouring properties.

2.5 Refer to Sections 01 10 10 for additional details and requirements regarding existing occupants and Contractor's use of premises.

3 HEALTH AND SAFETY AND COVID-19 REQUIREMENTS

3.1 The Contractor shall follow all Health and Safety requirements by the Authorities Having Jurisdiction and coordinate and abide by the all current government and MOL regarding requirements for health and safety related to COVID-19.

3.2 The Contractor at all time within Courthouses is to follow all local authorities regarding requirements of health and safety and measures to mitigate the spread of COVID-19.

3.3 Contractor is responsible to ensure that all workers perform the government of Ontario recommended self-assessment daily prior to accessing to the Place of the Work.

3.4 Provide health and safety training on site prior to allowing access of subcontractors within construction site area including any updated requirements from the Authorities Having Jurisdiction as a result of COVID-19.

3.5 Provide a copy of Contractor's own COVID-19 health and safety policies to the Owner.

3.6 Ensure that Contractor, subcontractor and visitors on Site become familiar with and obey all requirements related to safety and those related to COVID-19.

3.7 Personal protection equipment (PPE) for use by Contractor and its Subcontractors as well as any additional PPE necessary as a result of the current MOL requirements related to COVID at the time of tender shall be furnished by Contractor and are part of the Contract Price.

3.8 Temperature check may be implemented by the Owner at any time and will then become a mandatory requirement for Contractor and workers prior to being granted access.

3.9 Site Specific Safety Plan

.1 Prior to commencement of the Work, the Contractor shall submit to the Owner a Project Specific Safety Plan. This includes the development and coordination of a project specific Health and Safety plan that encompasses the health and safety plans of Building manager, the Owner, and the Contractor.

.1 Site Specific Safety Plan must address COVID-19 procedures/policies.

.2 The final plan shall be posted on site and presented to the project team and MAG staff to ensure an understanding of health and safety during construction.

4 EMPLOYEES RESTRICTIONS

4.1 Refer to the Supplementary Conditions on the requirements for Security Screening for all the workers working within the Place of the Work.

4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract.

.1 The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

.2 The Contractor's staff will obtain the required identification badges for all staff and ensure they are being worn at all times.

.3 Contractor shall take all necessary precautions to keep the Place of the Work free of safety hazards and shall comply with all applicable provisions of law and building codes relating to injury to persons and property on or about the Place of the Work where the Work is being performed.

.4 Contractor shall not permit any of its employees, agents, representatives, or its Subcontractors, or their employees, agents or representatives, to engage in any activity in, on, or about the Place of the Work, or in connection with the Work, that violates any ordinance, statute, or other regulation of any governmental body having jurisdiction over the Place of the Work, including, but not limited to, gambling and other activity, though lawful, which in the Owner's opinion is not proper construction practice.

.5 Contractor shall prevent all agents, employees, licensees, and invitees of Contractor from smoking and/or vaping at the Place of the Work.

.6 Contractor agrees that the possession, distribution, or sale of alcohol, narcotics, drug-related paraphernalia, firearms, explosives, weapons or other dangerous or hazardous substances or articles is strictly forbidden on or at the Place of the Work and at the Project (including the misuse of prescription drugs or any mood altering substance while performing any work at the Project or related thereto.)

.7 If at any time it is determined that any employee, representative, Contractor or agent of Contractor is violating the drug and alcohol prohibition set forth herein, Owner shall be entitled, at its election, to terminate the Agreement upon Notice in Writing to Contractor.

5 SECURITY

5.1 The Contractor is to coordinate and provide security escorts for the duration of completion of the scope as defined in the Contract Documents. More than one security escort will be required if the work is taking place in more than one area of the courthouse at any one time. For clarity, security escorts must accompany workers at each area of the Courthouses where work is being completed. All costs associated with security escort services is to be included in the Contract Price.

5.2 There may be a requirement for identification badges to be worn while in the Courthouses. If required all workers will provide proper identification to security desk, sign the contractor’s register and display their issued card which will be worn visibly while working in the Courthouses.

5.3 The Contractor shall be solely responsible for securing the areas of Work, and for securing areas used for the storage of tools and materials. The Owner shall not have any responsibility in this regard.

5.4 Responsible for the security of the Contractor's and Subcontractors' own contents, materials, third party materials and completed work prior to turn over of site to the Owner upon Substantial Performance.

5.5 Contractor shall coordinate the Work carefully with the Consultant, the Owner and the building manager in order to ensure no disruption to the existing building's security system.

.1 Where existing building's security system is breached due to Contractor's negligence, be responsible for any damage or theft of property, regardless if area where damage or theft occurred is under Contractor's control or not.

6 SMOKING POLICY

6.1 Cooperate, respect and comply with the Owner's no smoking policy requirements.

6.2 Ensure the Contractor's employee, sub-contractors and suppliers, performing work on Site on Contractor's behalf, are instructed to comply with the policy.

7 PARKING

.1 Perth Courthouse:

.1 Parking is available on Site. The Contractor shall arrange and pay for off-site parking at their own expense if required.

.2 Parking in fire lanes and other designated "No Parking" areas may result in vehicle being towed at Contractor's expenses. All fines and fees as a result of infractions are at Contractor's expenses not the Owner.

8 USE OF ELEVATORS

8.1 The use of the elevator for movement of material and equipment by the Contractor must be arranged with minimum of twenty-four (24) hours' notice.

8.2 Ensure the existing conditions of the elevator is not compromised by its use and take precautions to protect floors and wall surfaces.

8.3 Damage to the elevator shall be the sole responsibility of the Contractor and shall be made good at no increase in the Contract Price.

8.4 Adhere to size and weight restrictions.

9 USE OF LOADING DOCK AND DELIVERIES

.1 Perth Courthouse:

.1 All Contractor's deliveries are to be received through the main entrance of the Courthouse.

9.2 Contractor will coordinate with the building manager allowing a minimum of twenty-four (24) hours' notice required.

9.3 Contractor is responsible for scheduling, coordination and receiving all deliveries and must be on-site to accept and verify them. Neither the Owner, the building manager nor MAG staff are responsible for receipt of any deliveries.

.1 Deliveries may need to be inspected by Owner's security staff before deliveries can be accepted.

9.4 Deliveries must be received during stated working hours.

9.5 Throughout the Work, ensure that there is no interference with the operation of the existing premises, and that the loading dock or main entrances remain free and clear of obstructions.

End of Section

1 CASH ALLOWANCES

1.1 Cash allowances, unless otherwise specified, cover net cost to Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation and other authorized expenses incurred in performing the Work.

1.2 The Contract Price, and not cash allowance, includes Contractor's overhead and profit in connection with such cash allowance.

1.3 The Owner reserves the right to call competitive tenders for portions of the work to be paid for out of any or all cash allowances. The relationship of the Contractor and the trades performing portions of the work to be paid out of cash allowances shall be such as between the Contractor and his Subcontractors.

1.4 Comply with Conditions of the Contract and Division 01 - General Requirements, and manage the Cash Allowances account in accordance with the protocol.

1.5 Make expenditures out of the cash allowance only on receipt of an order signed by the Consultant.

1.6 Unexpended amounts of cash allowances maybe reallocated to other specific cash allowances at the sole discretion of the Consultant.

1.7 Unexpended amounts of cash allowances shall be deducted from the Contract Price at completion of the Work.

1.8 For description and amounts of Cash Allowances refer to Document 00 41 10 – Stipulated Price Bid Form.

End of Section

1 SUBSTITUTIONS

1.1 Whenever Products are specified exclusively by trade name, manufacturer's name or by catalogue reference, use only those items, unless written approval for substitution is obtained from Consultant.

1.2 No substitutions will be permitted without prior written approval of the Consultant.

1.3 Proposals for substitutions may only be submitted after award of Contract.

1.4 Substitutions submitted on shop drawings without following requirements of this Section prior to submission of the shop drawings will cause the shop drawings to be rejected at any time. Consultant’s review of shop drawings shall not be construed as approval of substitutions.

1.5 Requests for substitutions must include statements of:

.1 Description of proposed substitution.

.2 Respective costs of items originally specified and the proposed substitution.

.3 Compliance with the Building Codes and requirements of authorities having jurisdiction.

.4 Affect concerning compatibility and interface with adjacent building materials and components.

.5 Compliance with the intent of the Contract Documents.

.6 Reason for the request.

1.6 Proposed substitutions will be considered only under the following conditions:

.1 If the materials and products specified are not available; or

.2 If substitute materials and products to those specified, which are brought to the attention of and considered by the Consultant as equivalent to those specified, will not change the Contract Price and Contract Time; or

.3 If substitute materials and products to those specified, which are brought to the attention of and considered by the Consultant as superior to those specified, will not change the Contract Price and Contract Time; or

.4 If a material or product is specified together with a requirement for performance and, in the opinion of the Contractor, the specified material or product will not produce the required results.

1.7 There is no obligation on the part of the Consultant or Owner to accept proposed substitutions. Acceptance of proposed substitutions by Owner does not relieve the Subcontractor's responsibility under the Contract.

1.8 Should proposed substitution be accepted either in part or in whole, bear full responsibility and costs when substitution affects other work on the project. Pay for design and contract document changes required as result of the substitution.

1.9 Amounts of all credits arising from acceptance of substitutions will be determined by the Consultant and the Contract Price adjusted accordingly.

1.10 Wherein the expression "other acceptable equivalents" or similar expressions in specification Sections, submissions under the expression shall be as specified in this Section.

End of Section

NORR

SUBSTITUTION REQUEST FORM

Substitution Request No: _____ **Date:** _____

Project: _____ **Project No:** _____

Contractor: _____

Specified Product Specification Reference

Section Number	Section Title	Paragraph Number
_____	_____	_____

Proposed Substitution

Manufacturer and Product Trade Name _____

Address _____ **Phone Number** _____

Contact Name _____ **Model Number** _____

History of Product New Product ____ 2-5 years old ___ 5-10 years old __ More than 10 years old_____

Similar Installation Project Name & Address _____

_____

Consultant _____ Owner _____

Proposed Substitution Affects Other Parts of Work No ____ Yes, explain: _____

_____

_____

Differences Between Proposed Substitution and Specified Product _____

_____

_____

_____

Reason For Not Providing Specified Product _____

_____

_____

_____

Changes to Contract Price Add/Deduct $ _____

Changes to Contract Time Add/Deduct _____ days

NORR

SUBSTITUTION REQUEST FORM

Contractor's Declaration

The Contractor Declares that:

- Proposed substitution has been fully investigated and determined to be equivalent or superior in all respects to specified product, and complies with requirements of authorities having jurisdiction.
- Same warranty will be furnished for proposed substitution as for specified product.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Proposed substitution is compatible with adjacent materials and assemblies.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Signed By: _____ Date: _____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Reports ☐ Other _____

Consultant's Review

☐ Substitution Accepted – Provide submittals in accordance with Specification requirement.

☐ Substitution Accepted as Noted – Provide submittals in accordance with Specification requirement.

☐ Substitution Not Accepted – Use specified product.

Signed By: _____ Date: _____

Owner's Acceptance

Signed By: _____ Date: _____

Additional Comments:

☐ Consultant _____

_____

_____

☐ Contractor _____

_____

_____

☐ Owner _____

_____

_____

1 **RELATED WORK**

1.1 Individual submittals: under pertinent sections of this specification.

2 **SUBMITTALS**

2.1 Submit to Consultant, shop drawings, samples and other items, in strict accordance with the provisions of this Section.

2.2 All submittals to the Consultant's office to include prepaid carrying and all other charges.

2.3 Keep one reviewed copy of each submission on site.

3 **SHOP DRAWINGS**

3.1 The term shop drawings means drawings, diagrams, illustrations, schedules, performance charts, product data, brochures and other data which are to be provided by the Contractor to illustrate details of portions of the work.

3.2 The Contractor shall arrange for the preparation of clearly identified shop drawings as the Consultant may reasonably request.

3.3 Prior to submission to the Consultant, the Contractor shall review all shop drawings. By this review the Contractor represents acknowledgement that all field measurements, field construction criteria, materials, catalogue numbers and similar data have been verified and shop drawings have been coordinated with the requirements of the Work and of the Contract Documents.

.1 The Contractor's review of each shop drawing shall be indicated by a “reviewed” stamp, with control number, project name, date and signature of reviewer.

.2 Submittals not stamped, identified with a control number and project name, signed and dated will be returned without being examined and considered rejected.

3.4 The Contractor shall submit shop drawings to the Consultant for review in orderly sequence and sufficiently in advance to allow for the Consultant’s proper review and so as to cause no delay to the Work.

3.5 If either the Contractor or the Consultant so requests, they shall jointly prepare a schedule fixing the dates for submission and return of shop drawings.

3.6 Shop Drawings Processing Time: Allow time for submittal review, including time for re-submittals, as follows:

.1 Time for review shall commence on Consultant’s receipt of submittal. If a shop drawing is received after 12 noon, it will be considered as received the next working day for the purposes of the processing time.

.2 For scheduling purposes allow 10 working days following submission and 10 working days following resubmission. Consultant will advise Contractor if additional time is required for technical or co-ordination review.

.3 Concurrent Review: When concurrent review of submittals by Consultant’s subconsultants, Owner, or other parties is required, allow a minimum of fifteen (15) working days for initial review of each submittal. Direct transmittal to Consultant’s subconsultants will not be permitted.

.4 If at any time the Contractor submits unusually large number of shop drawings, the Consultant will, within 5 working days of receipt of such drawings, provide the Contractor with an estimate of time necessary for processing such shop drawings.

.5 Failure to provide submittals in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension will be allowed.

3.7 Shop drawings shall be submitted in electronic format as a PDF or DWG file via the project website or other means of electronic file delivery. Scanned drawings will only be accepted if legible. Illegible drawings will be rejected.

3.8 With prior approval of the Consultant, catalogue cuts showing all aspects, design, sizes, components and rough-in information for equipment may be submitted as shop drawings. Supplement standard information to provide details applicable to project.

3.9 The Contractor shall make changes in shop drawings which the Consultant may require consistent with the Contract Documents and resubmit unless otherwise directed by the Consultant. When resubmitting, the Contractor shall notify the Consultant in writing of any revision other than those requested by the Consultant.

3.10 Shop drawings shall define the division of responsibility between different trades. Shop drawings shall show materials, methods of construction and attachment or anchorage, erection diagrams, connections and other details necessary to complete the work. Shop drawings shall show cross references to drawings and specifications.

3.11 The review by the Consultant is for the sole purpose of ascertaining conformance with the general design concept. The review shall not mean that the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor, and such review shall not relieve the Contractor of its responsibility for errors or omissions in the shop drawings or of its responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the Work of all subtrades and work of other contractors.

3.12 Any adjustments made on the shop drawings by the Consultant are not intended to change the Contract Price. If the Contractor deems that such adjustments affect the value of the work, he shall so state in writing before proceeding with the fabrication and installation of the work.

3.13 Make shop drawings accurately to a scale sufficiently large to show pertinent features of the item to be supplied and the method of connection to the work including attachments, reinforcing, anchorage and location of exposed fastenings.

4 REPRODUCTION OF DRAWING ELECTRONIC FILES

4.1 Reproduction of the Consultant's drawings to serve as background for shop drawings will be permitted. Remove all identification or reference to the Owner or Consultant from the drawings that are used for this purpose.

4.2 Make payment to the Consultant for the cost of reproduction plus Harmonized Sales Tax (HST) based on the number of drawing electronic files as indicated below.

.1 1 to 10 files: $600.00

.2 11 to 20 files: $700.00

.3 21 to 50 files: $900.00

.4 51 to 100 files: $1,200.00

.5 More than 100 files: $6.00 per file, plus $600.00 administration fee.

4.3 The release of these electronic files by the Consultant does not imply transfer of copyright and ownership to the Contractor. The Contractor shall be responsible for all liabilities and damages resulted from the use of these files.

5 SAMPLES

5.1 Submit samples, when requested by the Consultant, showing material, colour and finish. Materials used in the construction shall correspond to the reviewed samples.

5.2 Submit samples in such quantities which are required to be returned plus one which will be retained by the Consultant.

5.3 Refer to individual sections for more particular requirements for specified samples.

5.4 At each stage, assemble and submit all relevant samples in context, at one time, in the following groups:

.1 Interior Materials and Finishes

.2 Ceiling Systems and Light Fixtures

.3 Hardware

.4 Cover plates, grilles, etc., of Mechanical and Electrical Sections.

5.5 Identify each sample with Project Number, Job Name, Date of Submittal, Type of Material, Names of Contractor, Subcontractor and Manufacturers.

5.6 Reviewed samples will become standard of workmanship and material against which installed Work will be verified

6 COLOURS

6.1 Unless the precise colour and pattern is specifically described in the Contract Documents, whenever a choice of colour or pattern is available in a specified Product, submit accurate colour charts from the manufacturer's standard range of colours and pattern charts to the Consultant for review and selection.

6.2 Unless all available colours and patterns have identical costs and identical wearing capabilities and are identically suited for the installation, completely describe the relative costs and capabilities of each.

7 IDENTIFICATION OF SUBMITTALS

7.1 Completely identify each submittal and re-submittal by showing at least the following information:

.1 Project Number and Title.

.2 Date of Submittal.

.3 Name of Contractor.

.4 Control Number.

.5 Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.

.6 Drawing Number and Specification Section number to which the submittal applies.

.7 Whether this is an original submittal, or re-submittal.

.8 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

8 COORDINATION OF SUBMITTALS

8.1 Prior to submittals for Consultant's review, use all means necessary to fully coordinate material, including the following procedures:

.1 Determine and verify field dimensions and conditions, materials, catalogue numbers and similar data.

.2 Coordinate as required with the trades and with public authorities involved.

.3 Secure necessary approvals from public authorities and others and signify by stamp, or other means, that they have been secured.

.4 Clearly indicate deviations from the Contract Documents.

8.2 Unless otherwise specifically permitted by the Consultant, make submittals in groups containing associated items; the Consultant may reject partial submittals as not complying with the provisions of the Contract Documents.

8.3 Make submittals far enough in advance of scheduled dates of installation to provide required time for reviews, for securing necessary reviews, for possible revision and re-submittal, and for placing orders and securing delivery so as to cause no delay in the Work or in the work of other contractors.

8.4 Do not proceed with Work affected by submittal until review is complete.

8.5 Costs of delays occasioned by tardiness of submittals shall not be borne by the Owner.

End of Section

1 GENERAL REQUIREMENTS

1.1 Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

.1 Specific quality assurance and quality control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of products.

.2 Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality control procedures that facilitate compliance with the Contract Document requirements.

.3 Requirements for Contractor to provide quality assurance and quality control services required by Consultant, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 Travel Expenses: Where it is necessary for the Consultant and Owner to visit places away from the site of the Works in order to supervise, inspect or witness testing activities of items of the Work, for compliance with the Contract Documents, the Contractor shall pay the travelling, lodging and food expenses of Consultant and Owner, on the Owner's authorization.

2 DEFINITIONS

2.1 Quality Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

2.2 Quality Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Consultant.

2.3 Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

2.4 Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

2.5 Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

2.6 Product Testing: Tests and inspections that are performed by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

2.7 Source Quality Control Testing: Tests and inspections that are performed at the plant, mill, factory, or shop.

2.8 Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

2.9 Testing Agency: An entity engaged to perform specific tests, inspections, or both.

2.10 Experienced: An entity having successfully completed previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

3 CONFLICTING REQUIREMENTS

3.1 General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Consultant for a decision before proceeding.

3.2 Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Consultant for a decision before proceeding.

4 SUBMITTALS

4.1 Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

4.2 Schedule of Tests and Inspections: Prepare in tabular form and include the following:

.1 Specification Section number and title.

.2 Description of test and inspection.

.3 Identification of applicable standards.

.4 Identification of test and inspection methods.

.5 Number of tests and inspections required.

.6 Time schedule or time span for tests and inspections.

.7 Entity responsible for performing tests and inspections.

.8 Requirements for obtaining samples.

.9 Unique characteristics of each quality-control service.

4.3 Reports: Prepare and submit four copies of certified written reports that include the following:

.1 Date of issue.

.2 Project title and number.

.3 Name, address, and telephone number of testing agency.

.4 Dates and locations of samples and tests or inspections.

.5 Names of individuals making tests and inspections.

.6 Description of the Work and test and inspection method.

.7 Identification of product and Specification Section.

.8 Complete test or inspection data.

.9 Test and inspection results and an interpretation of test results.

.10 Record of temperature and weather conditions at time of sample taking and testing and inspecting.

.11 Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

.12 Name and signature of laboratory inspector.

.13 Recommendations on retesting and re-inspecting.

4.4 Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

5 QUALITY ASSURANCE

5.1 General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

5.2 Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

5.3 Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

5.4 Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

5.5 Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

5.6 Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated. Requirement for specialists shall not supersede requirements of authorities having jurisdiction.

5.7 Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

5.8 Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

5.9 Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

.1 Contractor responsibilities include the following:

.1 Provide test specimens representative of proposed products and construction.

.2 Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

.3 Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.

.4 Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.

.5 Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

.6 When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

.2 Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Consultant with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

5.1 Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

.1 Build mockups in location and of size indicated or, if not indicated, as directed by Consultant.

.2 Notify Consultant seven days in advance of dates and times when mockups will be constructed.

.3 Demonstrate the proposed range of aesthetic effects and workmanship.

.4 Obtain Consultant's approval of mockups before starting work, fabrication, or construction.

.1 Allow seven days for initial review and each re-review of each mockup.

.5 Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.

.6 Demolish and remove mockups when directed, unless otherwise indicated.

6 QUALITY CONTROL

6.1 Owner's Testing: The Owner may require during progress of the Work, testing and inspection by an independent testing company as directed by the Consultant, or as required in these Specifications, to determine if materials provided for the Works meet the specified requirements.

.1 Where independent inspection and testing are required by the Contract Documents, the cost of these services shall be paid for by the Owner, except where cash allowances have been included for the specific inspection & testing. In this case, the Contractor shall pay independent inspection and testing company charges authorized by the Consultant from the cash allowances included for these services.

.2 Retesting and Re-inspection: When initial tests indicate non-compliance with the Contract Documents, costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be deducted by the Owner from the Contract Price. Retesting and re-inspection shall be performed by the same testing agency as the initial tests.

.3 Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.

6.2 Code Compliance and Contractor's Convenience Testing

.1 Code Compliance Testing: Inspection and tests required by codes or ordinances, or by an authority having jurisdiction shall be the responsibility of the Contractor and shall be paid for by the Contractor.

.2 Contractor's Convenience Testing: Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor and paid for by Contractor as part of the Contractor's overhead expenses.

.3 Engage a qualified testing agency to perform these quality-control services. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

.4 Submit a certified written report, in triplicate, of each quality-control service.

.5 Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

.6 Retesting/Re-inspecting: Provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

6.3 Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field-assembled components and equipment installation, including service connections.

6.4 Testing Agency Responsibilities

.1 Cooperate with Consultant and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

.2 Notify Consultant and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

.3 Determine the location from which test samples will be taken and in which in-situ tests are conducted.

.4 Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

.5 Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

.6 Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

.7 Do not perform any duties of Contractor.

6.5 Contractor Responsibilities

.1 Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

.1 Access to the Work.

.2 Incidental labour and facilities necessary to facilitate tests and inspections.

.3 Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

.4 Facilities for storage and field curing of test samples.

.5 Delivery of samples to testing agencies.

.6 Preliminary design mix proposed for use for material mixes that require control by testing agency.

.7 Security and protection for samples and for testing and inspecting equipment at Project site.

.2 Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

.1 Schedule times for tests, inspections, obtaining samples, and similar activities.

.3 Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality assurance and quality control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.

.1 Distribution: Distribute schedule to Owner, Consultant, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

.2 Establishing Schedule: By advance discussion with the selected testing and inspection agencies, determine the time required for the agencies to perform their duties and the time required for the issuance of resulting reports. Allow for the times in the construction schedule.

.3 Schedule Revisions: Co-ordinate revisions with the testing and inspection agencies when changes to the construction schedule are necessary.

.4 Schedule Adherence: Provide advance notice to the testing laboratory and to the inspection company of when testing of the Work is required. If the testing laboratory is ready to perform its functions according to the schedule and is prevented from doing so due to incompleteness of the work, extra costs for testing attributable to the delay will be back charged to the Contractor.

7 TEST AND INSPECTION LOG

7.1 Prepare a record of tests and inspections. Include the following:

.1 Date test or inspection was conducted.

.2 Description of the Work tested or inspected.

.3 Date test or inspection results were transmitted to Consultant.

.4 Identification of testing agency or special inspector conducting test or inspection.

7.2 Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Consultant's reference during normal working hours.

8 REPAIR AND PROTECTION

8.1 On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

8.2 Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.

8.3 Protect construction exposed by or for quality-control service activities.

8.4 Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality control services.

End of Section

1 GENERAL

1.1 Notwithstanding that the Contract Documents are complementary and what is required by any one shall be as binding as if required by all, this Section shall be read in conjunction with the following Section in particular and each shall supplement the other as applicable:

.1 Section 01 10 10 – Summary of Work.

.2 Section 01 14 00 – Work Restrictions.

1.2 Provide temporary utilities, construction facilities and controls in order to execute the Work expeditiously.

1.3 Remove from Site all such work after use.

2 PRODUCT HANDLING

2.1 Protection: use all means necessary to maintain temporary facilities and controls in proper and safe condition throughout progress of the Work.

2.2 Replacements: In the event of loss or damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to the Owner.

3 TEMPORARY UTILITY

3.1 Permanent Existing Water Services and Facilities

.1 Existing permanent services are available for use of Contractor and Sub-Contractors.

.2 Contractor may connect to existing water supply for use of all trades. Obtain Owner's written permission prior to connection.

.3 Make such connections at own expense. Extend supply pipe or pipes from nearest available sources and maintain in good condition until permanent system is installed and ready for use.

.4 Cost of water reasonably so used will be provided without charge.

.5 Owner shall not be held responsible for delays or damage resulting due to failure or interruption of such services irrespective of cause.

3.2 Permanent Existing Electrical Services and Facilities

.1 Existing permanent services are available for use of Contractor and Sub-Contractors.

.2 Contractor may connect to existing electricity for use of all trades except for purpose of power welding and electric heating. Obtain Owner's written permission prior to connection.

.3 Make such connections at own expense. Provide electrical connection from nearest available sources and maintain in good condition.

.4 Cost of electricity reasonably so used will be provided without charge.

.5 Provide sufficient lighting to ensure sufficient visibility for the proper execution, safety and inspection of the Work. Extension cords and lamps shall be provided by those requiring them.

.6 Comply with Construction Safety Association's "Temporary Wiring Standards on Job Sites", the Ontario Electrical Code, and other authorities having jurisdiction.

.7 Owner shall not be held responsible for delays or damage resulting due to failure or interruption of such services irrespective of cause.

4 TEMPORARY SANITARY FACILITIES

4.1 Existing toilet facilities may be used as directed provided they are kept clean and serviced. Repair damage to existing toilet facilities and clean before handing over the Project.

5 TEMPORARY ENCLOSURES

5.1 Interior enclosures: erect interior dust-proof temporary enclosures where shown or directed. Enclosure to be complete with door, fastenings, lock and two keys for correctional facility, constructed as follows:

.1 38 mm x 89 mm wood or metal stud framing

.2 One layer of 0.25 mm thick polyethylene, or

.3 Two layers of 0.15 mm thick polyethylene

.4 Erect enclosure to form a dust-proof installation. Install slab door, opening toward the Work, complete with lock.

6 TEMPORARY PORTABLE FIRE EXTINGUISHERS

6.1 Provide portable fire extinguishers throughout construction areas; conform with fire authority requirements regarding location. Provide and maintain extinguishers in each location as required by Authorities Having Jurisdiction.

6.2 Maintain extinguishers to requirements of Canadian Fire Underwriters' Association. Use pressurized water type extinguishers of 11.365 litres capacity; anti-freeze type if subject to low temperatures; pressurized dry chemical extinguishers in vicinity of gasoline, oil or grease or where electrically operated equipment is used with minimum 2.27 kg capacity.

6.3 Extinguishers shall remain the property of the contractor. Remove at Substantial Performance of the Work.

7 SCAFFOLDING, PLANT AND MACHINERY

7.1 Provide form work, scaffolding, equipment, tools and machinery for the proper execution of the Work.

7.2 Construct and maintain scaffolding in a rigid, secure and safe manner. Erect scaffolding without damage to the structure or the finishes independent of walls. Use scaffolding in such a manner as to interfere as little as possible with other trades. When not in use, move scaffolding as necessary to permit installation of other work.

7.3 Remove scaffolding promptly when no longer required. Scaffolding in use over finished floor surfaces shall be mounted on rubber tired wheels.

8 ACCESS

8.1 Provide and maintain free access to permanent or temporary fire extinguishing equipment.

8.2 Maintain full exit facilities at all times.

8.3 Keep existing egress free from materials, equipment and obstructions of all kinds.

9 DEBRIS

9.1 Daily as the work proceeds and on completion, clean up and remove from the premises rubbish, surplus materials and equipment resulting from Work.

9.2 Dampen debris and put in containers and remove by means of material hoist or put in sealed containers and removed through the designated egress routes.

10 REMOVAL

10.1 Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work; remove all such temporary facilities and controls as rapidly as progress of the Work will permit or as directed by the Consultant and repair the damaged surfaces.

End of Section

1 STANDARDS AND CODES

1.1 Contract forms, codes, specifications, standards, manuals and installation, application and maintenance instructions, referred to in the Specifications unless otherwise specified and unless otherwise stated in the governing building code, shall be the latest published editions at the date of the Contractor's bid submission.

1.2 Conform to standards, in whole or in part, as stated in the Specifications.

1.3 If there is question as to whether any product or system is in conformance with applicable standards, the Owner reserves the right to have such products or systems tested at the Contractor's cost to prove conformance.

1.4 The cost for such testing will be borne by the Owner in the event of conformance with the Contract Documents or by the Contractor in the event of non-conformance.

2 SPECIFIED OPTIONS

2.1 When only one manufacturer's catalogued trade name is specified, provide only that catalogued trade name, material or product.

.1 Products by other manufacturers similar in function, design, performance, and construction complying with requirements of the named catalogued trade name, material or product may be incorporated into the Work subject to Consultant’s acceptance in accordance with Section 01 25 13 Product Substitution Procedures.

2.2 When more than one manufacturer's trade name is specified for a material or product, the choice is the contractors.

2.3 When more than one manufacturer's catalogued trade name is specified along with a referenced standard, the choice is the contractor's on condition the material or product complies with the referenced standard.

2.4 When a material or product is specified by reference to a standard only, the contractor may select any material or product that meets or exceeds the specified standard.

2.5 When a material or product is specified by prescriptive or performance specification, the contractor may select any material or product meeting or exceeding the specification.

2.6 When a material or product is specified by reference to a standard or by prescriptive or performance specification, upon request of the consultant, obtain from the manufacturer, an independent testing laboratory reporting, showing that the material or product meets or exceeds the specified requirements.

3 QUALITY

3.1 Products, materials, equipment and articles, referred to as Products throughout the specifications, incorporated into the Work shall be new, not damaged or defective, and of the best quality comparable with the specifications for the purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

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

3.3 Should any dispute arise as to the quality or fitness of products, the decision rests strictly with the consultant based upon the requirements of the contract documents.

3.4 Unless otherwise indicated in the specifications, maintain uniformity of manufacture for any particular or like item throughout the work.

4 AVAILABILITY

4.1 Immediately upon award of contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify the consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of work.

4.2 In the event of failure to notify the consultant at commencement of work and should it subsequently appear that work may be delayed for such reason, the contractor shall, as determined by the consultant and at no increase in contract price, temporarily install another product until such time as specified product becomes available, at which time the temporarily installed product shall be removed and the specified product installed.

5 PRODUCT DELIVERY, STORAGE, HANDLING AND PROTECTION

5.1 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling to the products, other building components, assemblies, other products, the structure, the site and surrounding property and in accordance with manufacturer's instructions when applicable.

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

5.3 Delivery and Handling:

.1 Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

.2 Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

.3 Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

.4 Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

5.4 Storage:

.1 Store packaged or bundled products in original and undamaged condition with manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the work, except where otherwise specified for a specific item.

.2 Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.

.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 a heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

6 TRANSPORTATION

6.1 Pay costs of transportation of products required in the performance of the work.

6.2 Transportation cost of products supplied by the owner will be paid for FOB curb side at the site by the owner. Unload, handle and store such products.

7 WORKMANSHIP

7.1 Workmanship shall be 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 the required results.

7.2 Do not employ any unfit person or anyone unskilled in their required duties.

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

8 SPECIAL PROTECTION AND PRECAUTIONS

8.1 Comply with the requirements of the workplace hazardous materials information system (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of material safety data sheets (MSDS).

9 FASTENINGS

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

9.2 Prevent electrolytic action between dissimilar metals and materials.

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

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

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

10 STAINLESS STEEL WORK

10.1 Stainless steel used in the Work shall be type as specified in each perspective Section, and shall be high quality and manufactured of non-rusting, virgin, and non-recycled materials.

10.2 Use tools that are free of contaminants that will cause corrosion and rusting of stainless steel in the fabrication and finishing of stainless steel work.

10.3 When requested by the Consultant, identify the names of the stainless steel manufacturers, fabricators and the finishing subcontractors. The Owner reserves the right to visit the manufacturing, fabrication and finishing facilities. The Contractor shall arrange for such visits by the Owner and Consultant.

10.4 An inspection and testing agency may be appointed by the Owner to test the stainless steel work.

11 MANUFACTURER'S INSTRUCTIONS

11.1 Unless otherwise indicated in the 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.

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

11.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the consultant to require removal and re-installation at no increase in the contract price.

12 TRADEMARKS AND LABELS

12.1 Trademarks and labels, including applied trademarks and labels are not acceptable in the finished work, except those required for operating instructions, or when located in mechanical, electrical and control rooms.

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

13 CONCEALMENT

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

13.2 Before installation, inform the consultant if there is a contradictory situation. Install as directed by the consultant.

End of Section

1 DEFINITIONS

1.1 Cutting: Removal of in-place construction necessary to permit installation or performance of other Work. Cutting does not include mere drilling of holes to accommodate screws, anchors, bolts or other fasteners, such drilling is part of each Section's installation function.

1.2 Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

2 SUBMITTALS

2.1 Submit written request in advance of cutting or patching which affects:

.1 Structural integrity of any element of Work and of Project.

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

.3 Visual qualities of sight-exposed elements.

.4 Work of Owner or other contractor.

2.2 Include in request:

.1 Identification of Project.

.2 Location and description of affected Work.

.3 Statement on necessity for cutting or patching.

.4 Description of proposed work, and Products to be used.

.5 Alternatives to cutting and patching.

.6 Effect on work by Owner or separate contractor.

.7 Written permission of affected separate contractor.

.8 Date and time work will be performed.

3 PREPARATION

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

3.2 After uncovering, inspect conditions affecting performance of Work.

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

3.4 Provide supports to assure structural integrity of surroundings; devices and methods to protect other portions of Work from damage.

4 DRILLING OR CORING INTO EXISTING CONCRETE

4.1 Prior to coring and drilling into an existing concrete member (slabs, beams, columns and walls), provide full scanning, X-raying of the surfaces to locate rebars and other embedded items, such as pretensioned strands, electrical and communication conduits. Employ a professional structural engineer registered in the province of Place of the Work to review the Xray scanning report and provide recommendations for coring, drilling, trenching and proposed penetrations.

4.2 Once the concrete reinforcement and other obstructions have been located, submit a coring request for review by Consultant, indicating located obstructions layout and proposed penetration locations.

.1 If obstructions are found, relocate proposed penetrations, anchors and cores in order to avoid damaging embedded items.

.2 Clearly mark existing concrete to show proposed penetrations.

.3 In certain cases, it may be necessary for the Consultant to review condition on site. In such cases, arrange a site visit by Consultant to review each proposed location.

.4 Proceed with coring and drilling only upon obtaining written approval for each condition.

4.3 Indicate penetration locations on As-Built Drawings, showing the size of each hole and the distance in relation to grid lines.

5 EXECUTION

5.1 Execute cutting, fitting, and patching, to complete the Work.

5.2 Do not cut, drill or sleeve load-bearing members without obtaining written approval for each condition.

5.3 Uncover Work to install ill-timed work.

5.4 Remove and replace defective and non-conforming work.

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

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

5.7 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and with suitable allowance for deflections and expansions and contractions.

5.8 Completely seal voids of penetrations of fire rated wall, ceiling, and floor constructions with firestopping material, full thickness of the construction element.

5.9 Refinish surfaces to match adjacent finishes. Refinish continuous surfaces to nearest intersection. Refinish entire assembly.

End of Section

1 INSPECTION/TAKEOVER PROCEDURES

1.1 Prior to application for certificate of Substantial Performance, carefully inspect the Work and ensure it is complete, that major and minor construction deficiencies are complete, defects are corrected and building is clean and in condition for occupancy. Notify Consultant in writing, of satisfactory completion of the Work and request an inspection.

1.2 During Consultant inspection, a list of deficiencies and defects will be tabulated. Correct same.

1.3 When Consultant considers deficiencies and defects have been corrected and it appears requirements of Contract have been performed, make application for certificate of Substantial Performance.

1.4 Conform to OAA/OGCA Document No.100 for takeover procedures.

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

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

2 CLEANING

2.1 Remove stains, paint, plaster, labels, caulking compound, spots, marks and dirt from decorative work, electrical and mechanical fixtures and equipment, fitments, walls, floors, ceilings, doors, windows, partitions. Vacuum, dust, clean and polish surfaces. Touch-up damaged painted areas.

2.2 Clean and polish glass, mirrors, hardware, stainless steel, chrome, porcelain enamel, baked enamel and plastic laminate. Replace broken, scratched or disfigured glass.

2.3 Vacuum clean and dust behind grilles, and screens.

2.4 Clean floors exposed in the finished work, including concrete floors with special finishes. Remove building paper, stains and debris. Scrub floors with rotary brush and water.

.1 Clean floors in a manner to be approved by the Consultant.

2.5 Remove dirt and other disfigurations from exterior surfaces.

2.6 Obtain Consultant's authorization before commencing with final cleaning.

3 AS-BUILT RECORDS

3.1 Keep an accurate record of 'as-built' conditions. Record clearly as the Work progresses, using industry standard drafting procedures, any variations from work, engineering or shop drawings.

3.2 Maintain documents in clean, dry, legible condition.

3.3 As-built drawings are in addition to any 'as-built' or 'record' drawings that may be required of Subcontractors under various trade sections.

3.4 In addition to the information provided from the various Subcontractors as-built or record drawings shall include revisions arising from approved Field Orders, Change Orders and Supplementary Instructions.

3.5 These drawings will remain on the site, available for the periodic review of the Consultant.

3.6 At time of application for Substantial Performance of the Work, deliver to the Consultant `marked-up' sets, reflecting such variations. Two extra sets of white prints will be supplied for this purpose.

4 DATA BINDERS

4.1 Collect and assemble all manufacturer's data in logical order and insert in suitable hard cover, loose leaf binders approximately 215 mm x 280 mm (8-1/2” x 11”). Mark each section with a labelled tab protected with a celluloid cover.

4.2 Organize contents into applicable sections of work to parallel project specification breakdown using broad scope headings: Architectural, Mechanical and Electrical.

4.3 Binders shall be submitted to Consultant in triplicate with at least the following:

.1 Identification on, or readable through, the front cover stating general nature of the Data Binder.

.2 Neatly typewritten index near the front of Data Binder, furnishing immediate information as to location in the Data Binder of emergency data regarding the installation.

.3 Complete instructions regarding operation and maintenance of equipment involved.

.4 Complete nomenclature of replaceable parts, their part numbers, current cost, and name and address of manufacturer and nearest vendor of parts.

.5 Cleaning and maintenance instructions for surfaces and materials.

.6 Description of equipment, operation and maintenance instructions for mechanical, electrical and sprinkler equipment.

.7 Copy of hardware schedule, paint schedule and name of Contractor and names of Subcontractors.

.8 Warranties and bonds.

.9 Complete list of mechanical and sprinkler equipment supplied and installed under the contract. Include name tag information such as make, type, size, capacity, serial number, etc.

4.4 Where contents of Data Binder include manufacturers' catalogue pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, manufacturers' data with which this installation is not concerned.

4.5 Notes shall be typed.

4.6 One complete set of final reviewed shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

4.7 One (1) copy of survey as specified in Submittals Section 01300.

4.8 Submit Data Binders in triplicate to Consultant at time of application for `Substantial Performance of the Work'.

5 DEMONSTRATION OF SYSTEMS

5.1 Demonstrate and instruct the Owner's personnel in operation and maintenance of all systems.

5.2 Refer to the various Sections of the Specifications for the specific testing requirements.

End of Section

Part 1 General

1.1 SUMMARY

.1 Section Includes:

- .1 Purpose and extent of commissioning
- .2 Roles and responsibilities of the commissioning team.
- .3 Requirements and description of the Commissioning Plan
- .4 Draft content and structure of commissioning forms

.2 Related Requirements

- .1 Division 08, 09, 20, 21, 23 and 26 specifications.

1.2 REFERENCE STANDARDS

.1 Infrastructure Ontario (IO)

- .1 IO Building Commissioning Guidelines 2017.

1.3 GENERAL

.1 The purpose of commissioning is to provide a fully functional video room facility where:

- .1 Systems, equipment, and components meet user's functional requirements before date of acceptance and operate reliably under normal usage. Commissioning scope will include all pertinent sections of this Contract.
- .2 Facility user personnel have been fully trained in the aspects of installed systems.
- .3 New equipment is fully integrated into the existing building systems.
- .4 Complete documentation relating to installed equipment and systems is provided.

.2 Term "Cx" in this section means "Commissioning".

.3 Use this outline Cx Plan as master planning document for Cx. This specification:

- .1 Provides an overview of Cx
- .2 Outlines organization, scheduling, allocation of resources, verification and acceptance procedures and documentation pertaining to implementation of Cx
- .3 Communicates the responsibilities of the team members involved in Cx
- .4 Sets out deliverables relating to O&M, process, and administration of Cx. Cx will include the technical requirements noted in all project specifications
- .5 Describes process of verification of how built works meet design requirements
- .6 Produces a complete functional system prior to issuance of Certificate of Acceptance

.4 Acronyms:

- .1 Cx - Commissioning.
- .2 BMM - Building Management Manual.
- .3 EMCS - Energy Monitoring and Control Systems.
- .4 PI - Product Information.
- .5 PV - Performance Verification.

.6 TAB - Testing, Adjusting and Balancing.

.7 MMS Maintenance Management System.

1.4 DRAFT COMMISSIONING PLAN

.1 The Commissioning Plan will be aligned with the following draft Table of Contents:

.1 Title page indicating contract identification

.2 Summary of systems to be verified and commissioned

.3 List of all contributors and participants in commissioning

.4 Approved shop drawings and product data.

.5 Approved changes to contract.

.6 Contractor's project schedule.

.7 Project Cx schedule.

.8 Demonstration and training schedule

.9 Contractor's, sub-contractor's, suppliers' requirements start-up, testing and verification requirements.

.10 Project construction team's and Cx team's requirements

.11 Verification and Commissioning forms for applicable elements and systems

.12 Demonstration and Training Verification form

.2 Submit project specific Draft Commissioning Plan within two weeks of award of contract as a project submittal for review and comment by the Independent Commissioning Agent.

1.5 REFINEMENT OF Cx PLAN

.1 During the completion of the construction phase, revise, refine and update Cx Plan to include:

.1 Changes resulting from Client program modifications.

.2 Approved design and construction changes.

.2 Revise, refine and update the plan prior to the start of commissioning and as changes may become applicable. At each revision, indicate revision number and date and maintain a log to confirm the most recent revision.

.3 Submit each revised Cx Plan as a project submittal for review and comment. Make any changes necessary as directed by the comments received on the returned submittal.

.4 Include testing parameters at full range of operating conditions and check responses of equipment and systems.

.5 Cx Plan to be 100% completed eight weeks prior to scheduled start of commissioning. Submit revised plan for Owner, Consultant and Independent Commissioning Agent review and written approval.

1.6 COMPOSITION, ROLES AND RESPONSIBILITIES OF Cx TEAM

.1 Owner to maintain overall responsibility for project. The Cx team reports to the Owner.

.2 The Cx Team will consist of following members:

.1 Independent Commissioning agent: ensures Cx activities are carried out to ensure delivery of a fully operational installation including:

.1 Preparation of Cx documentation framework.

.2 Review for performance, reliability, durability of operation, accessibility, maintainability, operational efficiency under conditions of operation.

.3 Monitoring of Cx activities, training, and completion of Cx documentation.

.4 Ensuring implementation of the final Cx Plan

.5 Implementation of Training Plan.

.6 Performing verification of performance of installed systems and equipment.

.7 Co-ordination of Cx activities with Contractor

.8 Review and submission of final commissioning report

.2 Consultant is responsible for:

.1 Monitoring operations Cx activities.

.2 Witnessing, certifying accuracy of reported results.

.3 Witnessing and certifying TAB and other tests.

.3 Construction Team: contractor, subcontractors, equipment manufacturers, suppliers and support disciplines, is responsible for construction/installation in accordance with Contract Documents, including:

.1 Preparation of 100% Cx plan based on the outline commissioning plan included in this section.

.2 Assigning one person as point of contact with Independent Commissioning agent for administrative and coordination purposes.

.3 Testing.

.4 TAB.

.5 Performance of Cx activities.

.6 Delivery of demonstrations, training and Cx documentation.

.7 Documentation of training, test reports, and verification forms.

.8 Providing content for the commissioning report.

.4 Property Manager: represents lead role in Operation Phase and onwards and is responsible for:

.1 Receiving facility.

.2 Day-To-Day operation and maintenance of facility.

.3 Attends demonstrations, training, and testing

.4 Provides access to building systems as required.

1.7 Cx PARTICIPANTS

.1 Provide names of participants to Owner and Independent Commissioning agent and details of instruments and procedures to be followed for Cx two months prior to starting date of Cx for review and approval.

.2 Client: responsible for intrusion and access security systems

1.8 EXTENT OF Cx

.1 Commission the following systems and associated equipment:

.1 Air supply and exhaust systems

.2 Fire suppression systems

.3 BMS interface (when applicable)

.4 Enabling works for IT and Communications work

.5 Security, CCTV and Card Access

.6 Power distribution system

.7 Fire Alarm System

1.9 DELIVERABLES RELATING TO O&M PERSPECTIVES

.1 General requirements:

.1 Compile English documentation.

.2 Documentation to be computer-compatible format ready for inputting for data management.

.2 The Contractor shall provide deliverables in accordance with IO Supplementary Conditions and the following list:

.1 Warranties.

.2 Project record documentation.

.3 Shop drawings

.4 Maintenance and operating instructions

.5 Inventory of spare parts, special tools and maintenance materials.

.6 Computerized Maintenance Management System (CMMS) identification system aligned with the system used at each site.

.7 Electrical Panel inventory containing detailed inventory of electrical circuitry for each panel board affected by the installation. Duplicate of inventory inside each panel. Include any data line labeling and distribution updates.

1.10 DELIVERABLES RELATING TO THE Cx PROCESS

.1 General:

.1 Start-up, testing and Cx requirements, conditions for acceptance and specifications form part of relevant technical sections of these specifications.

.2 Definitions:

.1 Cx as used in this section includes:

.1 Cx of components, equipment, systems, subsystems, and integrated systems.

.2 Performance verification tests.

.3 Deliverables: provided by the Consultant and Independent Commissioning agent:

.1 Requirements for Commissioning

.2 Technical requirements for Cx in technical specifications and as required by this section.

.3 Commissioning Plan Outline

.4 Indicative commissioning report forms.

.4 Deliverables: provided by Contractor

.1 Draft and final updated Commissioning Plan

.2 Results of Performance Verification Tests and Inspections.

.3 Description of Cx activities and documentation.

.4 Training Plans and Verification.

.5 Completed Cx Reports and Forms.

.6 Prescribed activities during warranty period.

.5 Independent Commissioning Agent to witness and certify tests and reports of results. Consultant to review and sign off on results prior to submission to Owner.

1.11 START-UP

.1 Start up components, equipment, and systems.

.2 Equipment manufacturer, supplier, installing specialist sub-contractor, as appropriate, to start-up, under Contractor's direction, following equipment, systems:

.1 Exhaust Fans

.2 Fire Alarm System

.3 Communications System

.3 Rectify start-up deficiencies to satisfaction of the Consultant.

.4 Performance Verification:

.1 Contractor to perform. Repeat when necessary until results are acceptable to Independent Commissioning Agent.

.2 Use modified generic procedures to suit project requirements.

.3 Independent Commissioning Agent to witness and certify reported results using approved forms.

.4 Consultant to approve completed reports and provide to Owner

.5 Independent Commissioning Agent reserves the right to verify up to 30% of reported results at random.

.6 Failure of randomly selected item shall result in rejection of PV report or report of system start-up and testing.

1.12 Cx OF INTEGRATED SYSTEMS AND RELATED DOCUMENTATION

.1 Cx to be performed by specified Cx specialist, using procedures developed by Consultant and approved by Owner.

.2 Tests to be witnessed by Independent Commissioning Agent and documented on approved report forms.

.3 Upon satisfactory completion, Independent Commissioning agent to consolidate Cx documentation, to be certified by Consultant and submitted to Owner for review.

.4 Integrated systems to include when applicable:

.1 HVAC and associated systems forming part of an integrated HVAC system.

.2 Fire alarm systems.

.3 Voice communications systems (are in a separate contract).

1.13 COMMISSIONING FORMS

.1 Refer to part 3 of this specification for examples of indicative commissioning forms.

1.14 DELIVERABLES BY CONTRACTOR

.1 Pre- Cx Deliverables:

.1 Prepare detailed Cx Schedule and submit to Independent Commissioning Agent for review and approval same time as project Construction Schedule. Include:

.2 Milestones, testing, documentation, training and Cx activities of components, equipment, subsystems, systems and integrated systems, including:

.1 Design criteria, design intents.

.2 Notification of intention to start testing 21 days before start of testing.

.3 Identification of deferred Cx.

.4 Outline, implementation schedule and verification form for training.

.5 Cx reports: immediately upon successful completion of Cx.

.3 Detailed training schedule to demonstrate no conflicts with testing, completion of project and hand-over to Property Manager.

.2 After approval, incorporate Cx Schedule into Construction Schedule.

.3 Independent Commissioning agent, Contractor, Contractor's Cx agent, and Client Project Manager will monitor progress of Cx against this schedule.

1.15 Cx REPORTS

.1 Submit reports of tests, witnessed and certified by Independent Commissioning Agent to Client Project Manager who will verify reported results.

.2 Include completed and certified commissioning forms in properly formatted Cx Reports.

.3 Before reports are accepted, reported results to be subject to verification by Consultant.

1.16 TESTS TO BE PERFORMED BY OWNER/USER

.1 None is anticipated on this project.

1.17 TRAINING PLANS

.1 For all systems and project elements that are required to be verified and commissioned, ensure that facility user and operations personnel have been fully trained in the aspects of installed systems.

.2 Include in the commissioning plan a list of all training sessions necessary.

.3 Each training session shall be documented on a training form that outlines the subject of the training and provides on overview of the topics covered, the date and duration of training, the names and company of the people who gave the training and the printed names and signatures for user and operations staff who received training.

.4 Reference documentation shall be included in the O&M Manual

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 COMMISSIONING FORMS

.1 Commissioning forms shall be similar to or may be replicated from section 3.2 below.

.2 Applicability of commissioning forms shall suit the requirements of the individual installation. The following table is provided for reference. Additional forms as may be required for a specific Contract shall be prepared by the Contractor's Cx Agent.

Reference	Title
CR-1	EXHAUST AIR FAN / AIR TRANSFER FAN
CR-2	REVISION TO EXISTING HVAC SYSTEM
CR-3	PRIVACY BOOTH EXHAUST AIR FAN
CR-5	LIFE SAFETY
CR-7	ELECTRICAL
CR-8	SECURITY, CCTV and CARD ACCESS
CR-9	SPLIT AIR CONDITIONING SYSTEM

3.2 COMMISSIONING FORMS

Project Name **Project Number**		**EXHAUST AIR FAN / AIR TRANSFER FAN COMMISSIONING REPORT CR-1**	
Manufacturer **Model number** **MMS ID**		**Design airflow** **Measured airflow**	
PRE-START CHECKS	**CONTRACTOR**	**CONSULTANT**	**REMARKS**
According to shop drawings			
Duct connections tight and flex connections installed to ductwork.			
Air transfer ductwork and fan ductwork acoustically lined 25mm all around full length as per drawings.			
Fan properly supported			
Controls accessible			
Thermostat or temperature sensor location as per drawings 24/7 air transfer FAN switch on/off located at the fan			
Identification tag visible			
Exhaust grille installed, dimensions and locations as per contract. Air transfer grilles installed as per contract.			
START-UP CHECKS			
Point to point verification with BMS completed and correct.			
TAB report appended			
REMARKS			
Signature of Contractor	Printed		Date
Signature of Independent Cx	Printed		Date
Signature of Consultant	Name of Consulting firm		Date

Project Name **Project Number**		**REVISION TO EXISTING HVAC SYSTEM COMMISSIONING REPORT CR-2**	
		Design airflow **Measured airflow**	
PRE-START CHECKS	**CONTRACTOR**	**CONSULTANT**	**REMARKS**
Existing supply air diffuser/ troffer reinstalled and ductwork reconnected to existing as per contract documents.			
Insulated flexible connections to existing duct provided where specified.			
Existing return air grille/diffuser/troffer reinstalled and reconnected to existing ductwork as per contract documents.			
Existing room temperature sensor/ thermostat relocated at new furred out wall.			
New grilles/diffusers installed where required and connected to existing system as per contract.			
START-UP CHECKS			
Tab report appended			
Room temperature at setpoint and tested.			

REMARKS

Signature of Contractor	Printed	Date
Signature of Independent Cx	Printed	Date
Signature of Consultant	Name of Consulting firm	Date

Project Name **Project Number**		**PRIVACY BOOTH EXHAUST AIR FAN COMMISSIONING REPORT** **CR-3**	
Manufacturer **Model number** **MMS ID**		**Design airflow** **Measured airflow**	
PRE-START CHECKS	**CONTRACTOR**	**CONSULTANT**	**REMARKS**
According to shop drawings			
Duct connections tight and flex connections installed to ductwork.			
Air transfer ductwork and fan ductwork acoustically lined 25mm all around full length as per drawings.			
Fan properly supported and accessible through tiled ceiling.			
Controls accessible			
Fan controlled by light switch tested and operational			
Identification tag visible			
Fan exhaust grilles installed, dimensions and locations as per contract. Air transfer grilles installed as per contract.			
START-UP CHECKS			
TAB report appended			
REMARKS			
Signature of Contractor	Printed		Date
Signature of Independent Cx	Printed		Date
Signature of Consultant	Name of Consulting firm		Date

Project Name **Project Number**		**LIFE SAFETY COMMISSIONING REPORT CR-5**	
Strobe/Light **Manufacturer** **Model number** **Serial Number** **MMS ID**		**Sprinkler head** **Manufacturer**	
PRE-START CHECKS	**CONTRACTOR**	**CONSULTANT**	**REMARKS**
Speaker/strobe applicable			
Speaker/strobe according to shop drawings			
Speaker/strobe installed and wired			
Sprinkler head applicable			
Sprinkler head anti-ligature			
Sprinkler head installed			
Piping connected to system			
START-UP CHECKS			
Speaker/strobe operation verified by fire alarm vendor appended			
Sprinkler designer sign-off appended			

REMARKS

Signature of Contractor	Printed	Date
Signature of Independent Cx	Printed	Date
Signature of Consultant	Name of Consulting firm	Date

Project Name **Project Number**			**ELECTRICAL COMMISSIONING REPORT CR-7**
PRE-START CHECKS	**CONTRACTOR**	**CONSULTANT**	**REMARKS**
POWER SUPPLY			
According to shop drawings			
Installed correctly			
Breaker(s)/Panel correctly installed			
Panel circuit sheet updated			
Power to all loads			
RECALL BELL AND LIGHT			
According to shop drawings			
Installed correctly			
COMMUNICATION CONNECTION			
In correct location			
Tested and verified			
AV COMMUNICATION CONDUIT			
Box in correct location			
Pull string installed			
START-UP			
Recall system verified			
ESA Inspection report			

REMARKS		
Signature of Contractor	Printed	Date
Signature of Independent Cx	Printed	Date
Signature of Consultant	Name of Consulting firm	Date

Project Name **Project Number**		**SPLIT AIR CONDITIONING SYSTEM** **CR-9**	
Manufacturer **Model number** **Serial Number** **MMS ID**		**Design capacity** **Measured capacity**	
PRE-START CHECKS	**CONTRACTOR**	**CONSULTANT**	**REMARKS**
According to shop drawings			
Installation completed as per manufacturers installation and contract documents.			
Condensate pump installed and connected.			
Disconnect provided at outdoor unit.			
Refrigerant piping is correct insulation installed and piping is securely supported.			
Room controller installed and operational. Room temperature at set point.			
Refrigerant filled and leak tested			
START-UP CHECKS			
Start-up report appended			

REMARKS		
Signature of Contractor	Printed	Date
Signature of Independent Cx	Printed	Date
Signature of Consultant	Name of Consulting firm	Date

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

1.2 SECTION INCLUDES

.1 This Section of the Work covers the requirements for demolishing, salvaging, relocating and removing wholly or in part the various items designated on the drawings or required to be removed or partially removed for the receipt of the Work of this Contract.

.2 Selective demolition includes, but is not necessarily limited to:

.1 Alteration and renovations to existing building.

.2 Cutting and removing of walls, floor finishes, etc., in the existing buildings as indicated on drawings.

.3 Patching, making good walls, floors and ceilings including painting, as required.

.4 Removal of rubbish, debris, demolished fixtures, fitments and items not scheduled to remain Owner's property, resulting from the demolition and preparatory work.

.5 Dust Control during the operations of the work of this section.

1.3 QUALITY ASSURANCE

.1 Comply with pertinent codes, regulations and insurance carriers providing coverage for this Work.

.2 Execute the work in strict accordance with 'The Occupational Health and Safety Act and Regulations for Construction Projects' latest addition. Keep copy of the Act at the place of the Work at all times.

.3 Carry out demolition work in accordance with CSA S350-M.

.4 Submit fire safety plan in accordance with requirements of Owner.

1.4 SUBMITTALS

.1 Submit demolition and cutting schedule to Consultant for review. Schedule to show timing and phasing of the Work in the various areas of the existing building. Deviation from schedule will not be permitted without approval.

1.5 PROTECTION

.1 Use all means necessary to protect existing objects designated to remain and in the event of damage, immediately make all repairs and replacements necessary to the approval of the Consultant and at no additional cost to Owner.

.2 Provide protection required to enable existing building and equipment to remain in continuous and normal operations, and maintain construction schedule.

.3 Erect barricades, covered ways, barriers, scaffolding, screens, notice and warning boards and maintain all lights, signals and protection of all kinds for the protection of workmen on the Work, for the protection of adjoining property and for the protection of public.

PART - 2 PRODUCTS

2.1 MATERIALS

.1 Demolished materials become Contractor's property. Remove materials from site daily, unless such materials are specified or shown on Contract Documents to be reused or turned over to Owner.

2.2 TEMPORARY PARTITIONS

.1 Partitions shall be erected prior to demolition. Construct partitions of wood studs, exterior grade plywood, insulation and caulk all joints including perimeter joints. Partitions shall extend from floor-to-floor and roof.

PART - 3 EXECUTION

3.1 PREPARATION

.1 Notify the Consultant at least two full working days prior to commencing of the Work.

.2 The drawings do not purport to show all objects existing on the site.

.3 Before commencing the Work, carefully check drawings and verify with the Consultant regarding all objects to be removed and all objects to be preserved.

.4 Schedule all Work in a careful manner with all necessary consideration for the requirements of Owner, his employees and the public.

.5 Avoid interference with the use of, and passage to and from, adjacent buildings and facilities.

.6 Before starting the operations, arrange with the appropriate trade concerned for the disconnection of all utility services, affecting the work.

.7 Preserve in operating condition all active utilities to remain.

3.2 DEMOLITION AND PREPARATORY WORK

.1 In order to afford the least interference with the efficient operations of the existing building and to keep the risk of fire to a minimum at all times, ensure that demolished materials are continuously removed from the buildings and grounds as they accumulate, that no hazard condition is left during non-working hours and that full measures are taken by sprinkling and other means to keep dust to a minimum and to confine what dust there is within the working area.

.2 Maintain proper and safe means of fire exit from all zones of the existing building to the approval of the authorities having jurisdiction.

.3 Confine operation to those parts of the buildings which are to be altered or renovated. Do not damage existing construction beyond that necessary for performance of new work and repair such damage as required.

.4 Carefully remove in re-usable condition, transport and store on site where directed by Owner's representative and protect against damage all materials and equipment to be salvaged or relocated for reuse in the new work as directed by Owner's representative.

.5 Take possession of all other materials arising from the demolition work and remove from the site.

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

.7 The use of pneumatic or electrical jack hammers is not permitted.

.8 Where items are to be removed from existing structure or surfaces that are to remain in place, remove those items complete with hangers, brackets and other readily removable supports and fastenings:

.1 Remove bolts, but not inserts embedded in concrete or masonry.

.2 Remove bolt and rivet fastenings from steel structure.

.9 Demolish work into sections of practical size for removal without alteration or damage to the existing building remaining in place.

.10 Upon completion of demolition, leave interior surfaces broom clean.

.11 New openings required in existing walls and partitions shall be carefully cut and formed to blend into existing work.

.12 Join and make good new work to existing in such a manner that the joint is structurally sound and inconspicuous.

.13 Cuts, breaks and other temporary openings into existing surfaces, which are required for installation or application of new fixtures, fitments, materials or services shall be, at completion of work, patched and/or made good and finished to blend with surrounding finishes. Openings to allow passage of ducts shall be closed tight to perimeters of duct at all locations where fire dampers are required.

.14 In areas where work is required to be performed over acoustic ceilings composed of lay-in panels in a supporting grid, carefully remove panels to avoid damage and replace when work is completed. If existing lay-in panels in a room are damaged and cannot be matched with new panels, then replace all the panels in that room with new units to the Engineer's approval at no additional expense to Owner.

.15 Where fireproofing membranes or coverings to existing structural steel members and open web steel joists are disturbed, restore the fire protection with materials and methods acceptable by the authorities having jurisdiction.

.16 Materials and other equipment not required for re-use shall not be stored or sold from the site.

.17 Burning of materials on site is prohibited.

.18 Maintain security of existing building.

3.3 **MAKING GOOD**

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

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

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

3.4 **CUTTING AND PATCHING**

.1 Perform cutting, fitting, and patching to complete the Work. Do not cut, drill or sleeve load-bearing members without obtaining written approval for each condition.

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

.3 Perform work to avoid damage to other work.

.4 Prepare proper surfaces to receive patching and finishing.

.5 Cut rigid materials using power saw or core drill. Pneumatic or impact tools not allowed.

.6 Restore work with new products to match existing in accordance with Contract Documents.

.7 Fit work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.8 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with fire rated material, full thickness of construction element.

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

END OF SECTION

1 PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of, and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Ltd. report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Silica-containing materials identified and/or suspected can be found within the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020.

1.4 SCOPE OF WORK

1.4.1 The Contractor shall identify all silica-containing materials, even though they have been thoroughly surveyed in the referenced DSHM assessment report. Follow all applicable regulations, guidelines, and standards for adequate worker protection during all work.

1.4.2 Removing, demolishing, or working with building materials suspected to contain silica including but not limited to: brick, concrete, concrete block, cement, mortar, plaster, ceiling tiles and gypsum board, shall follow Type 1, Type 2, and/or Type 3 removal operations as outlined in the Ontario Ministry of Labour Guideline – Silica on Construction Projects dated April, 2011.

1.4.2.1 Related work requirements specified elsewhere shall also apply, where required.

1.4.2.2 All work methods referred to in this section are to be completed and followed by all trades conducting any type of construction and or demolition work where a silica-containing material disturbance will or may occur. This includes, but is not limited to, handling, cutting, breaking, cleaning, removing, and installing any silica-containing material.

1.4.2.3 It is expected that most demolition and construction work will result in a Type 1 or Type 2 Silica Work Operation in accordance with work type classification identified in the Ontario Ministry of Labour document *Guideline: Silica on Construction Projects*, based on the surveyors' knowledge of the building and the anticipated demolition/construction methods.

1.4.2.4 Protective measures and procedures should be implemented when working with silica. Specific measures and procedures will depend on how the work is classified. This will be the responsibility of the Contractor to determine silica disturbance work activities and appropriate measures and procedures. The Contractor may seek guidance or request a review of selected silica work measures and procedures with the Environmental Consultant.

1.4.2.5 The generation of airborne silica-containing dust should be controlled with a mechanical ventilation system, wetting, or the use of a dust collection system. If silica-containing airborne dust is generated, mechanical ventilation with an air flow sufficient to remove airborne contaminants from workers' breathing zones should be provided. The air flow of the mechanical ventilation system should be at least 50 cubic feet per minute (ft^3/min) per square foot of face area of the intake vent grill (0.25 m^3/s per square metre of face area). However, if it is determined that ventilation, wetting, and dust collection methods are not practical, workers may be provided with respirators (see Table 1: Silica Disturbance Respirator Requirements) to protect them from exposure. In this case, a Job Hazard Analysis should be completed that explains the process of assessing the engineering control methods (ventilation, wetting, and dust collection) and the reasons why they were determined to be impracticable.

1.4.2.6 Where effective dust control measures are in place and where an employer (Contractor) can demonstrate on a continual basis that the silica exposure levels are below the Occupational Exposure Limit (OEL), respirators may not be required.

1.5 DEFINITIONS

1.5.1 **Authorized Visitors**: Owner's Environmental Consultant and/or person(s) representing regulatory agencies, and person(s) authorized by them.

1.5.2 **Competent Person**: A worker who is qualified because of knowledge, training, and experience to perform work, is familiar with relevant acts and regulations that apply to the work, and has knowledge of all potential or actual dangers to health or safety in work.

1.5.3 **Effective**: implies that the dust collection system should be capable of controlling airborne silica concentration levels to below 0.05 milligrams per cubic metre (mg/m^3).

1.5.4 **Environmental Consultant**: Third party inspection agency.

1.5.5 **HEPA Filter**: High Efficiency Particulate Aerosol filter, at least 99.97% efficient in collecting a 0.3 micron aerosol. Each filter should be individually tested and certified to have an efficiency of not less than 99.97 percent when challenged with 0.3 micron Dioctyl Phtalate (DOP) or Poly Alfa Olefin (PAO) particles. DOP/PAO testing must be conducted in accordance with the Environmental Abatement Council of Ontario (EACO) document *DOP/PAO Testing Guideline*, 2013.

1.5.6 **HEPA Vacuum/HEPA-Filtered Vacuum**: a vacuum cleaner equipped with HEPA filtration that is capable of being performance leak tested.

1.5.7 **Silica**: means crystalline silica in a respirable form. Silica is the primary component of many construction materials. The best-known and most abundant type of crystalline silica is quartz. Other forms of crystalline silica include cristobalite, tridymite and tripoli.

Some commonly used construction materials containing silica include: abrasives used for blasting, brick, refractory brick, plaster, drywall, lay-in acoustic ceiling tiles, concrete, concrete block, cement, mortar, granite, sandstone, quartzite, slate, gunite, mineral deposits, rock and stone, sand, fill dirt, top soil and asphalt containing rock or stone.

1.5.8 **Silica Work Area**: Area where work takes place, which will, or may, disturb silica-containing material.

1.6 REGULATIONS, GUIDELINES & INDUSTRY STANDARDS

1.6.1 Contractor shall:

1.6.1.1 Comply with Provincial, and local requirements pertaining to silica, provided that in any case of conflict among these requirements or with these specifications, the most stringent requirements shall apply.

1.6.1.2 Carry out measures and procedures prescribed in Ontario Regulation 490/09: *Designated Substances* (as amended).

1.6.1.3 Protect the health and safety of workers by ensuring compliance with the specific occupational exposure limits (OELs) for silica. The OEL for cristobalite silica is 0.05 mg/m³ of air as an 8-hour daily or 40 hour weekly time-weighted average. The OEL for quartz and tripoli silica is 0.10 mg/m³. Measures and procedures that ensure construction workers receive the same standard of protection as workers covered by O. Reg. 490 should be implemented on construction projects where exposure to silica is a hazard. Such measures and procedures are deemed to be in compliance with section 25(2)(h) of the Occupational Health and Safety Act (OHSA), as taking “every precaution reasonable” in the circumstances for the protection of a worker.

1.6.1.4 Carry out measures and procedures prescribed by Ontario Regulation 213/91: *Construction Projects* (as amended); R.R.O. 1990, Regulation 860: *Workplace Hazardous Materials Information System (WHMIS)* (as amended); and Ontario Ministry of Labour *Guideline – Silica on Construction Projects* dated April, 2011.

1.6.1.5 Comply with R.R.O. 1990, Regulation 347: *General-Waste Management* (as amended), made under the Environmental Protection Act.

1.6.1.6 Ensure every employee and every worker on project complies with applicable acts and regulations.

1.6.1.7 Provide instruction and training by a competent person to every worker in the following subjects: WHMIS training, hazards of silica exposure, recognition of typical operations containing silica, personal hygiene, the use, cleaning and disposal of respirators, and personal protective equipment.

1.6.1.8 Protect health and safety of workers and public.

1.6.2 Contractor may:

1.6.2.1 Be requested to provide information on their health and safety record and training documents.

1.6.2.2 Be required to provide a copy of their respiratory protection program.

1.7 QUALITY ASSURANCE

1.7.1 Ensure work proceeds on schedule, and meets all requirements of this Section.

1.7.2 Pay cost to Owner for inspections performed as a result of failure to perform work satisfactorily regarding quality, safety, or schedule.

1.7.3 Use only skilled and qualified workers for all the trades required for this work.

1.8 SUBMITTALS

1.8.1 Before commencing work:

1.8.1.1 Laws of the province of Ontario shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, duties as may be required.

1.8.1.2 Submit names of supervisor personnel who will be responsible for silica work area(s).

1.8.1.3 Contractor shall submit, in writing, confirmation of good standing with Workplace Safety and Insurance Board and transcription of insurance.

1.8.1.4 Submit documentation including test results for fire and flammable data and Safety Data Sheets for materials and chemicals to be used.

1.9 WORKER AND VISITOR PROTECTION

1.9.1 **Instruction and Training**: Before commencing work, provide to Owner and/or Environmental Consultant satisfactory proof that every worker has had instruction and training in WHMIS; hazards of silica exposure, including health effects and symptom recognition; personal hygiene; respirator requirements; work measures and procedures; and use, cleaning and disposal of respirators and protective equipment by a competent person as defined by Occupational Health and Safety Act.

1.9.2 **Respirators**: United States National Institute for Occupational Safety and Health (NIOSH)-approved respirators may be worn during silica work activities as per Ontario Regulation 490/09. Silica dust on personal respirators should be removed by damp wiping or HEPA vacuuming. Respirators should be selected in accordance with the NIOSH Assigned Protection Factors (APF). A summary of respirator requirements based on anticipated concentration of airborne silica can be found in Table 1. Maintenance and care for respirators should be conducted as per Canadian Standards Association Z94.4-02 *Selection, Use, and Care of Respirators* Guideline. **If Contractor can demonstrate that the silica exposure levels are below the OEL for the work activity, respirators may not be required.**

Table 1: Silica Disturbance Respirator Requirements

Silica Disturbance Type (Work Activity)	Required Respirator
Type 1 Silica Removal Operations (> 0.05 to 0.50 mg/m^3 of silica in the form of cristobalite and tridymite) (> 0.10 to 1.0 mg/m^3 of silica in the form of quartz and tripoli) • The drilling of holes in concrete or rock that is not part of a tunnelling operation or road construction. • Milling of asphalt from concrete highway pavement. • Charging mixers and hoppers with silica sand (sand consisting of at least 95% silica) or silica flour (finely ground sand consisting of at least 95% silica) • Any other operation at a project that requires the handling of silica-containing material in a way that may result in a worker being exposed to airborne silica. • Entry into a dry mortar removal or abrasive blasting area while airborne dust is visible for less than 15 minutes for inspection and/or sampling. • Working within 25 metres of an area where compressed air is being used to remove silica-containing dust outdoors.	**NIOSH APF = 10** • Half-mask particulate respirator with N-, R-, or P-series filter and 95, 99, or 100 percent efficiency.
Type 2 Silica Removal Operations (> 0.50 to 2.5 mg/m^3 of silica in the form of cristobalite and tridymite) (> 1.0 to 5.0 mg/m^3 of silica in the form of quartz and tripoli) • Removal of silica containing refractory materials with a jackhammer. • The drilling of holes in concrete or rock that is part of a tunnelling operation or road construction. • The use of a power tool to cut, grind, or polish concrete, masonry, terrazzo or refractory materials. • The use of a power tool to remove silica-containing materials. • The use of a power tool indoors to chip or break and remove concrete, masonry, stone, terrazzo or refractory materials. • Tunnelling (operation of the tunnel boring machine, tunnel drilling, or tunnel mesh installation). • Tuckpointing and surface grinding. • Dry method dust clean-up from abrasive blasting operations. • Dry mortar removal with an electric or pneumatic cutting device. • The use of compressed air outdoors for removing silica dust. • Entry into area where abrasive blasting is being carried out for more than 15 minutes.	**NIOSH APF = 50** • Full-facepiece air-purifying respirator with any 100-series particulate filter. • Tight-fitting powered air-purifying respirator with any 100-series particulate filter. • Full-facepiece supplied-air respirator operated in demand mode. • Half-mask or full-facepiece supplied air respirator operated in continuous-flow mode.
Type 3 Silica Removal Operations (> 2.5 mg/m^3 of silica in the form of cristobalite and tridymite) (> 5.0 mg/m^3 of silica in the form of quartz and tripoli) • Abrasive blasting with an abrasive that contains ≥ 1% silica. • Abrasive blasting of a material that contains ≥ 1% silica.	**NIOSH APF ≥ 1000** • Type CE abrasive-blast supplied air respirator operated in a positive pressure mode with a tight-fitting half-mask facepiece. • Type CE abrasive-blast supplied air respirator operated in a pressure demand or positive pressure mode with a tight-fitting facepiece.

1.9.3 **Protective Clothing**: Provide workers and visitors in silica work area(s) with disposable and/or washable work clothes, including shoe covers. Work clothes that are contaminated with silica dust should not be worn outside the work area(s). Silica dust on washable work clothes should be removed by damp wiping or HEPA vacuuming and washed in facilities suitable for handling silica contaminated laundry before reusing. Provide or have access to appropriate washing facility equipped with clean water, soap, and individual towels for washing hands and face of workers. The washing facility shall

be used by every worker when leaving silica work area(s) and if feasible, the washing facility should include a shower.

1.9.4 Workers who may be exposed to silica on a regular basis should undergo a pre-placement medical assessment and periodic medical examinations.

1.9.5 A worker shall not eat, drink, chew gum, or use tobacco products in work area(s).

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **HEPA Vacuum**: See Section 1.5.6. High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining particles greater than 0.3 microns in any direction at 99.97% efficiency.

2.1.2 **Polyethylene sheeting sealed with tape**: Polyethylene sheeting of type and thickness specified sealed with tape along all edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of silica dust through sheeting into a clean area.

2.1.3 **Tape**: Tape suitable for sealing polyethylene to surfaces under both wet conditions using amended water and dry conditions.

3 PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Equipment, tools, furnishings, and stored materials which can be moved, without disturbing silica-containing materials shall be moved by the Contractor in preparation of executing any work.

3.2 REMOVAL (SILICA DISTURBANCE WORK)

3.2.1 **TYPE 1 OPERATIONS**

3.2.2 A half-mask particulate respirator with N-, R-, or P-series filter and 95, 99 or 100 percent efficiency should be provided for workers performing Type 1 operations unless the Contractor can demonstrate effective dust control measures using mechanical ventilation, material wetting, and/or the use of a dust collection system for the specific work activity. Respirators may not be required for a Type 1 work activity where silica dust concentrations are demonstrated to be below the OEL.

3.2.2.1 An enclosure is not required for Type 1 work. However, if significant concentrations of dust are being generated the work should be re-evaluated by a qualified person and additional procedures should be implemented.

3.2.3 **TYPE 2 OPERATIONS**

3.2.3.1 Ropes or barriers should be set up at least 10 metres away from the immediate work activity to prevent unauthorized personnel from entering the work area. If this is not possible and there are bystanders within the 10-metre limit, the Type 2 operation should be enclosed to prevent the escape of airborne silica-containing dust. It is not expected that full enclosure removal procedures are necessary for the work included under this contract.

3.2.3.2 The generation of silica-containing airborne dust should be controlled by thoroughly wetting the area prior to and/or during drilling or cutting operations.

3.2.3.3 Respirators with a NIOSH APF of 50 should be provided for workers performing Type 2 operations unless the Contractor can demonstrate effective dust control measures for the work activity, i.e. where it can be demonstrated that dust control measures can maintain silica dust concentrations below the OEL.

3.2.3.4 Building personnel shall disable air handling and ventilation systems (if applicable) supplying or exhausting from silica work area(s) and/or enclosure(s). Ensure air handling systems remain shut-off during duration of work. All air handling and ventilation systems shall additionally be isolated from the silica work area by sealing all vent grills or other openings using polyethylene sheeting and tape.

3.2.3.5 Before disturbing silica-containing material, install polyethylene drop sheets as appropriate to control spread of dust.

3.2.3.6 If significant concentrations of dust are being generated the work should be re-evaluated by a qualified person and additional procedures should be implemented. This may include erection of a full enclosure using polyethylene sheeting in order to separate silica work area(s) from remaining building areas. The Ontario Ministry of Labour *Guideline – Silica on Construction Projects* dated April, 2011 should be consulted for all additional recommended requirements.

3.2.3.7 Emergency and fire exits are to be established from silica work area(s), or alternative exits have been established satisfactory to authorities having jurisdiction.

3.2.3.8 Temporary lighting in silica work area(s) is to be provided (if necessary) to a level that will permit work to be done safely and well where necessary.

3.2.3.9 Signs shall be displayed in all areas where access to silica work area(s) is possible. Signs should be at least 500 mm x 350 mm and state the date and place of the silica removal project. Such signs shall read in large, clearly visible letters:

CAUTION
Silica Dust Hazard
No Unauthorized Entry
Wear Assigned Personal Protective Equipment

3.2.3.10 Work shall proceed only when the Owner's Environmental Consultant has been notified of the intention to proceed and has reviewed equipment and procedures.

3.3 CLEAN-UP

3.3.1 Clean all immediate work area surfaces by washing down with water and vacuuming with a HEPA vacuum until no visible residue remains to prevent dust-containing silica from spreading.

3.3.2 Workers exposed to silica should be provided with, or have access to, washing facilities equipped with clean water, soap, and individual clean towels.

3.3.3 Silica dust on personal protective clothing and equipment should be removed by damp wiping and/or HEPA vacuuming.

3.3.4 When exiting the work area(s), dispose of any contaminated disposable work clothes as construction waste.

3.3.5 All workers and visitors in the silica work area(s) must properly decontaminate themselves prior to leaving the work area.

3.4 AIR MONITORING

3.4.1 The Owner may arrange for air samples to be taken, as required, during representative silica disturbance work. Air sampling results can then be used to determine if the engineering controls implemented (Type 1, 2, or 3) are providing adequate respiratory protection for workers and also determine if respiratory protection is necessary for the specific work action performed.

3.5 INSPECTION

3.5.1 From commencement of work until completion of clean-up operations, Environmental Consultant may be present on an as required basis, both inside and outside silica work area(s).

3.5.2 Pay cost to provide re-inspection of work found not in accordance with these specifications and requirements of authorities having jurisdiction.

3.6 DISPOSAL OF WASTE

3.6.1 Conform to requirements of Regulation 347, as amended, made under The Environmental Protection Act, for waste management, transportation, and disposal of hazardous waste.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of, and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Table 2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all known and suspected asbestos-containing materials for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment where asbestos-containing materials may be disturbed, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases that may contain asbestos-containing materials.

1.4.1.2 This Section (02 82 01) only applies to that work for which the disturbance of asbestos-containing materials is classified as a Type 1 operation in accordance with Ontario Regulation 278/05: "*Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations"*, as amended.

1.4.1.3 The work performed may be completed by first completely removing the non-friable asbestos-containing material(s) that may be disturbed as an asbestos operation and replacing them with new non-asbestos-containing materials, or by working with the asbestos-containing material following the appropriate asbestos operations as regulated by O. Reg. 278/05.

1.5 DEFINITIONS

1.5.1 Refer to Item 1.5 of Section 02 82 03.

1.6 REGULATIONS

1.6.1 Refer to Item 1.6 of Section 02 82 03, except:

1.6.1.1 Notification to the Ministry of Labour is not required for Type 1 asbestos abatement.

1.7 SUPERVISION

1.7.1 Refer to Item 1.7 of Section 02 82 03.

1.8 QUALITY ASSURANCE

1.8.1 Refer to Item 1.8 of Section 02 82 03.

1.9 SUBMITTALS

1.9.1 Refer to Item 1.9 of Section 02 82 03, except:

1.9.1.1 Workers and Supervisors are not required to have MTCU training certificates and therefore these are not to be submitted.

1.10 WORKER AND VISITOR PROTECTION

1.10.1 Respirators are not mandatory for work with non-friable asbestos-containing materials, however, for this project, provide workers with non-powered half-face air purifying respirators with minimum replaceable P100 filter cartridges in accordance with NIOSH Part 84 requirements. Provide proper instruction to all workers that utilize respirators in the use, care, and maintenance of respirators. All workers that wear a respirator for their work activities must be fit tested using a quantitative method of fit testing. Replace filter cartridges as necessary, according to manufacturer's instructions. Workers shall not wear facial hair that affects seal between respirator and face. Abatement Contractor to post on the job bulletin board complete personal protective equipment instructions, procedures, and information pertaining to protection for workers and approved visitors.

1.10.2 Provide, and insist on using, facilities for washing of hands and face by every worker when leaving asbestos work area. Prohibit smoking, eating, and drinking in asbestos work area(s).

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **Amended Water:** Water with non-ionic water wetting agent added.

2.1.2 **Asbestos Waste Receptors:** Two (2) separate containers of which one shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or metal or fibre drum or wood box. Other container shall be adequate to prevent perforating rips or tears in first container during filling, transport, or disposal. Containers must be acceptable to disposal site selected and Ministry of Environment. Containers shall be labelled in accordance with Ministry of Environment regulations.

2.1.3 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.

2.1.4 **HEPA Vacuum:** Refer to Item 1.5 of Section 02 82 03. Vacuum with all necessary fittings, tools, and attachments. Air must pass HEPA filter before discharge.

2.1.5 **Lock-Down Agent**: Pre-mixed solution of slow drying adhesive/sealing treatment for microscopic residual asbestos fibres present after the removal of asbestos-containing material.

2.1.6 **Mastic Remover**: Spray applied chemical product used to remove mastic (eg. BEAN-e-doo® product by Franmar Chemical).

2.1.7 **Polyethylene Sheeting:** 0.15 mm (6mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.

2.1.8 **Sprayer:** Garden-type portable air-less manual sprayer, low velocity, capable of producing mist or fine spray.

2.1.9 **Tape:** Tape suitable for sealing polyethylene to surfaces under both wet conditions using amended water and under dry conditions.

3 PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Re-locate any movable furnishings, equipment, and contents from the work area prior to beginning work.

3.1.2 Before disturbing non-friable asbestos materials except those used as flooring, cover floor and any immovable furnishings, equipment or contents below work with polyethylene sheeting.

3.1.3 Pre-clean all surfaces within the asbestos work area using a HEPA vacuum and/or damp cloth.

3.1.4 Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Provide ground fault electrical system where application of amended water is required for wetting asbestos-containing materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.2 REMOVAL OF ASBESTOS-CONTAINING VINYL FLOOR TILE

3.2.1 In the event that vinyl floor tiles must be removed to facilitate work, follow the directions presented below.

3.2.2 Start removal by wedging heavy-duty scraper in the seam of two (2) adjoining tiles and gradually forcing the edge of one (1) tile up and away from floor. Do not break off pieces of tile, but continue to force up the balance of the tile.

3.2.3 When first tile is removed, place it, without breaking into smaller pieces, into asbestos waste receptor.

3.2.4 Continue removal of tiles using hand tools and removing tiles intact wherever possible. When adhesive is spread heavily or is quite hard, it may prove easier to force scraper through tightly adhered areas by striking scraper handle with hammer using blows of moderate force while maintaining scraper at 25º to 30º angle to floor. When even this technique cannot loosen tile, removal can be simplified by heating tile with hot air gun or infrared heaters until heat penetrates through tile and softens adhesive. Do not use powered electric scrapers.

3.2.5 After removal of small area scrape up adhesive remaining on floor with hand scraper until only thin smooth film remains. Where deposits are heavy or difficult to scrape, hot air gun or infrared heaters may be used. Deposit scrapings into asbestos waste receptors. Do not dry scrape surface of adhering pieces of tile.

3.2.6 If mastic is also asbestos-containing the following procedure may be required to remove all mastic residue:

3.2.6.1 Apply mastic removal agent to asbestos-containing mastic with sprayer. Allow mastic removal agent to dwell according to the manufacturer's specifications.

3.2.6.2 After appropriate dwelling time, using a hand scraper, remove asbestos-containing mastic (an absorbent material may be used to aid in controlling the spread of the liquefied mastic).

3.2.6.3 Using a shovel (or equivalent tool), transfer removed mastic from floor surfaces to asbestos waste receptor.

3.2.6.4 Should areas of mastic still remain, repeat paragraphs 3.4.2, 3.4.3 and 3.4.4 until all floor mastic has been removed.

3.2.6.5 On completion of removal, mop the floor with a detergent solution.

3.2.7 On completion of work, clean the floor with HEPA vacuum.

3.3 REMOVAL OF ASBESTOS-CONTAINING DRYWALL

3.3.1 Wet the material to be removed with amended water. Use enough water to suppress any dust that may be formed during the material removal, but not so much water as to cause damage.

3.3.2 Remove the material by using a utility knife, hook knife, hand saw, or other hand tool. Do not remove more than one square metre (1 m^2) in any given work area. For work areas where more than 1 m^2 of removal is required, refer to Item 3.4 of Section 02 82 02.

3.3.3 Place removed material directly into asbestos waste receptor.

3.3.4 Clean loose dust from debris from the area of the cut using a HEPA vacuum. Clean any remaining dust from any surfaces where drywall dust may have accumulated (e.g. wall surfaces polyethylene floor covering using HEPA vacuum and/or damp wipe techniques.

3.3.5 Once clean, apply sealant or coating to the cut edge of the remaining material where the cut was performed.

3.3.6 If applicable, replace the removed material with a similar non-asbestos-containing material once the sealant has dried.

3.4 REMOVAL OF ASBESTOS-CONTAINING CEILING TILES

3.4.1 Ensure the polyethylene floor covering is fixed in place and any ladder placed upon it does not rip or puncture it.

3.4.2 Set up equipment on top of the polyethylene floor covering.

3.4.3 Remove ceiling tiles carefully without bending, breaking, or cutting and place directly into asbestos-waste receptor. Remove no more than a total of 7.5 m^2 of tile (up to ten (10) 4'x2' ceiling tiles, or up to twenty (20) 2'x2' ceiling tiles). If more tiles must be removed, removal must be performed as a Type 2 operation (refer to Item 3.7 of Section 02 82 02).

3.5 INSPECTION

3.5.1 From commencement of work until completion of clean-up operations, the Environmental Consultant may be present on a part-time basis; both inside and outside asbestos work area(s).

3.5.2 The following Milestone Inspections are required for all Type 1 asbestos abatement work:

3.5.3 Milestone Inspection A – Clean Site Preparation: Inspection of preparations and set-up prior to contaminated work in the Asbestos Work Area.

3.5.4 Milestone Inspection B – Visual Clearance: Inspection of Asbestos Work Area after removal of all asbestos but prior to application of lock-down agent.

3.5.5 In addition to the Milestone Inspections, inspection of the Asbestos Work Area will be performed to confirm the Asbestos Abatement Contractor's compliance with the requirements of the specification and governing authorities. Any deviations from these requirements, which have not been approved in writing, may result in a stoppage of work, at no additional cost to the Owner.

3.5.6 The Environmental Consultant is empowered by the Owner to inspect adherence to specified procedures and materials, and to inspect for final cleanliness and completion. Additional labour or materials expended by the Asbestos Abatement Contractor to provide satisfactory performance to the level specified should be at no additional cost.

3.5.7 If the Asbestos Work Area is found unacceptable by the standards specified or required by governing authorities, the work required to meet the standards and obtain consent to proceed from the Environmental Consultant, shall be performed at no additional cost to the Owner.

3.5.8 The Environmental Consultant is empowered by the Owner to order a shutdown of work when a leakage of asbestos from the controlled Asbestos Work Area has occurred or is likely to occur. These conditions include, but are not limited to inadequate wetting, failure of the perimeter enclosure, water leaks, etc. Additional labour or materials to rectify these or other unsatisfactory conditions shall be at no cost to the Owner.

3.5.9 Pay cost to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.5.10 Inspection performed as a result of Asbestos Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule shall be back-charged to the Owner.

3.6 WASTE TRANSPORT AND DISPOSAL

3.6.1 Conform to requirements of R.R.O. 1990 Regulation 347, amended to 408/19, made under The Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.

3.6.2 Check with waste handling facility operator to determine the type of waste containers that are acceptable. Ensure waste is stored in a type of container that is deemed acceptable by the waste handling facility.

3.6.3 Ensure shipment of containers to waste handling facility is taken by waste hauler licensed to transport asbestos waste.

3.6.4 Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.

3.6.5 Co operate with Ministry of Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at waste handling facility to maintain environment, at no additional cost to Owner.

3.6.6 Ensure waste handling facility operator is fully aware of hazardous material being deposited.

3.6.7 Ensure that containers used for handling asbestos-containing waste are locked and covered at all times.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Table 2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all known and suspected asbestos-containing materials for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment where asbestos-containing materials may be disturbed, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases that may contain asbestos-containing materials.

1.4.1.2 This Section (02 82 02) only applies to that work for which the disturbance of asbestos-containing materials is classified as a Type 2 operation in accordance with Ontario Regulation 278/05: "*Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations"*, as amended. As such, all work stipulated by this section will be performed by full enclosure method.

1.4.1.3 The work performed may be completed by first completely removing the asbestos-containing material(s) that may be disturbed as an asbestos operation and replacing them with new non-asbestos-containing materials, or by working with the asbestos-containing material following the appropriate asbestos operations as regulated by O. Reg. 278/05.

1.4.1.4 Set up of the Type 2 asbestos abatement enclosures does not require workers to don personal protective equipment (i.e. disposable coveralls and respiratory protection); however, no other work is to be conducted within the area until set-up and site isolation is complete and verified by the Environmental Consultant as adequate.

1.4.1.5 The contractor is solely responsible to obtain and verify all quantities and locations of asbestos-containing materials and satisfy itself that all asbestos-containing materials identified to be removed have been included in their bid. This also includes, but is not limited to, all mechanical insulations, debris, rubble, etc. within rooms, mechanical chases, pipe chases, wall enclosures, etc.

1.4.1.6 Adequately protect and maintain all electrical and mechanical services passing through the asbestos work areas. Refer to Item 3.1.4 for additional details.

1.4.1.7 A potable water source and electrical supply will be provided by the Owner. However, the contactor is responsible to provide the necessary tools, equipment, and professional trades for connections to their respective work areas.

1.4.1.8 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.9 All work will be subject to inspection and air monitoring inside and outside asbestos work areas by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or air monitoring, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.10 Contractor to erect a project health and safety board at each Type 2 location which shall be posted for the duration of the work. Health and safety board to contain contact information, MSDS's, Safety Policy, JHAs, project specifications, project reports, action plans, etc.

1.4.1.11 Ensure all necessary permits for asbestos abatement work, scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.12 Refer to Section 02 82 01, Type 1 Asbestos Abatement, which defines procedures and requirements for working with other non-friable asbestos-containing materials.

1.4.1.13 Refer to Section 02 82 03, Type 3 Asbestos Abatement, which defines procedures and requirements for working with other friable asbestos-containing materials.

1.5 DEFINITIONS

1.5.1 Refer to Item 1.5 of Section 02 82 03.

1.6 REGULATIONS

1.6.1 Refer to Item 1.6 of Section 02 82 03; except:

1.6.1.1 Notification to the Ministry of Labour is not required for Type 2 asbestos abatement.

1.7 SUPERVISION

1.7.1 Refer to Item 1.7 of Section 02 82 03

1.8 QUALITY ASSURANCE

1.8.1 Refer to Item 1.8 of Section 02 82 03

1.9 SUBMITTALS

1.9.1 Refer to Item 1.9 of Section 02 82 03, except:

1.9.1.1 Workers and Supervisors are not required to have MTCU training certificates and therefore these are not to be submitted for the purpose of conducting Type 2 asbestos abatement.

1.10 WORKER AND VISITOR PROTECTION

1.10.1 Before entering asbestos work area(s), instruct workers and visitors in use of respirators, entry and exit from enclosures, and all aspects of work procedures and protective measures. Instruction shall be provided by competent person as defined by Occupational Health and Safety Act.

1.10.2 Provide workers with non-powered, half-face air purifying respirators with minimum replaceable P100 filter cartridges in accordance with NIOSH Part 84 requirements. Provide proper instruction to all workers that utilize respirators in the use, care, and maintenance of respirators. All workers that wear a respirator for their work activities must be fit tested using a quantitative method of fit testing. Replace filter cartridges as necessary, according to manufacturer's instructions. Workers shall not wear facial hair that affects seal between respirator and face. Abatement Contractor to post on the job bulletin board complete personal protective equipment instructions, procedures, and information pertaining to protection for workers and approved visitors.

1.10.3 Provide workers and visitors in full-enclosure sites with full body coveralls with integral hoods. Once coveralls are worn in asbestos work area, treat and dispose of as asbestos contaminated waste. Workers and visitors shall also wear other protective apparel required by Ministry of Labour construction regulations.

1.10.4 Before entering enclosure(s) put on respirator with new or tested filter cartridges, clean coveralls, and head covers. Wear coveralls with hoods up at all times.

1.10.5 When leaving enclosure workers and visitors use HEPA vacuum to clean exterior of respirator to remove visible contamination, and remove gross contamination from coveralls and other protective equipment. Immediately upon leaving the enclosure, workers and visitors shall remove their coveralls and wash their face and hands thoroughly with soap and water, and wet clean the inside of their respirator. Remove filter cartridges and dispose of or test filters according to manufacturer's specifications. Place coveralls and used filter cartridges in receptacles for disposal with other asbestos contaminated materials. Coveralls can be reused, to maximum of 8 hours wear, if coveralls remain inside work area. If filters are tested and will be reused, seal the filters to prevent release of fibres.

1.10.6 Provide, and insist on using, facilities for washing of hands and face by every worker and visitor when leaving asbestos work area. Prohibit smoking, eating, and drinking in asbestos work area(s).

1.10.7 Compressed air shall not be used to clean-up or remove dust from any surface.

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **Amended Water**: Water with non-ionic water wetting agent added.

2.1.2 **Asbestos Waste Receptors:** Two (2) separate containers of which one shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or metal or fibre drum or wood box. Other container shall be adequate to prevent perforating rips or tears in first container during filling, transport or disposal. Containers must be acceptable to disposal site selected and Ministry of Environment. Containers shall be labelled in accordance with Ministry of Environment regulations.

2.1.3 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.

2.1.4 **HEPA Vacuum:** Refer to Item 1.5 of Section 02 82 03. Vacuum with all necessary fittings, tools and attachments. Air must pass HEPA filter before discharge.

2.1.5 **Lock-Down Agent**: Pre-mixed solution of slow-drying adhesive/sealing treatment for microscopic residual asbestos fibres present after the removal of asbestos-containing material.

2.1.6 **Polyethylene Sheeting:** 0.15 mm (6mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.

2.1.7 **Power Drill Exhaust Attachment**: Properly designed exhaust attachment for a power drill with a connecting hose to a HEPA filtered vacuum unit. The attachment system must effectively control and capture dust during drilling operation.

2.1.8 **Sprayer:** Garden-type portable air-less manual sprayer, low velocity, capable of producing mist or fine spray.

2.1.9 **Tape:** Tape suitable for sealing polyethylene to surfaces under both wet conditions using amended water and under dry conditions.

3 PART 3 - EXECUTION

3.1 FULL ENCLOSURE ASBESTOS WORK AREA(S)

3.1.1 Perform a visual survey of the area where to the enclosure will be erected. Record all pre-existing damage to building materials in the work area and save the record.

3.1.2 Move contents, equipment, tools, and stored materials which can be moved without disturbing asbestos-containing materials.

3.1.3 Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Provide ground fault electrical system where application of amended water is required for wetting asbestos-containing materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.4 Arrange to disable the air handling and ventilation systems supplying or exhausting from asbestos work area enclosure(s), as required. Isolate the ventilation system by sealing all vent openings with polyethylene. Ensure air-handling systems remain disabled for duration of asbestos abatement work.

3.1.5 Erect wood or metal framing between asbestos work area and remaining building area, as necessary to support polyethylene sheeting enclosures. Where enclosures are not sealed to the deck, they shall have completely sealed polyethylene top.

3.1.6 Use sufficient layers to provide adequate protection. Protect floors with at least 1 layer of polyethylene sheeting (where flooring isn’t scheduled to be removed). Where walls are protected with sheeting, cover floors first so that wall polyethylene overlaps floor layer by at least 300 mm (12").

3.1.7 Where applicable clean previously contaminated surfaces with HEPA vacuum before covering with sheeting.

3.1.8 The entrance to the enclosure shall have either a zippered doorway or a curtained doorway (see Item 1.5.8. of Section 02 82 03). A zippered doorway shall have a flap on the high-pressure side of the doorway that is weighted at the bottom. If enclosure is used for more than 1 shift, construct airlock for entry to and exit from enclosure. Clean enclosure prior to exiting at completion of each shift.

3.1.9 Provide soap, water, and clean towels for washing of worker's face and hands when exiting enclosure.

3.1.10 Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.

3.1.11 Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Do not disrupt power supply to remainder of building.

3.2 MAINTENANCE OF ENCLOSURES

3.2.1 Maintain enclosures in tidy condition.

3.2.2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

3.2.3 Visually inspect enclosures at beginning and end of each working period.

3.3 COMMENCE ASBESTOS REMOVAL OR CLEAN-UP WORK WHEN

3.3.1 Arrangements have been made for disposal of waste.

3.3.2 Asbestos work areas enclosures and parts of building required to remain in use are effectively segregated.

3.3.3 Tools, equipment, materials, and waste receptors are inside enclosure.

3.3.4 Arrangements have been made for work area security.

3.3.5 Signs are displayed in all areas where access to sealed asbestos work areas is possible. Signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear Assigned Protective Equipment
Breathing asbestos dust may cause serious bodily harm

3.3.6 Environmental Consultant has been notified of intention to proceed and has reviewed enclosures and equipment.

3.4 DISTURBANCE OF ASBESTOS-CONTAINING GREATER THAN 1 M^2 OF DRYWALL OR PLASTER

3.4.1 Before commencing work, prepare Site as described in Items 3.1, 3.2 and 3.3.

3.4.2 Perform work required inside enclosure. Trades personnel may enter enclosure to perform Type 2 operations under the guidance of competent worker. All workers entering the Type 2 enclosure shall don PPE. Work may include removal of asbestos-containing drywall or plaster, or installation of JVN component onto asbestos-containing drywall or plaster.

3.4.3 Spray asbestos-containing material with amended water prior to and during work. Saturate asbestos (where possible) to prevent release of airborne fibres during removal. Immediately place asbestos waste directly into waste containers and do not allow waste materials to accumulate on work area surfaces.

3.4.4 Perform enclosure cleaning as per Item 3.10.

3.5 REMOVAL OF ASBESTOS-CONTAINING HARD STIPPLE (TEXTURE) COAT FINISHES

3.5.1 Before commencing work, prepare Site as described in Items 3.1, 3.2 and 3.3.

3.5.2 Workers performing removal of overhead material must wear full-face air purifying respirators and meet all other requirements of Item 1.10.2.

3.5.3 Adequately wet the stipple / texture coat finish with amended water before and during removal.

3.5.4 Perform removal of the material using non-powered hand tools, or using powered tools equipped with a HEPA-filtered dust collection system that has been DOP/PAO tested to verify efficiency.

3.5.5 Frequently and at regular intervals, clean all materials that have fallen to the floor using a HEPA vacuum. Do not allow material to accumulate. Do not step on and therefore crush, crumble, or pulverize the material.

3.5.6 Perform enclosure cleaning as per Item 3.10.

3.6 REMOVAL OF ASBESTOS-CONTAINING VINYL SHEET FLOORING (PAPER BACKING)

3.6.1 Before commencing work, prepare Site as described in Items 3.1, 3.2 and 3.3.

3.6.2 Use a utility knife to cut vinyl sheet flooring to the size and shape required for removal, or if removing a large area, cut into strips for ease of removal.

3.6.3 Select a section of flooring to remove and wedge a utility knife, chisel, scraper, or pry-bar along one edge of the selected piece. Ensure the tool is inserted beneath all layers of the flooring (vinyl and backing layers). Lift vinyl sheet floor finish, pulling away from the floor beneath and apply amended water to the asbestos-containing backing material as it becomes accessible.

3.6.4 If the flooring is secured by staples or other fasteners, remove the fasteners as the floor is removed by using an appropriate hand tool, such as a chisel, pry-bar, or screwdriver.

3.6.5 If the flooring is secured by mastic, use a hand scraper as the floor is removed to separate the sheet floor from the underlying material while wetting the areas to be scraped with amended water.

3.6.6 As the flooring is removed, place it directly in an asbestos waste container.

3.6.7 Following removal of the flooring material, inspect the floor surface for remaining vinyl sheet floor backing material. Wet remaining material with amended water and scrape away from the floor using a hand scraper. A chemical mastic thinning agent may be required to aid in separating backing material from the underlying floor.

3.6.8 Work is only complete once all asbestos-containing backing material (and mastic if applicable) is removed from the floor.

3.6.9 Perform enclosure cleaning as per Item 3.10.

3.7 REMOVAL OF GREATER THAN 7.5 M^2 OF ASBESTOS-CONTAINING CEILING TILES

3.7.1 Before commencing work, prepare Site as described in Items 3.1, 3.2 and 3.3. The enclosure may be fastened and sealed to the t-bar false ceiling system rather than the deck. An upper seal from the t-bar ceiling system to the deck is not required.

3.7.2 Workers performing removal of ceiling tiles where it is anticipated that asbestos-containing material debris may be lying on top of the tiles must wear full-face air purifying respirators and meet all other requirements of Item 1.10.2.

3.7.3 Ensure the polyethylene floor covering is fixed in place and any ladder placed upon it does not rip or puncture it.

3.7.4 Set up equipment on top of the polyethylene floor covering.

3.7.5 Remove ceiling tiles carefully and do not allow tiles to fall to the floor. Minimize bending, breaking, or cutting ceiling tiles unless wetted thoroughly with amended water. Place directly into asbestos-waste receptor.

3.7.6 Perform enclosure cleaning as per Item 3.10.

3.8 REMOVAL OF LESS THAN 1 M^2 OF FRIABLE ASBESTOS-CONTAINING MATERIALS

3.8.1 Before commencing work, prepare Site as described in Items 3.1, 3.2 and 3.3.

3.8.2 If possible, wet the material using amended water to control the spread of dust and fibres.

3.8.3 If possible, fix asbestos waste container beneath the area to be disturbed in order to catch removed material as it falls.

3.8.4 Perform work, as required.

3.8.5 Following removal, seal cut edges of asbestos-containing material using a durable sealant material, such as canvas and lagging or a thick coating of paint, to prevent the release of fibres.

3.8.6 Perform enclosure cleaning as per Item 3.10.

3.9 DISTURBANCE OF ASBESTOS-CONTAINING MATERIAL USING POWER TOOLS EQUPED WITH A HEPA-FILTERED DUST COLLECTION DEVICE

3.9.1 Before commencing work, prepare Site as described in Items 3.1, 3.2 and 3.3.

3.9.2 If possible, wet the material using amended water to control the spread of dust and fibres.

3.9.3 Inspect the HEPA-filtered dust collection system and ensure it is attached and affixed correctly. Provide proof that the HEPA-filtered dust collection system / device is DOP tested on site prior to use and meets the minimum required efficiency rating.

3.9.4 Engage the vacuum system on the dust collection equipment, as applicable.

3.9.5 Place the tool at the ready and activate the tool at the slowest setting. Commence cutting, drilling, grinding, etc. slowly and inspect the work to ensure that the dust collection system is capturing all dust, shavings, particulate, etc. as intended.

3.9.6 If the dust collection system is performing correctly, adjust the speed of the tool to the appropriate setting and continue with the work as normal. Continually monitor the efficiency of the dust collection system and adjust the work as necessary to ensure that all particulate is being captured.

3.9.7 If damaged asbestos-containing material remains present following the work, seal cut edges of asbestos-containing material using a durable sealant material, such as canvas and lagging or a thick coating of paint, to prevent the release of fibres.

3.9.8 Perform enclosure cleaning as per Item 3.10.

3.10 ENCLOSURE CLEANING FOLLOWING WORK PROCEDURES

3.10.1 Treat all materials that were removed as asbestos contaminated waste and dispose of as such. Treat used polyethylene sheeting that is not a component of the enclosure as asbestos-containing waste and dispose of as such.

3.10.2 Following completion of work, clean surfaces from which asbestos has been disturbed with HEPA vacuum, or wet-sponge if appropriate to remove all visible material.

3.10.3 Carefully place asbestos waste in inner bag of asbestos waste receptor. Clean inner bag surface of gross contamination and place in clean 6 mil outer bag. If waste is likely to tear inner bag, then instead of outer bag use fibreglass or metal drum, cardboard or wood box, or other suitably sturdy container. In such a case, label the outer container appropriately.

3.10.4 Remove all visible dust and debris from all horizontal and vertical surfaces, equipment, tools, etc. within the enclosure by wiping with a damp cloth or sponge, and/or vacuuming with a HEPA-filtered vacuum cleaner. Following removal of gross dust, carefully wipe the entire interior surface of the enclosure with a damp cloth or sponge methodically, using a top-down approach, followed by an additional cleaning with a HEPA-filtered vacuum. Finally, apply a coat of sealer to all surfaces from which asbestos has been disturbed. Apply thinned coat (sufficient to coat all surfaces) to interior of polyethylene enclosure prior to tear down. If new equipment has been installed, ensure the equipment is covered with polyethylene and protected from sealer.

3.11 TEAR DOWN OF PROTECTION

3.11.1 When dismantling enclosure, carefully roll polyethylene toward centre of enclosure. As polyethylene is rolled away, immediately remove any visible debris with HEPA vacuum.

3.11.2 Place polyethylene sheeting seals, tape, cleaning material, coveralls, and other contaminated waste in asbestos waste receptors for transport. Remove any debris fallen behind plastic with HEPA vacuum.

3.11.3 Clean-up asbestos waste receptors and equipment used in work, and remove from asbestos work area(s) via drum and equipment decontamination enclosure systems, at appropriate time in sequence. Double bag waste immediately prior to transport from site to disposal bin.

3.11.4 Final review may be carried out by the Environmental Consultant to ensure no dust or debris remains.

3.11.5 At completion of work make good all damage not identified in pre-removal survey.

3.12 INSPECTION

3.12.1 From commencement of work until completion of clean-up operations, the Environmental Consultant may be present on a part-time basis; both inside and outside asbestos work area(s).

3.12.2 The following Milestone Inspections are required for all Type 2 asbestos abatement work:

- **Milestone Inspection A** – Clean Site Preparation: Inspection of preparations and set-up prior to contaminated work in the Asbestos Work Area.
- **Milestone Inspection B** – Visual Clearance: Inspection of Asbestos Work Area after removal of all asbestos but prior to application of lock-down agent.

3.12.3 In addition to the Milestone Inspections, inspection of the Asbestos Work Area will be performed to confirm the Asbestos Abatement Contractor's compliance with the requirements of the specification and governing authorities. Any deviations from these requirements, which have not been approved in writing, may result in a stoppage of work, at no additional cost to the Owner.

3.12.4 The Environmental Consultant is empowered by the Owner to inspect adherence to specified procedures and materials, and to inspect for final cleanliness and completion. Additional labour or materials expended by the Asbestos Abatement Contractor to provide satisfactory performance to the level specified should be at no additional cost.

3.12.5 If the Asbestos Work Area is found unacceptable by the standards specified or required by governing authorities, the work required to meet the standards and obtain consent to proceed from the Environmental Consultant, shall be performed at no additional cost to the Owner.

3.12.6 The Environmental Consultant is empowered by the Owner to order a shutdown of work when a leakage of asbestos from the controlled Asbestos Work Area has occurred or is likely to occur. These conditions include, but are not limited to inadequate wetting, failure of the perimeter enclosure, water leaks, etc. Additional labour or materials to rectify these or other unsatisfactory conditions shall be at no cost to the Owner.

3.12.7 Pay cost to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.12.8 Inspection performed as a result of Asbestos Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule shall be back-charged to the Owner.

3.13 WASTE TRANSPORT AND DISPOSAL

3.13.1 Conform to requirements of R.R.O. 1990 Regulation 347, amended to 408/19, made under The Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.

3.13.2 Check with waste handling facility operator to determine the type of waste containers that are acceptable. Ensure waste is stored in a type of container that is deemed acceptable by the waste handling facility.

3.13.3 Ensure shipment of containers to waste handling facility is taken by waste hauler licensed to transport asbestos waste.

3.13.4 Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.

3.13.5 Co operate with Ministry of Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at waste handling facility to maintain environment, at no additional cost to Owner.

3.13.6 Ensure waste handling facility operator is fully aware of hazardous material being deposited.

3.13.7 Ensure that containers used for handling asbestos-containing waste are locked and covered at all times.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited draft report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Table 2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all known and suspected asbestos-containing materials for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment where asbestos-containing materials may be disturbed, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases that may contain asbestos-containing materials.

1.4.1.2 This Section (02 82 03) only applies to that work for which the disturbance of asbestos-containing materials is classified as a Type 3 operation in accordance with Ontario Regulation 278/05: "*Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations"*, as amended. As such, all work stipulated by this section will be performed by full enclosure method.

1.4.1.3 The work performed may be completed by first completely removing the asbestos-containing material(s) that may be disturbed as an asbestos operation and replacing them with new non-asbestos-containing materials, or by working with the asbestos-containing material following the appropriate asbestos operations as regulated by O. Reg. 278/05.

1.4.1.4 Set up of the Type 3 asbestos abatement enclosures does not require workers to don personal protective equipment (i.e. disposable coveralls and respiratory protection); however, no other work is to be conducted within the area until set-up and site isolation is complete and verified by the Environmental Consultant as adequate.

1.4.1.5 If the area of the building where asbestos abatement is taking place is uncontrolled, install a hoarding on the outside of the polyethylene wall using rigid material such as plywood, drywall, or rigid corrugated plastic sheets (plasticore), wherever the perimeter of the enclosure is not an existing wall. Install a self-closing, lockable door on the entrance to the enclosure.

1.4.1.6 The contractor is solely responsible to obtain and verify all quantities and locations of asbestos-containing materials and satisfy itself that all asbestos-containing materials identified to be removed have been included in their bid. This also includes, but is not limited to, all mechanical insulations, debris, rubble, etc. within rooms, mechanical chases, pipe chases, wall enclosures, etc.

1.4.1.7 Adequately protect and maintain all electrical and mechanical services passing through the asbestos work areas. Refer to Item 3.1.4.

1.4.1.8 A potable water source and electrical supply will be provided by the Owner. However, the contactor is responsible to provide the necessary tools, equipment, and professional trades for connections to their respective work areas.

1.4.1.9 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.10 All work will be subject to inspection and air monitoring inside and outside asbestos work areas by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or air monitoring, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.11 Contractor to erect a project health and safety board at each Type 3 location which shall be posted for the duration of the work. Health and safety board to contain contact information, MSDS’s, Safety Policy, JHAs, project specifications, project reports, action plans, etc.

1.4.1.12 Ensure all necessary permits for asbestos abatement work, scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.13 Refer to Section 02 82 01, Type 1 Asbestos Abatement, which defines procedures and requirements for working with other non-friable asbestos-containing materials.

1.4.1.14 Refer to Section 02 82 02, Type 2 Asbestos Abatement, which defines procedures and requirements for working with other friable asbestos-containing materials.

1.5 DEFINITIONS

1.5.1 **Abatement Contractor**: Specialized sub-contractor to the General Contractor of the contract who is responsible for abatement and remediation of designated substances and other hazardous materials.

1.5.2 **Air Lock**: Temporary chamber sealed with polyethylene sheeting; curtained doorways constructed at either end with a minimum of 6 feet (2.0 metres) separation; minimum width is 36 inches (900 mm).

1.5.3 **Amended Water**: Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.

1.5.4 **Asbestos-Containing Material (ACM)**: Material identified under Site Conditions, overspray, fallen material, and settled dust.

1.5.5 **Asbestos Waste Container**: An impermeable container acceptable to the disposal site and MOE. New Materials Only. Labelled as required by the MOL. Comprised of one of the following:

- A 6 mil (0.15 mm) sealed polyethylene bag, inside a second 6 mil (0.15 mm) sealed polyethylene bag.
- A 6 mil (0.15 mm) sealed polyethylene bag, positioned inside or outside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation and disposal.
- A sealed Glove Bag, inside a 6 mil (0.15 mm) sealed polyethylene bag.
- A sealed Glove Bag, inside a rigid sealed container of sufficient strength to prevent perforation of the container during filling, transportation, and disposal.

1.5.6 **Asbestos Work Area**: Area where work takes place, which will, or may, disturb ACM.

1.5.7 **Authorized Visitors**: Owner's Environmental Consultant or person(s) representing regulatory agencies, and person(s) authorized by them.

1.5.8 **Curtained Doorway:** Device to allow ingress or egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing 2 overlapping sheets of polyethylene sheeting (2 sheets of polyethylene sheeting per flap) attached to head and one jamb of existing or temporarily constructed door frame. Secure vertical edge of 1 flap along 1 vertical side of doorframe and vertical edge of other flap along opposite vertical side of doorframe. Reinforce free edges of polyethylene sheeting with duct tape.

1.5.9 **Damp-Wiping**: A cleaning process for removing residual asbestos contamination using damp cloths, sponges, or mops.

1.5.10 **DOP/PAO Test**: A testing method used to determine the integrity of the HEPA filters, particularly the Negative Pressure Unit, using dioctyl phthalate (DOP) or Poly Alfa Olefin (PAO) HEPA filter leak test. **For this project, provide documentation that negative air units have been DOP/PAO tested within the last thirty days**.

1.5.11 **Environmental Consultant**: Third party inspection agency hired by the Owner.

1.5.12 **Fitting**: Any elbow, valve, tee, reduction, etc. that is present on a pipe system.

1.5.13 **Friable Material**: Material that when dry can be crumbled, pulverized, or powdered by hand pressure and includes material that is crumbled, pulverized or powdered.

1.5.14 **HEPA Filter**: High Efficiency Particulate Aerosol filter that is at least 99.97 percent efficient in collecting a 0.3 micrometer aerosol.

1.5.15 **HEPA Vacuum**: A vacuum device fitted with a 99.97% (0.3 micrometer) high efficiency particulate aerosol filter removal system that is constructed in such a way that all air passing through the vacuum must pass through the filter, without bypass or leakage, before being discharged.

1.5.16 **Mechanical Contractor**: means a contractor whose services are unlimited in the execution of contracts requiring the experience, knowledge, and skill to install, maintain, repair, fabricate, alter, extend, or design, if not prohibited by law, central air-conditioning, refrigeration, heating, and ventilating systems.

1.5.17 **Mechanical Systems**: Components that make up a building's plumbing, heating, ventilation, or process systems including but not limited to piping, fittings, vessels, pumps, tanks, ducts, air-handling units, processing equipment, etc.

1.5.18 **Milestone Inspection**: Inspection of the Asbestos Work Area at defined point in the removal operation.

1.5.19 **Negative Air Unit**: Portable air handling system, which extracts air directly from asbestos work area and discharges air outside building or within the building at the approval of the Owner, Consultant, and Environmental Consultant. Unit shall be fitted with a changeable pre-filter and a HEPA filter. The unit shall be leak-proof so that air must pass through the HEPA filter before discharge. The unit shall have a pressure differential gauge to monitor filter loading. The unit shall have an auto shut-off feature and a warning system for HEPA filter failure. The HEPA filter shall have separate hold down clamps to retain filter(s) in place. Also called a Construction Air Handling Unit (CAHU).

1.5.20 **Negative Pressure**: Reduced pressure within asbestos work area(s) established by extracting air directly from work area, and discharging it directly to exterior of building. Discharged air first passes through HEPA filter. Extract sufficient air to ensure constant reduced pressure at perimeter of work area with respect to surrounding areas. Negative pressure to be maintained at -0.02 inches of water and measured with a device at regular intervals.

1.5.21 **Negative Pressure Device:** Contractor to supply and install electronic Negative Pressure Recorder complete with digital print out for precise real time monitoring of negative pressure levels. Standard of acceptance – Omniguard III by Engineering Solutions Inc., or equivalent.

1.5.22 **NIOSH:** National Institute for Occupational Safety and Health. United States federal agency responsible for conducting research and making recommendations for the prevention of work-related injury and illness.

1.5.23 **Non-Friable Material:** Material that when dry cannot be crumbled, pulverized, or powdered by hand pressure. Includes, but not limited to, following asbestos-containing products: vinyl asbestos floor tiles, resilient sheet flooring, mastics and glues, caulking, acoustic ceiling and wall tiles, gaskets, seals, packings, friction products, drywall joint compounds, and asbestos cement panels, shingles and piping.

1.5.24 **Occupied Area**: Any area of the building outside the Asbestos Work Area.

1.5.25 **Overall Asbestos Superintendent**: Abatement Contractor supervisory personnel who holds a recognised certificate of required training and have the required experience to supervise Abatement Contractor work force with authority to oversee all aspects of the work.

1.5.26 **Owner**: The Owner is the Ministry of the Attorney General (MAG) and their appointed representatives.

1.5.27 **Personnel**: All Contractors' employees, subcontractors' employees, supervisors, and authorized visitors.

1.5.28 **Polyethylene**: Either polyethylene sheeting or rip-proof polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape along edges around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from water damage or damage by lock-down agents, and to prevent escape of asbestos fibres through sheeting into Occupied Areas.

1.5.29 **Shift Superintendent**: Abatement Contractor supervisory personnel who holds a recognised certificate of required training and has the required experience to supervise Abatement Contractor work force for each work shift and someone who has authority regarding all aspects related to manpower, equipment, and production.

1.5.30 **Type 3 Operation**: means an operation as described in subsection 12(4), O. Reg. 278/05.

1.6 REGULATIONS

1.6.1 Comply with Ontario Regulation 278/05, "*Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations*" made under the Occupational Health and Safety Act, and local requirements pertaining to asbestos, provided that in case of conflict with these Specifications, the most stringent requirements shall apply.

1.6.2 Handle and dispose of contaminated waste as required under R.R.O. 1990 Regulation 347, as amended by O. Reg. 408/19, "*General - Waste Management*" made under the Environmental Protection Act.

1.6.3 Notify orally and in writing an inspector at the office of the Ontario Ministry of Labour nearest the workplace of the operation.

1.6.4 Notify sanitary landfill site in accordance with requirements of Regulation 347.

1.6.5 Contractor shall ensure that:

1.6.5.1 Measures and procedures prescribed under the Occupational Health & Safety Act and regulations are carried out.

1.6.5.2 Every employee and every worker on project complies with applicable acts and regulations.

1.6.5.3 Health & safety of workers and public is protected.

1.6.5.4 All material handling and associated equipment conform to and are operated in accordance with R.R.O. 1990, Regulation 860 "*Workplace Hazardous Materials Information System (WHMIS)*", as amended to 3/19.

1.6.5.5 Advise the Owner whenever work is expected to be hazardous to employees and/or public.

1.6.6 Contractor may be requested to provide information on their health & safety record.

1.7 SUPERVISION

1.7.1 Provide onsite, an Overall Asbestos Superintendent, with authority to oversee all aspects of the work, including but not limited to, estimating and negotiation of changes to the contract, update of submission requirements, scheduling, manpower and equipment requirements, and direct communication and coordination with project representatives and/or the Environmental Consultant.

1.7.2 Provide onsite, in addition to the Overall Asbestos Superintendent, and for each work shift, a Shift Superintendent who has authority regarding all aspects related to manpower, equipment, and production.

1.7.3 Supervisory personnel must hold a recognised certificate proving attendance at an asbestos removal training course (two-day minimum duration) acceptable to the Owner and have supervised a minimum of 5 other asbestos abatement/demolition projects in similar size and/or complexity.

1.7.4 The Overall Asbestos Superintendent or the Shift Superintendent must be on site at all times during work that is at risk of disturbing ACM. Failure to comply with this requirement will result in a stoppage of all work, at no cost to the Owner.

1.7.5 Replace supervisory personnel with approved replacements within three (3) working days of a written request from the Owner. The Owner reserves the right to request replacement of supervisory personnel without explanation.

1.7.6 Asbestos Abatement Contractor cannot replace supervisory personnel without written approval from the Owner.

1.8 QUALITY ASSURANCE

1.8.1 Ensure work proceeds to schedule, and meets all requirements of this Section. Perform work so that airborne asbestos, asbestos waste, or water runoff do not contaminate areas outside the asbestos work area. The Environmental Consultant is empowered to order a shutdown of work when a leak or breech of isolation has occurred or is likely to occur.

1.8.2 Pay cost to the Owner of inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or schedule.

1.8.3 Use only skilled and qualified workers for all trades required for this work.

1.8.4 All work of this section involving electrical, mechanical, carpentry, glazing, etc. shall be performed by licensed persons experienced and qualified for the work required.

1.8.5 The Owner, Consultant, and the Environmental Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs required for the work in accordance with the applicable construction safety legislation, other regulations or general construction practice. The Owner or the Environmental Consultant will not be responsible for or have control or charge over the acts or omissions of the Asbestos Abatement Contractor, his Subcontractors or their agents, employees, or other persons performing any of the work.

1.9 SUBMITTALS

1.9.1 Laws of province of Ontario shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, duties as may be required. Likewise, it is responsibility of contractor to comply with Workers Safety and Insurance Board and Occupational Health and Safety Act.

1.9.2 Prior to Commencing Work:

1.9.2.1 Submit a site-specific health and safety plan pertaining to the planned work and site activities.

1.9.2.2 Names and credentials of the:

- Overall Asbestos Abatement Superintendent.
- Shift Superintendents.
- Workers.

1.9.2.3 Proof in the form of a certificate that all workers have accreditation in accordance with the Ministry of Training, Colleges and Universities (MTCU) Asbestos Worker 253W program and supervisors to provide proof of MTCU Asbestos Supervisor 253S Program.

1.9.2.4 Proof with references that the Overall Asbestos Superintendent has performed supervisory function on at least five (5) other asbestos removal projects.

1.9.2.5 Submit list of existing damage for acceptance by Owner.

1.9.2.6 Proof that workers have received WHMIS training.

1.9.2.7 Worker's Compensation Board status and transcription of insurance.

1.9.2.8 Documentation including test results, fire and flammability data, and Safety Data Sheets for chemicals or materials used in the course of the project including but not limited to:

- Sealing Agent (Encapsulant).
- Wetting Agent.
- Lock-down agent.
- Rip-proof polyethylene.
- Other chemicals or materials proposed for use in the course of the asbestos abatement project.

1.9.2.9 Certificate proving that each worker on site has been fit tested for the respirator appropriate for the work being performed.

1.9.2.10 Ministry of Labour Notice of Project forms for each separate Type 3 work area.

1.9.2.11 Proposed schedule for each phase of the work providing the following for each separate Asbestos Work Area:

- Duration of abatement work in each Asbestos Work Area.
- Proposed average daily work force.
- Milestone inspection dates.

1.9.2.12 Shop drawings for each Asbestos Work Area detailing the following:

- Waste and worker decontamination facilities.
- Any proposed deviation from specifications, procedures, or drawings.
- Hoarding and details to be submitted to The Owner or its designated representative for approval prior to commencing work.
- Installation of negative air discharge panels.

1.9.2.13 Submit to The Owner or its designated representative in writing any changes from the initial schedule during the progression of the work.

1.9.2.14 At completion of work, submit:

- Completed shipping and landfill waybill documents containing the information outlined in the Transportation of Dangerous Goods Act for each shipment of asbestos waste leaving the work site.
- Waste Manifests as applicable.
- Proof that Form 1 – Asbestos Work Reports as per Regulation has been completed and submitted to the Ministry of Labour at least once in each twelve-month period for each worker who worked in a Type 3 operation.

1.10 WORKER AND VISITOR PROTECTION

1.10.1 **Instructions:** Before entering any asbestos work area instruct workers and visitors in the use of respirators, dress, showers, entry and exit from asbestos work areas, and all aspects of work procedures and protective measures. Instruction shall also include training in hazards of asbestos exposure and be provided by a Competent Person as defined by Occupational Health and Safety Act.

1.10.2 **Full Face Respirator:** During wet removal and clean-up in enclosed asbestos work area workers, supervisors, and authorized visitors shall be supplied with and use air-purifying full-face respirator (APR) with N-100, R-100, or P-100 filters as noted in Table 2 of Ontario Regulation 278/05. Replace filters daily or test according to manufacturer's specifications and replace as indicated. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour. Provide proper instruction to workers and visitors in the use of respirators, cleaning, inspection, and storage and ensure all personnel and visitors are fit-tested using quantitative techniques. Maintain respiratory protection equipment in proper functioning and clean condition.

1.10.3 **Protective Clothing**: Provide workers and visitors in full-enclosure sites with full body coveralls with integral hoods. Once coveralls are worn in asbestos work area, dispose of as contaminated waste. Workers and visitors shall wear other protective apparel required by Ministry of Labour regulations, including but not limited to: hard hats, safety shoes, and hearing protection.

1.10.4 Before entering asbestos work area(s) remove street clothes in clean change room and put on respirator with new or tested filters, clean coveralls and head covers before entering equipment and access areas or asbestos work area. Store street clothes, uncontaminated footwear, towels, etc. in clean change room.

1.10.5 Persons leaving asbestos work area(s) shall remove gross contamination from clothing before leaving asbestos work area. Proceed to equipment and access area and remove all clothing except respirator. Place contaminated work suit in receptacles for disposal with other asbestos contaminated materials. Footwear, clothing, hardhats, protective eyewear, etc., shall be left in equipment and access area to dry for later use. Still wearing respirator, proceed naked to showers. Clean respirator to ensure that visible contamination is removed. After having thoroughly washed hair and body with shampoo and soap, remove respirator. Remove filters and dispose of in container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Wet clean inside of respirator. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean before removing from equipment and access area, or carry in sealed plastic bag to next site.

1.10.6 Following showering, proceed to clean change room, dry off, and dress in street clothes. Store respirators in such a fashion as to allow them to be put on prior to entering asbestos work area at the start of the next shift without contaminating the clean area. If re-entry to asbestos work area is to take place after having left for eating or drinking, follow procedures in item 1.10.4.

1.10.7 Removal of waste and equipment from the holding room of waste decontamination enclosure system shall be performed by workers entering from outside. These workers shall wear clean coveralls and half-face, asbestos approved, respirator as specified in item 1.10.2 and 1.10.3. No worker shall use this system as means to leave or enter asbestos work area.

1.10.8 Do not eat, drink, smoke, or chew gum or tobacco except in established locations outside the Asbestos Work Area.

1.10.9 Workers and visitors shall be fully protected as specified herein when possibility of disturbance of asbestos exists.

1.10.10 Compressed air shall not be used to clean-up or remove dust from any surface.

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **Amended Water**: Water with wetting agent added.

2.1.2 **Asbestos Waste Receptors**: Two separate containers of which 1 shall consist of 0.15 mm **(true 6 mil)** minimum thickness sealable polyethylene bag. Other container may be 0.15 mm **(true 6 mil)** minimum thickness polyethylene bag. Outer container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. Containers must be acceptable to disposal site selected, and the Ministry of Environment, and shall be clearly marked to indicate that contents contain asbestos.

2.1.3 **Encapsulant**: Standard of acceptance - Ocean No. 666, Ocean Fire Retardants Inc., or equivalent, coloured bright red

2.1.4 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch

2.1.5 **HEPA Vacuum:** See Item 1.5, above. Vacuum to have all necessary fittings, tools, and attachments.

2.1.6 **Polyethylene**: 0.15 mm (6 mil) minimum thickness unless otherwise specified.

2.1.7 **Power Sprayer**: Standard of acceptance - Graco Maxi-wetter, or equivalent.

2.1.8 **Rip-Proof Polyethylene**: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil).

2.1.9 **Sealer**: Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry: Standard of acceptance - TC-55 (clear), A/D Fire Protection Systems Inc., Scarborough, Ontario, or equivalent. For mechanical equipment, piping and boilers, etc. use high temperature sealer only: Standard of acceptance - Chil-Abate CP210, Childers Products Company, or equivalent.

2.1.10 **Tape**: Tape suitable for sealing polyethylene to surface encountered, under both dry conditions and wet conditions using amended water.

2.1.11 **Wetting Agent**: Non-foaming surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre: Standard of Acceptance, Asbesto-Wet, distributed by Asbetec Distributors, or equivalent.

2.1.12 **Protective Coveralls**: Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark.

2.1.13 **Flexible ducting**: Metal reinforced flexible ductwork, 12" diameter minimum.

2.1.14 **Negative Air Unit**: See Item 1.5. Unit shall be fitted with prefilter and HEPA final filter. Air shall pass HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place.

3 PART 3 - EXECUTION

3.1 FULL-ENCLOSURE ASBESTOS WORK AREA(S).

3.1.1 The Contractor is responsible to move all equipment, tools, furnishings, and stored materials without disturbing asbestos-containing materials.

3.1.2 Deactivate air handling and ventilation systems supplying or exhausting from asbestos work area(s). Schedule this shut-down with the Owner’s site representatives as applicable.

3.1.3 All wall and horizontal surfaces shall be pre-cleaned using damp cloth or sponge techniques prior to placement of polyethylene sheeting to any wall or floor surfaces. HEPA equipped vacuum cleaners may also be used to perform this task.

3.1.4 If ductwork passes through the work area and services other areas of the building, and those areas require that the ventilation remain active, a Mechanical Contractor shall verify, in writing, that all ductwork within the enclosed work area is sealed, with no air leakage through seams, joints, cracks, or damage. If ductwork is not airtight, the Mechanical Contractor shall caulk and seal ducts and duct shafts to remain in service to make airtight, then verify it in writing. Cut and cap all supply ducts that service the work area with rigid sheet metal caps and seal with caulk or other sealant compound.

3.1.5 Seal off openings such as doorways, windows, vents, service holes in walls, and grilles to non-operating ducts with polyethylene sheeting with tape or with polyurethane foam as appropriate.

3.1.6 Cover wall and floor surfaces with polyethylene sheeting sealed with tape (except where concrete block walls make up the extent of the work area and can be adequately cleaned at the completion of abatement). Provide two (2) separately sealed layers of reinforced polyethylene sheeting. Separately seal floor drains or openings. Use sufficient layers (2) and necessary sheathing for walking surface to protect floors that can be damaged over the course of the work. Cover floors first so that polyethylene extends at least 300 mm (12") up walls, then cover walls to overlap floor sheeting. Provide additional protection for floors likely to be damaged by amended water, by covering floor with rip-proof polyethylene sheeting sealed with tape.

3.1.7 Cover with polyethylene sheeting, motors, heating units, fire apparatus, door closers, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings which are not being removed from asbestos work area and which could be damaged and/or which cannot be readily cleaned at completion of this work. Pre-clean surfaces potentially contaminated with asbestos, with HEPA vacuum or damp cloth prior to installing protection.

3.1.8 Install plywood enclosures, covered with rip-proof polyethylene sheeting to protect equipment or fixtures in asbestos work area(s) that may become damaged.

3.1.9 If the area of the building where asbestos abatement is taking place is uncontrolled, install a hoarding on the outside of the polyethylene wall using rigid material such as plywood, drywall, or rigid corrugated plastic sheets (plasticore), wherever the perimeter of the enclosure is not an existing wall. Install a self-closing, lockable door on the entrance to the enclosure.

3.1.10 Establish negative pressure in asbestos work areas as described in Item. 1.5.19. Negative pressure units shall have total rated capacity with filters in place sufficient to provide minimum 1 air change every 20 minutes in wet removal sites. Volume of air shall be sufficient to ensure airflow is maintained from clean areas into asbestos work area. Vent units to outside of building by removing, and later replacing, windows, and/or providing flexible ducting. Locate vents to discharge air away from building access points or sidewalks. Do not discharge air into building interior without obtaining approval from the Owner's Consultant. Leak test negative air units prior to commencement of abatement at operating position, using DOP/PAO method. Provide reports for unit efficiency test results within 48 hours of testing, including calibration certificates for testing equipment. Venting of exhaust air through occupied area shall be in rigid airtight ductwork. Operate negative pressure units continuously from this time until completion of final air monitoring. Replace pre-filters as necessary to maintain airflow. Maintain negative air pressure of 5 Pascal (-0.02 inches water column) pressure reduction within asbestos enclosure with respect to surrounding areas.

3.1.11 Negative pressure to be measured with a device at regular intervals. Measurements to be posted on health and safety boards on a daily basis.

3.1.12 Where required, remove and replace windows for the exhausting of negative air units for each Type 3 work area.

3.1.13 Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.

3.1.14 Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Provide ground fault electrical system where application of amended water is required for wetting asbestos-containing materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.15 Provide temporary lighting in asbestos work area to levels that will permit work to be done safely and well.

3.1.16 Provide fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.

3.2 WORKERS' DECONTAMINATION ENCLOSURE SYSTEM

3.2.1 Construct workers' decontamination enclosure at entrance to each asbestos work area. Worker decontamination enclosure system shall comprise three interconnecting rooms as listed in items 3.2.2, 3.2.3, and 3.2.4. Provide a set of curtain doorways between each room, and at both dirty and clean entrances to enclosure systems. Construction of the decontamination enclosure system shall meet the requirements of Item 3.3, below.

3.2.2 **Equipment and Access Room**: Build room between shower room and asbestos work area. Install waste receptor, and storage facilities for worker's shoes and any protective clothing to be re-worn in asbestos work areas. Equipment and access room shall be large enough to accommodate specified facilities, and other equipment needed, and at least one worker allowing sufficient space to undress comfortably. Minimum size 3 square metres (30 sq. ft.).

3.2.3 **Shower Room**: Build room between clean room and equipment and access room. Provide constant separate supplies of hot and cold water. Provide valves controllable at shower(s) to regulate water temperature. Provide rigid piping with watertight connections and connect to water sources and drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters. Direct wastewater to sanitary sewer drains via water filtering system consisting of a minimum 2-stage filtering system (25-micron and 5-micron filters).

3.2.4 **Clean Room**: Build room between shower room and clean areas outside of enclosures. If the entrance to the clean room is located in a publicly accessible area, provide vented wood door, with locking passage set at doorway to clean room and provide secure hoarding walls to protect the enclosure from damage or access. Provide hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install water heater, if required.

3.3 CONSTRUCTION OF DECONTAMINATION ENCLOSURES

3.3.1 **Floor**: Prior to erecting wall framing, lay 1 sheet of rip-proof polyethylene sheeting over floor area to be covered by enclosures. Turn 600 mm (24") of rip-proof polyethylene sheeting up outside of enclosure, overlapping with polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene sheeting to all floors, extending 600 mm up inside of enclosure walls.

3.3.2 **Walls**: Build load-bearing walls of 39 mm x 89 mm (2" x 4") wood framing, 400 mm (16") o.c. with continuous top and sill plates. Cover both sides walls with polyethylene sheeting. Walls exposed to asbestos work area shall be covered with min. 9 mm (3/8") plywood sheeting or hardboard. Caulk seal and tape plywood joints. Walls exposed to occupied area shall be covered with good one side 9 mm plywood.

3.3.3 **Roof:** Size of joists shall be determined by span, loads, use and Code. Use as a minimum 39 mm x 138 mm (2" x 6") joists. Cover joists with 19 mm (3/4") plywood sheeting. Seal and tape joints, and cover with two layers of rip-proof polyethylene sheeting. At underside of joists install one layer of polyethylene sheeting.

3.3.4 **Doorways**: Build curtain doorways designed so that when workers or drums and equipment move through doorway, one of two barriers comprising doorway always remains closed.

3.4 MAINTENANCE OF ENCLOSURES

3.4.1 Maintain enclosures in tidy condition.

3.4.2 Ensure barriers and polyethylene sheeting linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

3.4.3 Visually inspect enclosures at beginning and end of each working period.

3.5 DO NOT COMMENCE ASBESTOS REMOVAL WORK UNTIL

3.5.1 Arrangements have been made for disposal of waste.

3.5.2 Asbestos work areas and decontamination enclosures are effectively segregated. Negative pressure equipment is operating continuously.

3.5.3 Tools, equipment, and waste materials receptors are on hand.

3.5.4 Arrangements have been made with the Owner for work area security.

3.5.5 Signs are displayed in areas where access to sealed asbestos work area is possible. Signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm.

3.6.6 Proof of notification to Ministry of Labour has been submitted.

3.6.7 The Environmental Consultant has been notified of intention to proceed and has reviewed enclosures, equipment, and procedures.

3.6 CONTAMINATED PREPARATION FOR FULL-ENCLOSURE ASBESTOS WORK AREA

3.6.1 Before performing any contaminated work, prepare site as described in items 3.1, 3.2, 3.3, 3.4, 3.5, and 3.6.

3.6.2 Where required, using full protective procedures including amended water and HEPA vacuum, install upper seals as necessary to allow polyethylene sheeting to be fastened to structure. Each of two sheets forming wall of enclosure shall be fastened separately to deck using tape, spray adhesive, rapid setting foam, or other suitable method. Provide suitable framing to support polyethylene sheeting. Seal holes in existing perimeter walls, columns, deck etc., to ensure an airtight asbestos work area.

3.6.3 Promptly seal holes or penetrations in structure above ceiling, ducts, etc. to provide airtight enclosure around asbestos work area(s).

3.6.4 Protect electrical, communication, life safety, and control systems to remain in place in asbestos work area with polyethylene sheeting. Seal joints and holes in uninsulated HVAC ductwork to remain operational through an asbestos work area, using tape and rip-proof polyethylene sheeting.

3.7 DRILLING OR CUTTING ASBESTOS-CONTAINING MATERIAL WITH POWER TOOLS NOT EQUIPPED WITH HEPA-FILTERED DUST COLLECTION DEVICE

3.7.1 Prepare the work area with a Full Enclosure as per items 3.1 to 3.6, above.

3.7.2 Perform work, as required. All workers must be trained on the safe use of any powered equipment that they utilize to perform their work.

3.7.3 If work requires cutting or drilling completely through a material, ensure that both sides of the material are isolated by a full enclosure (e.g. if drilling through a wall from one room to another, both rooms shall be contained by an enclosure).

3.7.4 Minimize dust generation by wet misting the material being drilled, cut, etc.

3.7.5 After drilling, cutting, etc. seal the cut edges of the material with a coating of approved sealant.

3.7.6 Clean the enclosure following the method in Item 3.10, below.

3.8 REMOVAL OF GREATER THAN 1 M² OF FRIABLE ASBESTOS-CONTAINING PIPE INSULATION

3.8.1 Remove asbestos-containing pipe and fitting insulation in layers, while maintaining all exposed surfaces of insulation or lagging in wet condition. Full saturation of insulation will not be required if material is immediately bagged and not allowed to fall to floor.

3.8.2 Seal ends of pipe insulation at perimeters of asbestos work area (or where determined during the site walkthrough) with heavy coat of high temperature sealer and a heavy canvas jacketing.

3.8.3 Place asbestos waste in asbestos waste receptors. If drums are used for waste disposal, drums shall be sealed and cleaned in waste decontamination enclosures. If double plastic bags are used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer plastic bag in container cleaning room immediately prior to transfer from Site.

3.8.4 Treat all materials removed to expose asbestos, as asbestos-contaminated waste unless such materials are specified to be reused.

3.8.5 Clean the enclosure following the method in Item 3.10.

3.9 REMOVAL OF GREATER THAN 1 M² OF FRIABLE ASBESTOS-CONTAINING SPRAYED FIREPROOFING

3.9.1 Removal of sprayed fireproofing on ceilings will require a suitable work platform for workers to reach the material and perform work. A suitable work platform may include scaffolding or an elevating work platform.

3.9.1.1 Every scaffold,

- shall have uprights braced diagonally in the horizontal and vertical planes to prevent lateral movement;
- shall have horizontal members that are adequately secured to prevent lateral movement and that do not have splices between the points of support;
- shall have footings, sills or supports that are sound, rigid and capable of supporting at least two times the maximum load to which the scaffold may be subjected without settlement or deformation that may affect the stability of the scaffold;
- shall have all fittings and gear, including base plates or wheels, installed in accordance with the manufacturer's instructions;
- shall have connecting devices between frames that provide positive engagement in tension and compression;
- shall have safety catches on all hooks; and
- shall be adequately secured at vertical intervals not exceeding three times the least lateral dimension of the scaffold, measured at the base, to prevent lateral movement.

3.9.1.2 No scaffold shall be loaded in excess of the load that it is designed and constructed to bear.

3.9.1.3 Only a competent worker shall supervise the erection, alteration and dismantling of a scaffold.

3.9.1.4 Every scaffold platform and other work platform shall be designed, constructed and maintained to support or resist, without exceeding the allowable unit stresses for the materials of which it is constructed.

3.9.1.5 Each component of a scaffold platform or other work platform shall be capable of supporting a load of at least 2.2 kilonewtons without exceeding the allowable unit stress for each material used.

3.9.1.6 No scaffold platform or other work platform shall be loaded in excess of the load that it is designed and constructed to bear.

3.9.1.7 A scaffold platform or other work platform,

- shall be at least 460 millimetres wide;
- if it is 2.4 metres or more above a floor, roof or other surface, consist of planks laid tightly side by side for the full width of the scaffold;
- shall be provided with a guardrail;
- shall be provided with a means of access;
- shall not have any unguarded openings; and
- shall have each component secured against slipping from its supports.

3.9.1.8 An elevating work platform shall have signs that are clearly visible to an operator at its controls indicating,

- the rated working load;
- all limiting operating conditions including the use of outriggers, stabilizers and extendable axles;
- the specific firm level surface conditions required for use in the elevated position;
- such warnings as may be specified by the manufacturer;
- other than for a boom-type elevating work platform, the direction of machine movement for each operating control;
- the name and number of the National Standards of Canada standard to which it was designed; and
- the name and address of the owner.

3.9.1.9 An elevating work platform,

- shall not be loaded in excess of its rated working load;
- shall be used and moved only in accordance with the manufacturer's written instructions;
- shall not be loaded or used in such a manner as to affect its stability or endanger a worker;
- shall not be moved unless all workers on it are protected from ejection by being attached to an adequate anchorage point on the elevating work platform by a method of fall protection;
- shall not be used, in the case of a self-propelled or vehicle-mounted boom-type elevating work platform or a vehicle-mounted aerial device, unless all workers on it are attached to an adequate anchorage point on the elevating work platform by a method of fall protection; and
- shall be maintained appropriately.

3.9.1.10 All workers working on scaffolds and elevated work platforms must have received a valid training certificate from the Ontario Ministry of Labour indicating they have adequately completed a Working at Heights training course.

3.9.2 Use amended water to maintain sprayed fireproofing in a damp to wet state for removal to adequately control dust generation.

3.9.3 Using hand scrapers, push the blade of the scraper into the sprayed fireproofing material until the blade reaches the deck. Push the scraper tool along the surface of the ceiling to dislodge sprayed fireproofing. Repeat this process for remaining fireproofing until all fireproofing has been removed from the deck. Start in a small area and move to adjacent areas only when all the fireproofing has been removed from the previous area of the ceiling.

3.9.4 Ensure all fireproofing overspray has been removed from ceiling structures by following the scraping method in Item 3.9.3, above.

3.9.5 Once all fireproofing has been removed from the ceiling, clean the surface of the ceiling by HEPA vacuum and damp wipe techniques.

3.9.6 Working in a top down fashion, clean all fireproofing from ceiling joists, beams, services (ductwork, piping, etc.) or any other ceiling structures where falling fireproofing may have settled.

3.9.7 Place asbestos waste in asbestos waste receptors. If drums are used for waste disposal, drums shall be sealed and cleaned in waste decontamination enclosures. If double plastic bags are used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer plastic bag in container cleaning room immediately prior to transfer from Site.

3.9.8 Treat all materials removed to expose asbestos, as asbestos-contaminated waste unless such materials are specified to be reused.

3.9.9 Clean the enclosure following the method in Item 3.10, below.

3.10 CLEAN-UP

3.10.1 Clean surfaces with brushes and vacuum or wet-sponge to remove visible dust and debris.

3.10.2 Remove sealed and labelled asbestos waste receptors and dispose of in authorized disposal area in accordance with requirements of disposal authority.

3.10.3 After brushing and wet-sponging to remove visible asbestos, wet clean entire asbestos work area including equipment and access area, polyethylene sheeting, and equipment used in process. Floor and wall surfaces, ducts, and similar items not covered with polyethylene sheeting must be wet cleaned.

3.10.4 Request visual inspection and acceptance by the Environmental Consultant. Following inspection and acceptance, apply heavy coat of slow drying sealer to all surfaces from which asbestos has been removed. Apply thinned coat (sufficient to coat all surfaces) to other surfaces in asbestos work area including all polyethylene sheeting and surfaces scheduled for demolition. Allow minimum of 12 hours flushing time with no disturbance of asbestos work area. Operate negative air units during this period.

3.11 DISMANTLING OF PROTECTION

3.11.1 Clearance sampling to be conducted in accordance with Section 18 of Ontario Regulation 278/05 for buildings scheduled to remain in place.

3.11.2 If air sampling by the Environmental Consultant shows that levels in asbestos work area do not exceed 0.01 fibres/cc as determined by NIOSH 7400 Method A counting rules, proceed with final dismantling of enclosure.

3.11.3 Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Wear half face piece respirator and disposable coveralls during removal of sheeting. Carefully roll sheeting away from walls to centre of asbestos work area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.

3.11.4 While removing top layer of sheeting from surfaces protected by two layers of sheeting, cut lower sheeting so as to expose horizontal surfaces that may be contaminated with asbestos debris. HEPA vacuum any visible debris.

3.11.5 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in asbestos waste receptors for transport. Remove with HEPA vacuum any debris which may have fallen behind sheeting.

3.11.6 Clean asbestos work area(s), equipment and access area, washing/showering room, and other enclosures that may have been contaminated during work.

3.11.7 Clean asbestos waste receptors and equipment used in work and remove from asbestos work area(s) via drum and equipment decontamination enclosure system, at an appropriate time in sequence.

3.11.8 Remove hoardings, temporary lighting, equipment, and facilities provided for work. A final review may be carried out by the Owner's Consultant to ensure that no dust or debris remains. Asbestos abatement contractor responsible for inspecting and cleaning all adjacent spaces to the asbestos abatement work area. Adjacent work areas to be left free of construction related dust and debris.

3.12 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

3.12.1 When clean-up is complete, re-establish mechanical and electrical systems to remain operative in proper working order, where required. Arrange for, and pay costs of electrical or mechanical repairs needed due to work of this Section.

3.12.2 Make good all damage at completion of work not identified in pre-removal survey referred to in Item 1.9.2.5.

3.13 AIR MONITORING

3.13.1 The Environmental Consultant will perform clearance air sampling after the slow-drying sealant has had adequate drying time.

3.13.2 The Asbestos Abatement contractor is responsible for providing the Environmental Consultant with adequate notice of the completion of abatement work. A minimum of 48 hours' notice is required for sites located in and near the Greater Toronto Area. More notice may be required for remote or distant sites.

3.13.3 The Environmental Consultant for this project will be Safetech Environmental Limited.

3.13.4 Air monitoring will be performed using Phase Contrast Microscopy (PCM) following the National Institute for Occupational Safety and Health method 7400, as required by O. Reg. 278/05.

3.13.5 Co-operate with the Environmental Consultant in collection of air samples. All amenities that Asbestos Abatement Contractor is responsible for providing their workers during Type 3 operations shall be extended to the Environmental Consultant for air sampling including working hot and cold water for showers, sufficient electrical power supply for the Environmental Consultant's equipment, protective clothing, and asbestos waste receptors.

3.13.6 Asbestos Abatement Contractors forces must exercise care with Asbestos Abatement Consultant's equipment. The Owner reserves the right to back charge the Contractor for re-sampling of samples damaged by tampering or abuse. In addition, the Contractor will be responsible for the cost of testing equipment repairs resulting from the actions of the Contractor's forces.

3.13.7 The Environmental Consultant will collect 2, 3, or 5 air samples depending on the size of the enclosure.

3.13.8 If any single air samples collected from the enclosure results in a concentration that is above the Clearance Level, then the Asbestos Abatement contractor shall re-clean the enclosure at no additional cost to the Owner. Furthermore, the Asbestos Abatement contractor is responsible for covering the cost of additional clearance air testing required as a result of failed air clearance sampling.

3.13.9 If final air sampling by the Environmental Consultant shows that levels in completed asbestos work area do not exceed the Clearance Level, proceed with dismantling of enclosures.

3.13.10 The Clearance Level is 0.01 f/cc, as determined by NIOSH 7400 Method - "A" counting rules.

3.14 INSPECTION

3.14.1 From commencement of work until completion of clean-up operations, the Environmental Consultant may be present on a part-time basis; both inside and outside asbestos work area(s).

3.14.2 The following Milestone Inspections are required for all Type 3 asbestos abatement work:

- **Milestone Inspection A** – Clean Site Preparation: Inspection of preparations and set-up prior to contaminated work in the Asbestos Work Area.
- **Milestone Inspection B** – Visual Clearance: Inspection of Asbestos Work Area after removal of all asbestos but prior to application of lock-down agent.
- **Milestone Inspection C** – Air Monitoring Clearance: Inspection and air monitoring after the application of lock-down agent but prior to removal of polyethylene from within the Asbestos Work Area.

3.14.3 In addition to the Milestone Inspections, inspection of the Asbestos Work Area will be performed to confirm the Asbestos Abatement Contractor's compliance with the requirements of the specification and governing authorities. Any deviations from these requirements, which have not been approved in writing, may result in a stoppage of work, at no additional cost to the Owner.

3.14.4 The Environmental Consultant is empowered by the Owner to inspect adherence to specified procedures and materials, and to inspect for final cleanliness and completion. Additional labour or materials expended by the Asbestos Abatement Contractor to provide satisfactory performance to the level specified should be at no additional cost.

3.14.5 If the Asbestos Work Area is found unacceptable by the standards specified or required by governing authorities, the work required to meet the standards and obtain consent to proceed from the Environmental Consultant, shall be performed at no additional cost to the Owner.

3.14.6 The Environmental Consultant is empowered by the Owner to order a shutdown of work when a leakage of asbestos from the controlled Asbestos Work Area has occurred or is likely to occur. These conditions include, but are not limited to, failure of negative pressure systems, inadequate wetting, failure of the perimeter enclosure, water leaks, etc. Additional labour or materials to rectify these or other unsatisfactory conditions shall be at no cost to the Owner.

3.14.7 Pay cost to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.14.8 Inspection and air monitoring performed as a result of Asbestos Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule shall be back-charged to the Owner.

3.15 WASTE TRANSPORT AND DISPOSAL

3.15.1 Conform to requirements of R.R.O. 1990 Regulation 347, amended to 408/19, made under The Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.

3.15.2 Check with waste handling facility operator to determine the type of waste containers that are acceptable. Ensure waste is stored in a type of container that is deemed acceptable by the waste handling facility.

3.15.3 Ensure shipment of containers to waste handling facility is taken by waste hauler licensed to transport asbestos waste.

3.15.4 Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.

3.15.5 Co-operate with Ministry of Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at waste handling facility to maintain environment, at no additional cost to Owner.

3.15.6 Ensure waste handling facility operator is fully aware of hazardous material being deposited.

3.15.7 Ensure that containers used for handling asbestos-containing waste are locked and covered at all times.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited draft report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Table 2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all known and suspected asbestos-containing materials for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment where asbestos-containing materials may be disturbed, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases that may contain asbestos-containing materials.

1.4.1.2 This Section (02 82 04) only applies to that work for which the disturbance of asbestos-containing materials is classified as a Type 2 Glove Bag operation in accordance with Ontario Regulation 278/05: "*Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations"*, as amended. As such, all work stipulated by this section will be performed by the glove bag method.

1.4.1.3 The contractor is solely responsible to obtain and verify all quantities and locations of asbestos-containing materials and satisfy itself that all asbestos-containing materials identified to be removed have been included in their bid. This also includes, but is not limited to, all mechanical insulations, debris, rubble, etc. within rooms, mechanical chases, pipe chases, wall enclosures, etc.

1.4.1.4 Adequately protect and maintain all electrical and mechanical services passing through the asbestos work areas.

1.4.1.5 A potable water source and electrical supply will be provided by the Owner. The contactor is responsible to provide the necessary tools, equipment, and professional trades for connections to their respective work areas.

1.4.1.6 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.7 All work may be subject to inspection and air monitoring inside and outside asbestos work areas by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or air monitoring, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.8 Contractor to erect a project health and safety board at each Type 2 location which shall be posted for the duration of the work. Health and safety board to contain contact information, MSDS's, Safety Policy, JHAs, project specifications, project reports, action plans, etc.

1.4.1.9 Ensure all necessary permits for asbestos abatement work, scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.10 Refer to Section 02 82 01, Type 1 Asbestos Abatement, which defines procedures and requirements for working with other non-friable asbestos-containing materials.

1.4.1.11 Refer to Section 02 82 02, Type 2 Asbestos Abatement, which defines procedures and requirements for working with other non-friable asbestos-containing materials.

1.4.1.12 Refer to Section 02 82 03, Type 3 Asbestos Abatement, which defines procedures and requirements for working with other friable asbestos-containing materials.

1.5 DEFINITIONS

1.5.1 Refer to Item 1.5 of Section 02 82 03.

1.6 REGULATIONS

1.6.1 Refer to Item 1.6 of Section 02 82 03.

1.7 SUPERVISION

1.7.1 Refer to Item 1.7 of Section 02 82 03.

1.8 QUALITY ASSURANCE

1.8.1 Refer to Item 1.8 of Section 02 82 03.

1.9 SUBMITTALS

1.9.1 Refer to Item 1.9 of Section 02 82 03.

1.10 WORKER AND VISITOR PROTECTION

1.10.1 Provide non-powered air half face respirators with minimum P100 filter cartridges in accordance with NIOSH Part 84 requirements. Provide proper instruction to workers in use of respirators including qualitative and quantitative fit testing. Replace filters as necessary, according to manufacturer's instructions. Workers shall not wear facial hair that affects seal between respirator and face. Abatement Contractor to post on job bulletin Owner instructions, procedures, and information pertaining to abatement work.

1.10.2 Provide, and insist on using, facilities for washing of hands and face by every worker when leaving asbestos work area. Prohibit smoking, eating, and drinking in asbestos work area(s).

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **Asbestos Waste Receptors:** 2 separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or metal or fibre drum or wood box. Other container shall be adequate to prevent perforating rips or tears in first container during filling, transport, or disposal. Containers must be acceptable to disposal site selected and Ministry of Environment. Containers shall be labelled in accordance with Ministry of Environment regulations.

2.1.2 **Amended Water**: Water with non-ionic water wetting agent added.

2.1.3 **Glove Bag:** Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl-chloride bag with integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elasticized ports. Bag equipped with reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends to bag around pipe: Safe-T-Strip manufactured by Hazmasters Equipment Inc., Pickering Ontario, in configurations suitable for work.

2.1.4 **HEPA Vacuum:** A vacuum device fitted with a 99.97% (0.3 micrometer) high efficiency particulate aerosol filter removal system that is constructed in such a way that all air passing through the vacuum must pass through the filter, without bypass or leakage, before being discharged. Vacuum to have all necessary fittings, tools, and attachments.

2.1.5 **Knife:** Knife with fully retractable blade for use inside Glove Bag.

2.1.6 **Lock-Down Agent**: Pre-mixed “lockdown” sealing treatment for microscopic residual asbestos fibres present after the removal of asbestos-containing material.

2.1.7 **Sprayer:** Garden-type portable manual sprayer, low velocity, capable of producing mist or fine spray.

2.1.8 **Securing Straps:** For glove bag, reusable nylon straps at least 1" wide with metal tightening buckle for sealing ends of bags around pipe and/or insulation.

2.1.9 **Polyethylene Sheeting:** 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.

2.1.10 **Tape:** Tape suitable for sealing polyethylene sheeting to surface encountered under wet conditions using amended water and under dry conditions.

3 EXECUTION

3.1 COMMENCE ASBESTOS REMOVAL WORK WHEN

3.1.1 Equipment, tools, furnishings, and stored materials which can be moved without disturbing asbestos containing materials have been moved by Contractor.

3.1.2 Arrangements have been made for disposal of waste.

3.1.3 Asbestos work areas and parts of building required to remain in use are effectively segregated by walls or barricades.

3.1.4 Tools, equipment and materials waste receptors are on hand.

3.1.5 Arrangements have been made with Owner for work area security.

3.1.6 Signs are displayed in all areas where access to asbestos work area is possible. Such signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm.

3.1.7 Owner's Consultant has been notified of intention to proceed and has reviewed equipment and procedures.

3.2 FITTING AND PIPE INSULATION REMOVAL

3.2.1 Isolate asbestos work area with tape barriers, saw horses, or other barriers posted with notices marking area as asbestos removal area. Workers performing glove bag removal shall wear half face piece air purifying respirators with P100 HEPA filter cartridges.

3.2.2 Pre-clean surface of insulation and surfaces beneath the insulation of debris and damaged insulation by HEPA vacuuming or damp wiping.

3.2.3 Spray areas of damaged jacketing with mist of amended water. Tape over damage, or wrap with polyethylene sheeting, to provide temporary repair.

3.2.4 If insulation is not jacketed spray surface with mist of amended water and wrap entire length of insulation with 0.15 mm (6 mil) polyethylene sheeting taped in place.

3.2.5 Place tools necessary to remove insulation in tool pouch. Secure glove bag onto pipe insulation around the segment and/or fittings to be removed and seal all openings to insulation with cloth securing straps. For valve bags seal valve cover with wire tie or equivalent.

3.2.6 Place hands into gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag. Roll jacketing carefully to minimize possibility of ripping or puncturing glove bags.

3.2.7 Insert nozzle of spray pump into bag through valve and wash down insulation and interior of bag thoroughly. Use one hand to aid washing process. Wet surface of insulation in lower section of bag and exposed end of asbestos insulation remaining on fitting by spraying with water prior to moving bag.

3.2.8 If bag is to be moved along insulation, move bag, re seal to insulation using double pull zipper to pass hangers. Repeat stripping operation.

3.2.9 If bag is removed from fitting for use on new fitting, seal interior zip lock. Reinstall in new location before opening zip lock.

3.2.10 If glove bag is ripped, cut, or opened in any way, cease work and repair with tape before continuing work. Clean spilled material with HEPA vacuum or wet washing.

3.2.11 To remove bag once filled, wash top section and tools thoroughly. Place tools in one hand (glove), pull hand out inverting the glove with the tools inside, twist glove to create a separate pouch, and double tape to seal. Cut between tape and place the pouch containing the tools into the next glove bag, if continuing with glove bag removals. If finished, place pouch containing the tools into a bucket filled with water, then open the pouch underwater, clean tools, and allow the tools to dry.

3.2.12 Pull waste disposal bag over glove bag before removing from fitting. Remove securing straps. Unfasten zipper.

3.2.13 After removal of bag ensure pipes and pipe fittings are clean of residue. If necessary, after removal of each section of asbestos, HEPA vacuum surfaces of pipes and pipe fittings or wipe with wet cloth. Ensure that surfaces are kept free of wet sludge.

3.2.14 Before completion of shift, apply sealer to all surfaces of freshly exposed pipes and pipe fittings. Apply heavy coat of sealer to exposed ends of asbestos insulation that is to remain.

3.2.15 Once the lower portion of the glove bag is filled, dispose of the glove bag as contaminated waste. Do not reuse the glove bag.

3.2.16 Make good all damage at completion of work not identified in pre removal survey referred to in Item 1.9.2.5.

3.3 INSPECTION

3.3.1 From commencement of work until completion of clean-up operations, the Environmental Consultant may be present on a part-time basis, both inside and outside asbestos work area(s).

3.3.2 The following Milestone Inspections are required for all Gove Bag asbestos abatement work:

Clean Site Preparation: Inspection of preparations and set-up prior to contaminated work in the Asbestos Work Area.

Visual Clearance: Inspection of Asbestos Work Area during and following completion of abatement operations.

3.3.3 Inspection of the Asbestos Work Area(s) will be performed to confirm the Abatement Contractor's compliance with the requirements of the specification and governing authorities. Any deviations from these requirements, which have not been approved in writing, may result in a stoppage of work, at no additional cost to the Owner.

3.3.4 The Environmental Consultant is empowered by the Owner to inspect adherence to specified procedures and materials, and to inspect for final cleanliness and completion. Additional labour or materials expended by the Abatement Contractor to provide satisfactory performance to the level specified shall be at no additional cost to the Owner.

3.3.5 If the Asbestos Work Area is found unacceptable by the standards specified or required by governing authorities, the work required to meet the standards and obtain consent to proceed from the Environmental Consultant, shall be performed at no additional cost to the Owner.

3.3.6 Pay cost, at no additional cost to Owner, to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.3.7 The Contractor is responsible for the cost of additional inspections by the Environmental Consultant and the Consultant as a result of Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule.

3.4 WASTE TRANSPORT AND DISPOSAL

3.4.1 Conform to requirements of R.R.O. 1990 Regulation 347, amended to 408/19, made under The Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.

3.4.2 Check with waste handling facility operator to determine the type of waste containers that are acceptable. Ensure waste is stored in a type of container that is deemed acceptable by the waste handling facility.

3.4.3 Ensure shipment of containers to waste handling facility is taken by waste hauler licensed to transport asbestos waste.

3.4.4 Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.

3.4.5 Co-operate with Ministry of Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at waste handling facility to maintain environment, at no additional cost to Owner.

3.4.6 Ensure waste handling facility operator is fully aware of hazardous material being deposited.

3.4.7 Ensure that containers used for handling asbestos-containing waste are locked and covered at all times.

END OF SECTION

1 PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Table 3 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of lead-containing and lead-based paint coatings for each specific building respectively.

1.3.3 Paints and surface coatings containing lead in excess of 0.1% lead by weight (1000 µg/g or 1000 ppm) are confirmed on various building material surfaces in select renovation areas. These paints will be, or potentially will be, minimally disturbed as part of the JVN equipment installation activities.

1.3.4 Lead-containing batteries within emergency lighting systems are suspected to be present in select areas of renovation work but are not anticipated to be disturbed during the specified project work.

1.3.5 Lead-containing solder used on mechanical pipe fittings and within electrical equipment is suspected in all areas of renovation work but are not anticipated to be disturbed during the specified project work.

1.3.6 Lead-packing in cast iron bell and spigot connection gaskets is suspected present in select areas of renovation work but are not anticipated to be disturbed during the specified project work.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment where lead-containing or lead-based materials may be disturbed, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases that may be surface coated with lead-containing or lead-based materials.

1.4.1.2 This Section (02 83 00) only applies to that work which may disturb lead-based or lead-containing materials. All possible measures shall be taken to plan work so that lead-disturbing work is conducted as a Class I Operation as per the Ontario Ministry of Labour *Guideline for Lead on Construction Projects* and Environmental Abatement Council of Ontario's *Lead Guideline for Construction, Renovation, Maintenance, or Repair*.

1.4.1.3 Where a lead-containing or lead-based paint (or other surface coating) is to be disturbed by the scheduled work, the work performed may be completed by one of the following methods which shall be chosen as appropriate to protect both workers and occupants from lead:

- Remove the paint (or other surface coating) prior to disturbance via wet gel stripping.
- Remove the paint (or other surface coating) prior to disturbance via non-powered hand tools.
- Remove the underlying material with the paint (or other surface coating) chiefly intact using non-powered hand tools.
- Remove the paint (or other surface coating) prior to disturbance using a powered hand tool that is equipped with a HEPA-filtered dust collection device.
- Pre-drill fastener holes through underlying materials using a powered hand tool that is equipped with a HEPA-filtered dust collection device.

1.4.1.4 The contractor is solely responsible to confirm if any material they are disturbing has or has not been identified as lead-containing or lead-based, or is suspected to be lead-containing or lead-based. If the lead content of a suspect material, such as a surface coating, has not been identified, it should be treated as lead-containing.

1.4.1.5 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.6 All work may be subject to inspection and verification sampling by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or surface sampling, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.7 Ensure all necessary permits for scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.8 The contractor is responsible for verifying the asbestos classification of any underlying materials and following all appropriate precautions, measures, and procedures as appropriate, in addition to lead work procedures.

1.5 DEFINITIONS

1.5.1 **Authorized Visitor(s)**: Owner's Environmental Consultant or persons representing regulatory agencies, and person(s) authorized by either of them.

1.5.2 **Work Area(s)**: Area(s) where work takes place which will, or may disturb lead containing paint.

1.5.3 **HEPA Filter**: High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3-micrometer aerosol.

1.5.4 **HEPA Vacuum**: A vacuum device fitted with a 99.97% (0.3 micrometer) high efficiency particulate aerosol filter removal system that is constructed in such a way that all air passing through the vacuum must pass through the filter, without bypass or leakage, before being discharged.

1.5.5 **Polyethylene Sheeting**: Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, as required, to provide continuous polyethylene membrane protection.

1.5.6 **Environmental Consultant**: Third party inspection agency hired by the Owner.

1.5.7 **Abatement Contractor**: Specialized sub-contractor to the General Contractor of the contract who is responsible for abatement and remediation of designated substances and other hazardous materials.

1.6 REGULATIONS, GUIDELINES & INDUSTRY STANDARDS

1.6.1 Comply with Federal, Provincial, and local authority requirements. The more stringent requirements shall apply in the event of a conflict with any particular authority or jurisdiction. Regulations and Guidelines including:

1.6.1.1 *Construction Projects*, O. Reg. 213/91, amended to O. Reg. 327/19, made under The Occupational Health and Safety Act.

1.6.1.2 *Designated Substances*, O. Reg. 490/09, made under The Occupational Health and Safety Act.

1.6.1.3 *Guideline: Lead on Construction Projects,* Ministry of Labour, April 2011.

1.6.1.4 *Lead Guideline for Construction, Renovation, Maintenance or Repair*, Environmental Abatement Council of Ontario, 2014.

1.6.1.5 General – Waste Management, *R.R.O. Regulation 347* for disposal of hazardous waste.

1.7 QUALITY ASSURANCE

1.7.1 Ensure work proceeds on schedule, and meets all requirements of this Section.

1.7.2 Pay cost to Owner for inspection performed as a result of failure to perform work satisfactorily regarding quality, safety, or schedule.

1.7.3 Use only skilled and qualified workers for all the trades required for this work.

1.7.4 The Owner, Consultant, and the Environmental Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs required for the work in accordance with the applicable construction safety legislation, other regulations or general construction practice. The Owner, Consultant, and the Environmental Consultant will not be responsible for or have control or charge over the acts or omissions of the Abatement Contractor, his Subcontractors or their agents, employees, or other persons performing any of the work.

1.8 SUBMITTALS

1.8.1 Abatement Contractor to submit names of supervisory personnel who will be responsible for lead remediation work area(s). One of these supervisors must remain on site at all times during lead paint disturbance, removal, or cleanup. Submit proof that supervisory personnel have attended training course on lead control.

1.8.2 Abatement Contractor to submit the following:

1.8.2.1 Proof of worker training for lead abatement work.

1.8.2.2 Certificates indicating each worker has had proper respirator fit test for the respirator appropriate for work being performed.

1.8.2.3 Written documentation from an occupational physician for each worker stating that the worker is fit to perform lead abatement work and is capable of performing work wearing specified respiratory protection. Each worker should also be enrolled in a lead surveillance program.

1.8.3 Laws of province of Ontario shall govern this work. Abatement Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, and duties as may be required. Likewise, it is the responsibility of Abatement Contractor to comply with Workplace Safety and Insurance Board (WSIB).

1.8.4 Before commencing any work, Abatement Contractor shall submit, in writing, confirmation of good standing with Workplace Safety and Insurance Board (WSIB).

1.8.5 Abatement Contractor to submit proposed schedule showing phasing and scheduling.

1.8.6 Abatement Contractor to submit proof satisfactory to Owner's Environmental Consultant that suitable arrangements have been made to dispose of lead containing waste in accordance with requirements of authority having jurisdiction.

1.8.7 Instruction and Training:

1.8.7.1 Before commencing work provide satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.

1.8.7.2 Instruction and training shall be in accordance with the requirements set out in the Environmental Abatement Council of Ontario 2014 – *Lead Guideline for Construction, Renovation, Maintenance or Repair*, or equivalent.

1.8.7.3 The Abatement Contractor to post on the job bulletin board instructions, procedures, and information pertaining to abatement work.

1.9 WORKER AND VISITOR PROTECTION

1.9.1 **Instructions**: Before entering lead removal work area(s), instruct workers and Authorized Visitor(s) in use of respirators, and all aspects of work procedures and protective measures. Provide instruction by competent person as defined by The Occupational Health and Safety Act.

1.9.2 Provide (as required or as requested by the guidelines) disposable full body coveralls and approved respiratory protection to authorized visitors.

1.9.3 **Respirators**: As required or as requested by the guidelines, provide approved respirators to workers and authorized visitors. Provide sufficient filters and cartridges so workers can install new filters and cartridges following disposal of used filters and cartridges before re-entering contaminated areas. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour.

1.9.4 For Class 1 lead work, no respiratory protection is required. However, should a worker request a respirator, provide workers with personally issued half-face air purifying respirators (APR) with N, R, or P100 high efficiency (HEPA) cartridge filters.

1.9.5 Provide instruction in use of respirators, including qualitative fit testing. No worker or Authorized Visitor(s) may have facial hair which prevents proper contact between respirator face-piece and skin. Alternatively, supplied air positive pressure respirator or supplied air positive pressure hood or helmet may be provided. Maintain respirators in proper functioning and clean condition, or remove from Site.

1.9.6 **Goggles**: Workers and Authorized Visitor(s) shall wear protective eye goggles when actively removing lead paint from a building material and/or finish. Goggles are not required for Class 1 work.

1.9.7 **Protective Clothing**: Provide Workers conducting wet gel stripping of lead paint and Authorized Visitor(s) overseeing the work with disposable full body personal protective coveralls including attached head covering. Used protective coveralls shall be discarded and disposed of as lead contaminated waste. Protective clothing is not required for Class 1 work.

1.9.8 **Gloves**: Workers shall wear nitrile gloves or other applicable gloves to protect from lead and or chemical hazards related to gel stripping and cleaning products being used. Once worn, gloves shall be discarded and disposed of as lead contaminated waste. Gloves shall be worn during all work.

1.9.9 Do not eat, drink, smoke, or chew gum or tobacco in work areas.

1.9.10 Workers and Authorized Visitors shall wash hands and face with lead chelating soap when leaving work area(s). Provide workers with a designated wash facility.

2 PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 **Polyethylene**: 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.

2.1.2 **Rip-Proof Polyethylene**: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.

2.1.3 **Tape**: Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions.

2.1.4 **Waste Receptors**: Two separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag. Other container shall be adequate to prevent perforating rips, or tears during filling, transport, or disposal. Containers must be acceptable to disposal site selected, and Ministry of Environment.

2.1.5 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in lead work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.

2.1.6 **HEPA Vacuum**: See Item 1.5.4. above. Vacuum to have all necessary fittings, tools, and attachments.

2.1.7 **Protective Coveralls**: Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark.

2.1.8 **Paint Remover**: A wet chemical gel/stripper or paste used to soften paints and surface coatings and allow removal by manual scraping that does not generate dust.

3 PART 3 – EXECUTION

3.1 PRE-CLEANING

3.1.1 Install temporary isolation to the work area(s) by using yellow caution tape and appropriate signage at all entry points no less than 10 metres from the work area. Caution signs shall indicate the hazard (i.e. lead abatement) and indicate that access is limited to approved personnel wearing appropriate PPE.

3.1.2 Using Class 1 operations, in accordance with the Environmental Abatement Council of Ontario (EACO) Lead Guideline (2014), pre-clean all painted surfaces where chemical gel/stripper or paste will be applied using HEPA filtered vacuums and other non-powered hand-held tools.

3.2 WORK AREA PREPARATION

3.2.1 Prevent spread of dust and debris from work area using measures appropriate to work being done.

3.2.2 Provide temporary lighting (if required) in work area to levels that will permit work to be done safely and well.

3.2.3 Provide lead chelating soap, clean water, and towels for washing of worker's face and hands when exiting work area(s).

3.2.4 Perform work in manner to reduce dust creation to lowest levels practicable. Work is subject to visual inspection by the Environmental Consultant. Any contamination of surrounding areas indicated by visual inspection shall require complete and immediate clean-up of affected areas.

3.2.5 Cover the floor surfaces (including working platforms used) at each immediate work area with rip-proof polyethylene sheeting sealed with tape to catch and contain any dust, debris, or residue generated from paint stripping. Ensure that the polyethylene sheeting is sufficiently secure to contain all falling debris.

3.3 LEAD CONTAINING OR LEAD-BASED PAINT REMOVAL PRIOR TO DISTURBANCE WITH GEL STRIPPER OR NON-POWERED HAND TOOLS

3.3.1 Enclosure of the area is not required but use barriers and signage to denote the active work area as the work progresses.

3.3.2 Respirators are not required but the Abatement Contractor must provide respirators at the worker’s request (and the work must wear the respirator).

3.3.3 Combine this work with the requirements of Section 02 82 01, 02 82 02, 02 82 03, as appropriate if the underlying material is known or suspected to be asbestos-containing.

3.3.4 Contractor to determine each area requiring paint or primer stripping prior to installation of JVN project equipment.

3.3.5 Remove lead-containing or lead-based paint (or other surface coating) to a point 2 cm in all directions from all locations where the paint or surface coating will be disturbed by the work:

3.3.5.1 If removing the lead-containing or lead-based paint (or other surface coating) by gel stripping, apply the wet chemical gel/stripper or paste (e.g. PEEL AWAY) to the surface as per the manufacturer’s directions. All workers to wear appropriate PPE, as per the manufacturer’s directions. Using non-powered hand tools remove cover sheeting (if used) and scrape-off paint and paint residue from the underlying material. Place sheeting and removed paint directly into waste container. Ensure that the waste container will not be dissolved or degraded by the wet chemical gel/stripper or paste used to remove the paint.

3.3.5.2 If removing the lead-containing or lead-based paint (or other surface coating) by scraping, prepare the work site as above. Ensure polyethylene sheeting is covering enough of the floor to capture all debris. Use painter’s tape to seal polyethylene sheeting to the wall above baseboard height. Workers to wear disposable coveralls during scraping activities. Avoid damaging the underlying material while scraping. Consider the use of a heat gun to aid in removal of the surface coating. Use only non-powered hand tools to scrape surface coating. Avoid sanding or other aggressive, dust generating activities. Where possible, scrape paint directly into lead waste receptor. Wet mist floor surfaces during scraping work to control dust. The addition of a wetting agent should be

considered for additional dust control, if necessary. Wetting shall not be used if it may create a hazard or cause damage. Paint flakes created by the work shall be immediately cleaned-up by using a HEPA vacuum. Utilize the HEPA-vacuum to clean footwear to avoid transporting lead-containing paint off the polyethylene and/or away from the work area. Cleaning with compressed air or dry sweeping shall not be performed. Sweeping compounds shall be used where wetting is not possible.

3.4 DEMOLITION OF MATERIAL WITH LEAD-CONTAINING OR LEAD-BASED PAINT

3.4.1 Determine washing facility for workers. Washing facility shall consist of a wash basin, clean water, soap and clean disposable towels. Workers shall use the dedicated washing facility upon leaving the work area and before eating, drinking, or smoking.

3.4.2 Workers shall wear dust-impermeable gloves. Respirators, coveralls, or boot covers are not required but shall be provided if requested by the worker.

3.4.3 Utilize demolition work methods that minimize dust generation whenever possible and supress any dust generated. Demolition work must be completed with non-powered hand tools and must leave the paint/surface coating chiefly intact (i.e. using a non-powered drywall saw or sledgehammer).

3.4.4 Abatement to evaluate total lead content for waste disposal requirements. It is expected that waste materials may be disposed of as general construction waste but it is the responsibility of the Abatement Contractor to verify prior to disposal with the Environmental Consultant.

3.5 LEAD CONTAINING OR LEAD-BASED PAINT REMOVAL VIA POWERED HAND TOOLS

3.5.1 Enclosure of the area is not required but use barriers and signage to denote the active work area as the work progresses.

3.5.2 Abatement Contractor to wear a half-face air purifying respirator equipped with N-, R-, or P-100 filter cartridges during work.

3.5.3 Combine this work with the requirements stipulated by Section 02 82 02 due if the underlying material is known or suspected to be asbestos-containing.

3.5.4 Air handling systems (supply and return) servicing the work area shall be removed from service or isolated to prevent migration of lead through the air handling system.

3.5.5 Wet mist surfaces during work to control dust. The addition of a wetting agent should be considered for additional dust control, if necessary. Wetting shall not be used if it may create a hazard or cause damage.

3.5.6 The HEPA-filtered dust collection device used on each power tool must provide an air velocity of no less than 0.5 metres per second (100 feet per minute) at the source of the dust, mist, or fume generation. The dust collection device shall require that all exhausted air must pass through a HEPA filter without bypass or leakage.

3.5.7 If mounting equipment to a surface coated with a lead-containing or lead-based paint (or other surface coating) without removing the paint (or other surface coating), pre-drilling of all holes where fasteners will be located using the method specified in Items 3.5.1 to 3.5.6 shall be considered sufficient. The subsequent anchoring of equipment using fasteners need not be performed as a lead operation provided the fasteners are only installed at the pre-drilled locations.

3.6 CLEAN UP:

3.6.1 Clean surfaces from which lead has been removed with brushes and HEPA vacuums or wet-sponge to remove visible dust and debris. HEPA vacuum all surfaces to ensure surfaces are free of visible dust and debris.

3.6.2 All surfaces within the work area(s) must be cleaned (including polyethylene sheeting and equipment used in the remediation) using the following outline: 1) HEPA vacuum; 2) Wet clean using clean damp cloths and detergent solution; and 3) HEPA vacuum.

3.6.3 The cloths are to be folded in 8 panel sections dampened and used continuously by keep folding and using clean panel to wipe surfaces. When all eight (8) panels have been used, discard cloth as contaminated waste. DO NOT contaminate wash water by re-dipping cloth. Cloth is to be dipped only once into the wash water. Once fully used discard cloth in waste container.

3.6.4 Consider the use of lead specific chelating cleaning solutions.

3.6.5 Dispose of all waste as lead contaminated including polyethylene drop sheets, coveralls, respirator filters, and all porous materials that cannot be properly cleaned and decontaminated.

3.6.6 Place full vacuum bags into waste receptors. Double polyethylene bags are to be used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer polyethylene bag in container cleaning room immediately prior to transfer from Site.

3.6.7 At the completion of clean-up, request visual inspection and acceptance by the Environmental Consultant, if required by the Owner. There should be no dust on scaffolds, working platforms, building surfaces, floors, or enclosure materials, where applicable. If the area is not acceptably clean additional cleaning will be required at no additional cost to the Owner.

3.6.8 Dispose of waste in accordance with all applicable Acts, Regulations, Codes, Guidelines, and by-laws including Regulation 347.

3.7 WORKERS' DECONTAMINATION

3.7.1 Provide workers with wash area at a central location to all work areas. Worker wash area shall comprise of a waste container, wash basin with an adequate supply of clean potable water for every worker, lead chelating soap, and clean single use disposable towels.

3.7.2 Following lead abatement work, all workers shall proceed directly to the wash area. Minimize touching of surfaces between the work area and the wash area (such as door handles) and clean all surfaces that are touched in this manner prior to leaving site.

3.7.3 All workers are to wash their hands and face with lead chelating soap. Utilize proper hand washing techniques, including washing for a minimum of 40 to 60 seconds.

3.8 DO NOT COMMENCE LEAD ABATEMENT WORK UNTIL

3.8.1 Arrangements have been made for disposal of waste.

3.8.2 Lead work area(s) and worker wash area(s) are identified.

3.8.3 Tools, equipment and materials waste receptors are on hand.

3.8.4 Signs are displayed, where required. Signs shall read:

CAUTION
Lead Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing Lead dust may cause serious bodily harm.

3.8.5 Environmental Consultant has been notified of intention to proceed and has reviewed work areas, equipment, and procedures (if required by the Owner).

3.9 REMOVAL OF PROTECTION

3.9.1 Remove and dispose of polyethylene sheeting exposed during work. Carefully roll sheeting into itself so that any particulate is captured within the polyethylene sheeting. As sheeting is rolled up, HEPA vacuum any visible dust, debris, or residue found.

3.9.2 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other waste in lead waste receptors for disposal.

3.9.3 A final review may be carried out by the Environmental Consultant to ensure that no dust or debris remains.

3.9.4 Worker to properly decontaminate (i.e. wash) before each break and before going home at completion of work shift. Wash area to have plenty of soap, clean water, and disposable towels. Instruction to be provided for proper hygiene practices.

3.10 FIELD QUALITY CONTROL

3.10.1 Environmental Consultant may arrange for air samples to be taken from commencement of work until completion of cleaning operations in accordance with NIOSH methods. Air samples may be collected both inside the building during work activities and directly within the work area(s).

3.10.2 Cooperate with Environmental Consultant in collection of air samples, including requiring workers to wear sampling pumps for up to half shift periods. Workers shall exercise care not to damage sampling equipment.

3.10.3 All work is subject to visual inspection, swab clearance testing, and may be subject to air monitoring. Any contamination of surrounding areas indicated by visual inspection or swab clearance testing shall require clean-up of affected areas.

3.11 INSPECTION

3.11.1 From commencement of work until completion of clean-up operations, Environmental Consultant may be present periodically; both inside and outside work area(s).

3.11.2 If work area(s) or adjacent areas, are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to Owner.

3.11.3 Pay cost to provide re-inspection of work found not in accordance with these specifications and requirements of authorities having jurisdiction.

3.11.4 Cooperate with and assist inspection and testing company's personnel during inspection and testing.

3.12 DISPOSAL

3.12.1 Conform to requirements of Regulation 347 under the Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.

3.12.2 Dispose of lead waste in accordance with requirements of Provincial and federal authority having jurisdiction.

3.12.3 For general waste disposal of building materials painted with a lead-containing paint or surface coating may be evaluated by leachate analysis for waste disposal classification. It’s anticipated that most general construction waste (that contains lead paint) will not require any special waste classification and may be disposed of as general construction waste. Contractor to verify prior to waste disposal.

3.12.4 Cooperate with Ministry of Environment inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to Owner.

3.12.5 Provided Owner's Environmental Consultant with original copy of waste shipping manifest for disposed lead containing waste issued by dump operator. Abatement Contractor is responsible for completing all required manifest documentation for each load leaving the site.

END OF SECTION

1 PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 01 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Section 2.1.3 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all known and suspected mercury-containing materials for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 Remove, package, and recycle/dispose of, if applicable, all mercury-containing fluorescent light tubes and thermostat switches only where deemed necessary for the installation of JVN program equipment.

1.4.2 All work may be subject to inspection by the Environmental Consultant.

1.5 DEFINITIONS

1.5.1 **Environmental Consultant**: Third party inspection agency hired by the Owner.

1.6 REGULATIONS

1.6.1 Comply with Federal, Provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications more stringent requirements shall apply. Work shall be performed under regulations in effect at time work is performed. Regulations include but are not limited to the following:

1.6.1.1 Environmental Protection Act, Revised Statutes of Ontario 1990, Chapter E. 19.

1.6.1.2 Canadian Environmental Protection Act, Revised Statutes of Canada 1985, c.16.

1.6.1.3 Ministry of Environment Regulations for the disposal of mercury waste, including R.R.O. 1990, Regulation 347/90 *General – Waste Disposal*.

1.6.1.4 Ontario Regulation 490/09, *Designated Substances*.

1.7 INSTRUCTION & TRAINING

1.7.1 Ensure that all workers likely to handle mercury-containing items have knowledge of the hazards related to mercury exposure, are trained in use of Mercury Spill Kit, and are trained in handling of mercury.

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **Cardboard Containers**: New or used cardboard boxes. Suitable for packaging of fluorescent light tubes to prevent breakage of tubes.

2.2 EQUIPMENT

2.2.1 Mercury Spill Response Kit consisting of following:

2.2.1.1 HEPA vacuum dedicated for use with mercury spills.

2.2.1.2 Air-purifying cartridge respirators with mercury absorbing cartridges and an end-of-life service indicator.

2.2.1.3 Nitrile gloves (or equivalent) to prevent skin exposure.

2.2.1.4 Neutralizing compound such as 20% calcium polysulfide or 20% sodium thiosulfide to clean spilled surfaces

3 PART 3 - EXECUTION

3.1 PACKAGING OF FLUORESCENT LIGHT TUBES

3.1.1 Carefully remove fluorescent light tubes from fixtures, wipe with a damp cloth or clean with a HEPA filtered vacuum, and place in cardboard containers.

3.1.2 Place tubes in container as they are removed from fixtures. Ensure that tubes are packaged in a manner to prevent breakage.

3.1.3 Avoid rough handling of tubes to avoid breakage.

3.1.4 Store full containers in a central location on site.

3.2 PACKAGING OF THERMOSTAT SWITCHES

3.2.1 Carefully remove mercury-containing thermostat switches from thermostat and wipe with a damp cloth or clean with a HEPA filtered vacuum and place in cardboard containers.

3.2.2 Place in a sealable container, ensuring that any switches are packaged in a manner to avoid breakage.

3.2.3 Avoid rough handling of tubes to avoid breakage.

3.2.4 Store full containers in a central location on site.

3.3 WASTE TRANSPORT AND DISPOSAL

3.3.1 Do not dispose of mercury-containing equipment with other construction waste or in a landfill. Do not dispose of liquid mercury in a sink or other drain.

3.3.2 Dispose of mercury-containing equipment at a recycling facility approved by Owner and/or Environmental Consultant.

3.3.3 Offer complete recycling of all parts (i.e., lamps, caps, clips etc.)

3.3.4 Must be able to supply Contractor with packaging material, if necessary.

3.3.5 Obtain and submit to Owner all Waste Manifests, as applicable.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Section 2.2.3 and Table 4 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all known and suspected PCB-containing materials or equipment for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 Identify, remove, and dispose of all PCB-containing ballasts for fixtures that are required to be taken out of service if required as part of the JVN program installation scope of work.

1.4.2 Fixtures that are required to be taken out of service as part of the JVN Project scope of work with ballasts labelled as Non-PCB may be disposed of as general waste.

1.4.3 Fixtures that are required to be taken out of service as part of the JVN Project scope with ballasts not labelled Non-PCB are to be removed from the light fixture and examined for date code stamp (usually on back of ballast casing).

1.4.3.1 Ballasts with date code of 1980 or later may be disposed of as general waste.

1.4.3.2 Ballasts stamped 1979 or earlier are to be classified as PCB containing unless otherwise stated.

1.4.3.3 Ballasts with no date code stamp are to be considered PCB containing until otherwise stated. Ballast manufacturer may be contacted to determine presence of PCBs.

1.4.4 Prepare for transportation of verified PCB-containing ballasts by performing the following:

1.4.4.1 Place sealed ballasts into 205 L, No. 18-gauge steel drums fitted with NB steel removable lids and gaskets made of PCB resistant material, such as nitrile rubber, cork, or Teflon. Drum to be lined with 0.15 mm (6 mil) polyethylene bag prior to placement of ballasts in drum.

1.4.4.2 Ballasts shall be stored with terminals up to prevent leakage from capacitor bushings.

1.4.4.3 Place as many layers of ballasts as space allows into each drum. Each layer of ballasts to be separated by a layer of absorbent material (e.g. exfoliated non-asbestos vermiculite).

1.4.4.4 Drums or containers smaller than 205 L may be used when size or quantity of ballasts does not justify larger container.

1.4.5 Leaking ballasts are to be placed separately in heavy duty polyethylene bags before storing in drum (one ballast per bag).

1.4.5.1 Drums are to be packed with absorbent material (e.g. exfoliated non-asbestos vermiculite) sufficient to absorb any PCB's which may escape from bags.

1.4.6 All PCB waste is to be stored and disposed of in accordance with R.R.O. 1990 Regulation 362– *Waste Management (PCBs)*.

1.4.7 Transportation of PCB materials to be carried out following all guidelines as per chapter 4 of R.R.O. 1990 Regulation 347 – *General – Waste Management*.

1.5 WORK AREA AND WORKER PROTECTION

1.5.1 Select a space within work area which is well ventilated. Lay down one layer of 0.254 mm (10 mil) rip proof polyethylene sheeting to protect floor surfaces from contamination.

1.5.2 Workers to wear rubber boots and rubber gloves when performing actual separation and packing of PCB containing ballasts.

1.6 WASTE TRANSPORT AND DISPOSAL

1.6.1 Obtain and submit to Owner all Waste Manifests, as applicable.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
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Section 02 82 04 – Glove Bag Asbestos Abatement
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Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 02 – Level 2 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Section 2.2.2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all identified water damage and mould growth on visible surfaces within project areas for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases.

1.4.1.2 This Section (02 85 01) only applies to that work which may disturb water damaged or mould-contaminated materials where less than 1 m^2 (10 ft^2) of mould growth exists. Work must be planned so that all mould growth is removed following the measures and procedures in the Environmental Abatement Council of Ontario's *Mould Abatement Guidelines* (2015) prior to JVN project related work.

1.4.1.3 The contractor is solely responsible to confirm if any material they are disturbing is contaminated by mould growth.

1.4.1.4 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.5 All work may be subject to inspection and verification sampling by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or surface sampling, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.6 Contractor to erect a project health and safety board at each lead-abatement location which shall be posted for the duration of the work. Health and safety board to contain contact information, MSDS's, Safety Policy, JHAs, project specifications, project reports, action plans, etc.

1.4.1.7 Ensure all necessary permits for scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.8 The contractor is responsible for verifying the asbestos classification of any underlying materials and following all appropriate precautions, measures, and procedures as appropriate, in addition to mould abatement procedures.

1.5 DEFINITIONS

1.5.1 Refer to Item 1.5 of Section 02 85 03.

1.6 REGULATIONS

1.6.1 Refer to Item 1.6 of Section 02 85 03.

1.7 SUPERVISION

1.7.1 Refer to Item 1.7 of Section 02 85 03.

1.8 QUALITY ASSURANCE

1.8.1 Refer to Item 1.8 of Section 02 85 03.

1.9 SUBMITTALS

1.9.1 Refer to Item 1.9 of Section 02 85 03.

1.10 WORKER AND VISITOR PROTECTION

1.10.1 **Instructions:** Before entering mould work area, instruct workers and visitors in use of respirators, dress, wash station, entry and exit from mould work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by Competent Person as defined by Occupational Health and Safety Act.

1.10.2 **Half Face Negative Pressure Respirator:** Provide appropriate respiratory equipment for all persons within mould remediation work area. During removal and cleanup in mould work area workers, supervisors, and authorized visitors shall be supplied with and use half face negative pressure (HFNP) respirators with minimum N95 protection. Replace filters daily or test according to manufacturer's specifications and replace as indicated. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. Maintain respiratory protection equipment in proper functioning and clean condition.

1.10.3 **Protective Clothing**: Provide workers with full body coveralls with integral hoods. Once coveralls are worn in mould work area, dispose of as contaminated waste. Workers shall wear other protective apparel required by Ministry of Labour construction regulations.

1.10.4 Persons leaving work area(s) shall remove gross contamination from clothing before leaving work area. Remove contaminated work suit and place in receptacles for disposal with other mould contaminated materials. Clean respirator to ensure that visible contamination is removed. Dispose of respirator filters as necessary. Wet clean inside of respirator.

1.10.5 Do not eat, drink, smoke, or chew gum or tobacco at work site.

1.10.6 Workers and visitors shall be fully protected as specified herein when possibility of disturbance of mould exists.

2 PART 2 - PRODUCTS

2.1 MATERIALS

2.1.1 **Disinfectant:** Standard of acceptance Benefect or Concrobium – 100% Natural Disinfectant & Fungicide.

2.1.2 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in mould abatement enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Installed by licensed electrician.

2.1.3 **HEPA Vacuum:** Vacuum with all necessary fittings, tools and attachments. Air must pass HEPA filter before discharge.

2.1.4 **Mould Waste Receptors**: Two separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness sealable clear polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag. Outer container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal.

2.1.5 **Polyethylene:** 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints. **Protective Coveralls:** Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark.

2.1.6 **Rip-Proof Polyethylene:** 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.

2.1.7 **Sprayer:** Garden type, portable manual sprayer, low velocity, capable of producing fine spray.

2.1.8 **Tape:** Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions.

3 PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 Enclosure isolation is not required for Level 1 mould remediation work. However, Abatement Contractor to install visible barricades and signage warning of the mould work.

3.1.2 Request building personnel to deactivate air handling and ventilation systems supplying or exhausting from mould work area(s).

3.1.3 Ensure existing power supply to mould work area is isolated and disconnected where necessary. Provide ground fault electrical system where application of amended water is required for wetting materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.4 Cover floor surfaces with polyethylene drop sheets. Cover other items in the immediate vicinity of the work area with polyethylene drop sheets to protect from dust.

3.1.5 Maintain emergency and fire exits from mould work area, or establish alternative exits satisfactory to authorities having jurisdiction.

3.2 DO NOT COMMENCE MOULD REMOVAL WORK UNTIL

3.2.1 Arrangements have been made for disposal of waste.

3.2.2 Tools, equipment and waste materials receptors are on hand.

3.3 MOULD CLEAN-UP/REMOVAL

3.3.1 **Ceiling Tiles:**

3.3.1.1 Carefully lift and remove water damaged and mould contaminated ceiling tiles from the ceiling grid. Place the removed ceiling tile directly into a waste bag for disposal. Do not allow the ceiling tile to break or drop to the floor.

3.3.1.2 Using a HEPA filtered vacuum, clean all surrounding ceiling tiles and ceiling track where the damaged ceiling tile was removed. After vacuuming is completed, damp wipe all surrounding ceiling surfaces and tracking, polyethylene drop sheet, the ladder used to access the ceiling tile and all tools and equipment used by the worker.

3.3.2 **Semi-Porous and Non-Porous Materials:**

3.3.2.1 Surface clean semi-porous (e.g. plaster, concrete, wood framing) and non-porous (metal vent grills) materials within the work area by first cleaning with a HEPA vacuuming, then using a hard-bristled brush with hot, soapy water to scrub the surface of the material. Once the material has dried, clean with a HEPA vacuum again.

3.3.2.2 Following cleaning, apply an optional disinfectant as per Item 2.1.1.

3.3.3 **Porous Materials:**

3.3.3.1 Porous materials must be removed and disposed of.

3.3.3.2 Where possible, cover the water damaged and mould contaminated area with polyethylene and tape. Carefully cut out the affected section of material. Remove intact as much as possible.

3.3.3.3 All items which are determined to be disposed of are to be placed as mould waste into mould waste receptors. Clear double polyethylene bags are to be used; inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer polyethylene bag immediately prior to transfer from site.

3.3.3.4 Treat all materials removed to exposed mould as mould-contaminated waste, unless such materials are specified to be reused.

3.4 CLEAN-UP

3.4.1 Evaluate factors that affect the success of disinfectant. These include, but are not necessarily limited to: organic matter present, extent of prior cleaning, type, and level of microbial contamination, type of disinfectant required, concentration, and time of exposure to the disinfectant required, and the nature of the material to be decontaminated.

3.4.2 Owner must be advised of their right to know about any product being applied in their work environment. Disinfectant application must comply with applicable local, provincial, or federal licensing requirements.

3.4.3 All surfaces within the work areas must be cleaned (including the polyethylene sheeting and equipment used in the remediation) using the following outline: 1. HEPA vacuum; 2. Wet clean using clean cloths and a disinfectant and; 3. HEPA vacuum.

3.4.4 A final review may be carried out by Environmental Consultant to ensure that no debris remains.

3.5 INSPECTION

3.5.1 From commencement of work until completion of clean-up operations, the Environmental Consultant may be present on a part-time basis; both inside and outside mould work area(s).

3.5.2 Inspection of the mould work area(s) may be performed to confirm the Abatement Contractor's compliance with the requirements of the specification and governing authorities. Any deviations from these requirements, which have not been approved in writing, may result in a stoppage of work, at no additional cost to the Owner.

3.5.3 The Environmental Consultant is empowered by the Owner to inspect adherence to specified procedures and materials, and to inspect for final cleanliness and completion. Additional labour or materials expended by the Abatement Contractor to provide satisfactory performance to the level specified shall be at no additional cost to the Owner.

3.5.4 If the mould work area is found unacceptable by the standards specified or required by governing authorities, the work required to meet the standards and obtain consent to proceed from the Environmental Consultant, shall be performed at no additional cost to the Owner.

3.5.5 Pay cost, at no additional cost to the Owner, to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.5.6 The Contractor is responsible for the cost of additional inspections by the Environmental Consultant and the Consultant as a result of Abatement Contractor's failure to perform satisfactorily regarding quality, safety, or schedule.

3.6 WASTE TRANSPORT AND DISPOSAL

3.6.1 Dispose of all mould-contaminated waste at local landfill. Should landfill reject this waste, an alternative disposal method may be required, such as incineration. All waste to be disposed of in accordance with R.R.O. 1990 Regulation 347, General – Waste Management. Check with dump operator to determine type of waste containers acceptable.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
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Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 03 – Level 3 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Section 2.2.2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all identified water damage and mould growth on visible surfaces within project areas for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases.

1.4.1.2 This Section (02 85 02) only applies to that work which may disturb water damaged or mould-contaminated materials where between 1 m^2 (10 ft^2) and 10 m^2 (100 ft^2), inclusive, of mould growth exists (or less than 1 m^2 (10 ft^2) within an HVAC system). Work must be planned so that all mould growth is removed following the measures and procedures in the Environmental Abatement Council of Ontario's Mould Abatement Guidelines (2015) prior to JVN project related work.

1.4.1.3 The Contractor is solely responsible to confirm if any material they are disturbing is contaminated by mould growth.

1.4.1.4 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.5 All work may be subject to inspection and verification sampling by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or surface sampling, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.6 Contractor to erect a project health and safety board at each lead-abatement location which shall be posted for the duration of the work. Health and safety board to contain contact information, MSDS's, Safety Policy, JHAs, project specifications, project reports, action plans, etc.

1.4.1.7 Ensure all necessary permits for scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.8 The contractor is responsible for verifying the asbestos classification of any underlying materials and following all appropriate precautions, measures, and procedures as appropriate, in addition to mould abatement procedures.

1.5 DEFINITIONS

1.5.1 Refer to Item 1.5 of Section 02 85 03.

1.6 REGULATIONS

1.6.1 Refer to Item 1.6 of Section 02 85 03.

1.7 SUPERVISION

1.7.1 Refer to Item 1.7 of Section 02 85 03.

1.8 QUALITY ASSURANCE

1.8.1 Refer to Item 1.8 of Section 02 85 03.

1.9 SUBMITTALS

1.9.1 Refer to Item 1.9 of Section 02 85 03.

1.10 WORKER AND VISITOR PROTECTION

1.10.1 **Instructions:** Before entering mould work area, instruct workers and visitors in use of respirators, dress, wash station, entry and exit from mould work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by Competent Person as defined by Occupational Health and Safety Act.

1.10.2 **Half Face Negative Pressure Respirator:** Provide appropriate respiratory equipment for all persons within mould remediation work area including authorized visitors. During removal and cleanup in enclosed mould work area -workers, supervisors, and authorized visitors shall be supplied with and use half face negative pressure (HFNP) with P100 filter cartridges (in accordance with NIOSH Part 84 requirements - high efficiency particulate aerosol (HEPA) cartridge filters). Replace filters daily or test according to manufacturer's specifications and replace as indicated. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour. Provide proper instruction to workers and visitors in use of respirators, including quantitative fit testing. Maintain respiratory protection equipment in proper functioning and clean condition.

1.10.3 Protective Clothing: Provide workers and visitors in full-enclosure sites with full body coveralls with integral hoods. Once coveralls are worn in mould work area, dispose of as contaminated waste. Workers and visitors shall wear other protective apparel required by Ministry of Labour construction regulations. Workers and visitors shall also wear other protective apparel required by Ministry of Labour construction regulations including rubber Nitrile gloves and boots.

1.10.4 Before entering full-enclosure mould work area(s) the worker shall don clean coveralls, boot covers, and a respirator with new or tested filters in the clean change room. The worker may remove street clothes in clean change room, but this is optional.

1.10.5 Persons leaving full-enclosure mould work area(s) shall remove gross contamination from coveralls before leaving mould work area. Proceed to dirty change room and remove coveralls. Do not remove respirator yet. Place contaminated coveralls in receptacles for disposal with other mould contaminated materials. Hardhats, protective eye wear, and work boots used without boot covers, etc., shall be left in dirty change room for later use. Still wearing respirator proceed to clean change room. Clean respirator to ensure that visible contamination is removed. After having thoroughly cleaned hands and face at the wash station, remove respirator. Remove filters and dispose of in container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Wet clean inside of respirator. Upon completion of mould abatement, dispose of footwear as contaminated waste or clean before removing from equipment and access area, or carry in sealed plastic bag to next contaminated site.

1.10.6 Removal of waste and equipment from double bagging room of waste decontamination enclosure system shall be performed by workers entering from outside. These workers shall wear clean coveralls and full-face, mould approved, respirator as specified in item 1.10.2. No worker shall use this system as means to leave or enter mould work area.

1.10.7 Do not eat, drink smoke or chew gum or tobacco at work site.

1.10.8 Workers and visitors shall be fully protected as specified herein when possibility of disturbance of mould exists.

2 PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 **Disinfectant and Sealant:** Standard of acceptance Benefect – 100% Natural Disinfectant & Fungicide, or equivalent.

2.1.2 **Flexible ducting:** Metal reinforced flexible ductwork, 12" diameter minimum.

2.1.3 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch

2.1.4 **HEPA Vacuum**: See Item 1.5, above. Vacuum to have all necessary fittings, tools, and attachments.

2.1.5 **Mould Waste Receptors**: Two separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness sealable clear polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag. Outer container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal.

2.1.6 **Negative Air Unit:** See Item 1.5, above. Unit shall be fitted with prefilter and HEPA final filter. Air shall pass HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place.

2.1.7 **Polyethylene**: 0.15 mm (6 mil) minimum thickness (Super Six) unless otherwise specified; in sheet size to minimize joints.

2.1.8 **Power Sprayer**: Standard of acceptance - Graco Maxi-wetter, or equivalent.

2.1.9 **Protective Coveralls:** Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark.

2.1.10 **Rip-Proof Polyethylene**: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.

2.1.11 **Sprayer**: Garden type, portable manual sprayer, low velocity, capable of producing fine spray.

2.1.12 **Tape**: Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions.

3 PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 All mould work under this section (Section 02 85 03) shall be completed by the full-enclosure method.

3.1.2 The abatement contractor shall pre-clean movable equipment, furnishings, and stored materials within the work area, then relocated items to a safe and secure on site. Items may be moved for off-site cleaning and/or storage at the discretion of the Owner. All items moved offsite and their condition must be carefully recorded.

3.1.3 All horizontal surfaces shall be pre-cleaned using damp cloth or sponge techniques prior to placement of polyethylene sheeting to any wall or floor surfaces. A disinfectant and/or detergent solution may be used for this task. HEPA equipped vacuum cleaners may also be used to perform this task.

3.1.4 Ensure existing power supply to mould work area is isolated and disconnected where necessary. Provide ground fault electrical system where application of amended water is required for wetting materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.5 If necessary, caulk and seal ducts and duct shafts to remain in service as required, to make airtight. Cut and cap supply ducts with rigid sheet metal caps and seal. Perform work at appropriate time under contaminated conditions if necessary.

3.1.6 Seal off openings such as doorways, windows, vents, service holes in walls and grilles to non-operating ducts with polyethylene sheeting sealed with tape or with polyurethane foam as appropriate.

3.1.7 Cover floor surfaces with polyethylene sheeting sealed with tape. Provide two separately sealed layers of polyethylene sheeting. Separately seal floor drains or openings. Use sufficient layers (2) and necessary sheathing for walking surface to protect floors which may be damaged. Provide additional protection for floors likely to be damaged by amended water, by covering floor with rip-proof polyethylene sheeting sealed with tape.

3.1.8 Cover with polyethylene sheeting, motors, heating units, fire apparatus, door closers, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings which are not being removed from mould work area and which could be damaged and/or which cannot be readily cleaned at completion of this work. Pre-clean surfaces potentially contaminated with mould, with HEPA vacuum or damp cloth with detergent solution prior to installing protection.

3.1.9 Erect a dust-proof enclosure around the Level 2 work area(s). The walls of the enclosure shall have at least one layer of rip-proof polyethylene sheeting that is secured either to existing structure, or where no structure exists, to a framed temporary wall by using metal or wood supports at 16” o.c. (on centre) with top and bottom continuous sill plates. Add additional bracing as necessary to support hoarding wall for site isolation.

3.1.10 If the area of the building where mould abatement is taking place is uncontrolled, install a hoarding on the outside of the polyethylene wall using rigid material such as plywood, drywall, or rigid corrugated plastic sheets (plasticore), wherever the perimeter of the enclosure is not an existing wall. Install a self-closing, lockable door on the entrance to the enclosure.

3.1.11 Establish negative pressure in mould work area as described in item 1.5.9. Negative pressure units shall have total rated capacity with filters in place sufficient to provide a minimum negative pressure of 5 Pascals (0.02 inches of water column) and minimum 4 air changes per hour. Volume of air shall be sufficient to ensure airflow is maintained from clean areas into mould work area. Vent units into building interior with approval from the Environmental Consultant and Owner. Leak test negative air units prior to commencement of abatement at operating position, using DOP/PAO method. Provide reports for unit efficiency test results within 24 hours of testing, including calibration certificates for testing equipment. Venting of exhaust air through occupied area shall be in rigid airtight ductwork. Operate negative pressure units continuously from this time

until completion of final air monitoring. Replace pre-filters as necessary to maintain air flow. Maintain negative air pressure of 5 Pascal (0.02 inches water column) pressure differential within mould enclosure with respect to surrounding areas.

3.1.12 Maintain emergency and fire exits from mould work area(s), or establish alternative exits satisfactory to authorities having jurisdiction.

3.1.13 Ensure existing power supply to mould work area is isolated and disconnected where necessary. Do not disrupt power supply to remaining areas of building. Provide ground fault electrical system where application of amended water is required for wetting mould contaminated materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.14 Provide temporary lighting in mould work area to levels that will permit work to be done safely and well.

3.1.15 Provide fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.

3.2 WORKERS' DECONTAMINATION ENCLOSURE SYSTEM

3.2.1 Construct workers' decontamination enclosure at entrance to each mould work area. Worker decontamination enclosure system shall consist of a single chamber decontamination room.

3.2.2 Provide a set of curtain doorways at entrance/exit of the decontamination room.

3.3 WASTE DECONTAMINATION ENCLOSURE SYSTEM

3.3.1 If the size and layout of the Level 2 work area permit, construct a system comprised of a one-chamber waste transfer room. The purpose of this system is to provide means to decontaminate drums, scaffolding, material containers, vacuum and spray equipment; and other tools and equipment for which the worker decontamination system is not suitable. Provide curtain doorways at the entrance/exit to the waste transfer room.

3.3.2 Wipe the exterior of the waste clean then place a second bag around the bagged waste. Seal the second bag. Transfer the double bagged waste into the waste transfer room for removal by workers entering from the outside of the decontamination facilities.

3.3.3 **Waste Transfer Room:** Build waste transfer room in order to transfer double bagged waste to the outside area. Workers to enter the waste transfer room from outside the decontamination facilities. The Waste Transfer Room shall not be used as a means of entering or exiting the enclosure.

3.4 CONSTRUCTION OF DECONTAMINATION CLOSURES

3.4.1 **Floor:** Prior to erecting wall framing, lay 1 sheet of rip-proof polyethylene over floor area to be covered by enclosures. Turn 600 mm (24") of rip-proof polyethylene up outside of enclosure, overlapping with polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene to all floors, extending 600 mm up inside of enclosure walls.

3.4.2 **Walls:** If no existing structure is present at enclosure walls, build load bearing walls of 39 mm x 89 mm (2" x 4") wood framing, 400 mm (16") o.c. with continuous top and sill plates. Cover both sides walls with polyethylene sheeting. If the area in which the enclosure is constructed is uncontrolled, the exterior (facing occupied side) of any temporary framed walls shall be covered with min. 9 mm (3/8") plywood sheeting, drywall, corrugated plastic sheeting, or other suitable rigid material. Caulk seal and tape rigid sheet joints.

3.4.3 **Roof:** Polyethylene sheeting may be affixed to existing structure, if the existing structure is capable of supporting the weight of the additional material. If no suitable existing structure is present, support the roof with poles or joists, as necessary. Size of joists shall be determined by span, loads, and use. Where necessary, use as a minimum 39 mm x 138 mm (2" x 6") joists. Cover joists with 19 mm (3/4") plywood sheeting. Seal and tape joints, and cover with two layers of rip-proof polyethylene. At underside of joists, install one layer of polyethylene sheeting.

3.4.4 **Doorways:** Build curtain doorways designed so that when workers or drums and equipment move through doorway, one of two barriers comprising doorway always remains closed.

3.5 **MAINTENANCE OF ENCLOSURES**

3.5.1 Maintain enclosures in tidy condition.

3.5.2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

3.5.3 Visually inspect enclosures at beginning and end of each working period.

3.6 **DO NOT COMMENCE MOULD REMOVAL WORK UNTIL**

3.6.1 Arrangements have been made for disposal of waste.

3.6.2 Mould work areas and decontamination enclosures are effectively segregated. Negative pressure equipment is operating continuously.

3.6.3 Tools, equipment and waste materials receptors are on hand.

3.6.4 Arrangements have been made with the Owner and the Environmental Consultant for work area security.

3.6.5 Signs are displayed in areas where access to sealed mould work area is possible. Signs shall read:

CAUTION
Mould Hazard Area
No Unauthorized Entry
Wear Assigned Protective Equipment

3.6.6 Environmental Consultant has been notified of intention to proceed and has reviewed enclosures, equipment and procedures.

3.7 MOULD REMOVAL

3.7.1 The Abatement Contractor shall refer to the DSHM report to determine if asbestos or lead procedures are required in conjunction with mould removal procedures. Refer to Section 02 82 03 for Type 3 asbestos abatement procedures and Section 02 83 00 for Lead abatement procedures.

3.7.2 Concrete base materials and non-porous materials (such as metallic vent grills) shall be aggressively cleaned where surface mould growth, water damage, and water staining are visually identified. Use non-powered hand-held tools and equipment to clean these materials. Once cleaning is complete apply a disinfectant to all surfaces within the work area.

3.7.3 Plaster materials may be aggressively surface cleaned, or may require removal. Confer with Owner and/or Environmental Consultant.

3.7.4 Remove water damaged and mould contaminated drywall to a point at least 30 cm (1') from visible mould growth in all directions.

3.7.5 Remove water damaged and mould contaminated fibreglass insulations at least 60 cm (2') back from visible mould growth, staining, and/or damage. Re-insulation to be completed by others.

3.7.6 Place all general waste into mould waste receptors. Clear double polyethylene bags are to be used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer polyethylene bag in container cleaning room immediately prior to transfer from site.

3.7.7 Treat all materials removed from inside the enclosure as mould-contaminated waste, unless such materials are specified to be reused. In the case that removed materials are also asbestos-containing, dispose of materials as asbestos waste. See Section 02 82 03 for details.

3.8 CLEAN-UP

3.8.1 Evaluate factors that affect the success of disinfectant. These include, but are not necessarily limited to: organic matter present, extent of prior cleaning, type and level of microbial contamination, type of disinfectant required, concentration and time of exposure to the disinfectant required, and the nature of the material to be decontaminated.

3.8.2 Owner must be advised of their right to know about any product being applied in their work environment. Disinfectant must be applied in accordance with label instructions by properly protected persons and only in unoccupied buildings or contained areas. Disinfectant application must comply with applicable local, provincial, or federal licensing requirements.

3.8.3 All surfaces within the work areas must be cleaned (including the polyethylene sheeting and equipment used in the remediation) using the following outline: 1. HEPA vacuum; 2. Wet clean using clean damp cloths and disinfectant; and, 3. HEPA vacuum.

3.8.4 The cloths are to be folded in 8 panel sections, dampened, and used continuously - keep folding and using clean panel to wipe surfaces. When all eight (8) panels have been used, discard cloth as mould contaminated waste. DO NOT contaminate wash water by re-dipping cloth. Cloth is to be dipped only once into the wash water.

3.8.5 Following final clean-up allow minimum of 12 hours flushing time with no disturbance of mould work area. Operate negative air units and air scrubbers during this period.

3.9 **DISMANTLING OF PROTECTION**

3.9.1 Following sufficient flushing time of 12 hours and upon approval of Environmental Consultant, proceed with final dismantling of enclosure.

3.9.2 Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Carefully roll sheeting away from walls to centre of mould work area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.

3.9.3 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in mould waste receptors for transport. Remove with HEPA vacuum any debris which may have fallen behind sheeting.

3.9.4 Clean/disinfect mould work area(s), equipment, and access area, clean change room, dirty change room and other enclosures that may have been contaminated during work.

3.9.5 Clean/disinfect mould waste receptors and equipment used in work area and remove from mould work area(s) via drum and equipment decontamination enclosure system, at an appropriate time in sequence.

3.9.6 Clean/disinfect any items that were covered with polyethylene sheeting and stored within the mould remediation area such as furniture, shelves, etc.

3.9.7 Remove hoardings, temporary lighting, equipment, and facilities provided for work.

3.9.8 A final review may be carried out by the Environmental Consultant to ensure that no debris remains.

3.10 **RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS**

3.10.1 When clean-up is complete re-establish mechanical and electrical systems to remain operative in proper working order. Arrange for, and pay costs of electrical or mechanical repairs needed due to work of this Section.

3.10.2 Make good all damage at completion of work not identified in pre-removal survey.

3.10.3 Mould abatement contractor to re-instate all previously moved items.

3.11 **INSPECTION**

3.11.1 From commencement of work until completion of clean-up operations, Environmental Consultant may be present on a full or part time basis, both inside and outside contained work areas, at the discretion of the Owner.

3.11.2 If mould work areas or adjacent areas, are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to Owner.

3.11.3 If visual inspection shows that areas inside and outside work areas or decontamination facilities are contaminated, clean these areas in same manner as that applicable to microbial work areas, at no cost to Owner.

3.11.4 Pay cost to provide re-inspection and re-testing of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.12 **CLEARANCE INSPECTION AND MONITORING**

3.12.1 Environmental Consultant may arrange for visual clearance inspection to be performed after completion of all work.

3.12.2 If visual inspection shows that areas inside or outside current mould work area(s) enclosure or decontamination facilities are contaminated, clean these areas in same manner as that applicable to mould work areas, at no cost to Owner.

3.12.3 Final air/surface sampling may also be performed at the discretion of the Environmental Consultant and the Owner. If final air or surface sampling is requested, the Abatement Contractor will cooperate with the Environmental Consultant. Refer to Item 3.12 of Section 02 85 03 for details on clearance sampling.

3.13 **WASTE TRANSPORT AND DISPOSAL**

3.13.1 Dispose of all mould-contaminated waste at local landfill. Should landfill reject this waste, an alternative disposal method may be required, such as incineration. All waste to be disposed of in accordance with R.R.O. 1990 Regulation 347, General – Waste Management.

3.13.2 Check with dump operator to determine type of waste containers acceptable.

END OF SECTION

1 PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

1.1.1 The General Conditions of and the Supplementary Conditions to CCDC 2-2008 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.

1.2 RELATED WORK

1.2.1 Section 02 80 00 – Silica Disturbance
Section 02 82 01 – Type 1 Asbestos Abatement
Section 02 82 02 – Type 2 Asbestos Abatement
Section 02 82 03 – Type 3 Asbestos Abatement
Section 02 82 04 – Glove Bag Asbestos Abatement
Section 02 83 00 – Lead Remediation
Section 02 84 16 – Mercury Removal
Section 02 84 33 – PCB Ballast Removal & Handling
Section 02 85 01 – Level 1 Mould Remediation
Section 02 85 02 – Level 2 Mould Remediation

1.3 SITE CONDITIONS

1.3.1 Refer to the Safetech Environmental Limited report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a list of all identified and suspected designated substances and hazardous building materials within the subject work areas. This report is herein referred to as "DSHM assessment report". This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended.

1.3.2 Refer to Section 2.2.2 of each of the building-specific reports provided in Appendices A through AD of the report titled "*Designated Substances and Hazardous Materials – Specific to the Ministry of the Attorney General (MAG) Justice Video Technology Program (JVN) – Thirty (30) MAG Facilities Across Ontario*", dated November 6, 2020, for a complete list of all identified water damage and mould growth on visible surfaces within project areas for each specific building respectively.

1.4 SCOPE OF WORK

1.4.1 General:

1.4.1.1 Perform all work required to install JVN Project equipment, including mounting equipment racks, cameras, speakers, and monitors to walls and ceilings, as well as running data cable through ceilings, bulkheads, or service chases.

1.4.1.2 This Section (02 85 03) only applies to that work which may disturb water damaged and/or mould-contaminated materials where greater than 10 m^2 (100 ft^2) of mould growth exists (or greater than 1 m^2 (10 ft^2) within an HVAC system) in a work area. Work must be planned so that all mould growth is removed following the measures and procedures in the Environmental Abatement Council of Ontario's *Mould Abatement Guidelines* (2015) prior to JVN project related work.

1.4.1.3 The contractor is solely responsible to confirm if any material they are disturbing is contaminated by mould growth.

1.4.1.4 Provide necessary scaffolding, work platforms, and safety equipment to adequately complete the work and maintain worker safety for all work. The Contractor shall provide Engineer stamped drawings and approvals for scaffolding and work platforms where required by law.

1.4.1.5 All work may be subject to inspection and verification sampling by the Environmental Consultant. Any contamination of surrounding areas, indicated by visual inspection or surface sampling, shall necessitate immediate clean-up of the affected areas at no additional cost to the Owner.

1.4.1.6 Contractor to erect a project health and safety board at each lead-abatement location which shall be posted for the duration of the work. Health and safety board to contain contact information, MSDS's, Safety Policy, JHAs, project specifications, project reports, action plans, etc.

1.4.1.7 Ensure all necessary permits for scaffolding / work platform construction, variances, demolition, etc. are posted at the site prior to start of work.

1.4.1.8 The contractor is responsible for verifying the asbestos classification of any underlying materials and following all appropriate precautions, measures, and procedures as appropriate, in addition to mould abatement procedures.

1.5 DEFINITIONS

1.5.1 **Abatement Contractor**: Specialized sub-contractor to the General Contractor of the contract who is responsible for abatement and remediation of designated substances and other hazardous materials.

1.5.2 **Authorized Visitor(s):** Owner's Consultant, person(s) representing regulatory agencies, or other authorized persons.

1.5.3 **Curtained Doorway:** Device to allow ingress or egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing 2 overlapping sheets of polyethylene sheeting (2 sheets of polyethylene per flap) attached to head and one jamb of existing or temporarily constructed door frame. Secure vertical edge of 1 flap along 1 vertical side of door frame and vertical edge of other flap along opposite vertical side of door frame. Reinforce free edges of polyethylene with duct tape.

1.5.4 **Disinfectant Cleaning Product**: Standard of acceptance: Benefect or Concrobium – 100% Natural Disinfectant & Fungicide.

1.5.5 **DOP/PAO Test**: A testing method used to determine the integrity of the HEPA filters, particularly the Negative Pressure Unit, using dioctyl phthalate (DOP) or Poly Alfa Olefin (PAO) HEPA filter leak test. **For this project, provide documentation that negative air units have been DOP/PAO tested within the last thirty days**.

1.5.6 **Environmental Consultant**: Third party inspection agency hired by the Owner.

1.5.7 **HEPA Filter:** High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.

1.5.8 **HEPA Vacuum**: A vacuum device fitted with a 99.97% (0.3 micrometer) high efficiency particulate aerosol filter removal system that is constructed in such a way that all air passing through the vacuum must pass through the filter, without bypass or leakage, before being discharged.

1.5.9 **Negative Pressure:** Reduced pressure within mould work area(s) established by extracting air directly from work area, and discharging it directly to exterior of building. Discharged air first passes through HEPA filter. Extract sufficient air to ensure constant reduced pressure at perimeter of work area with respect to surrounding areas.

1.5.10 **Polyethylene Sheeting:** Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.

1.5.11 **Work Area(s)**: Area(s) where work takes place which will, or may disturb mould growth on building materials and finishes.

1.6 REGULATIONS

1.6.1 Comply with Federal, Provincial, and local authority requirements. The more stringent requirements shall apply in the event of a conflict with any particular authority or jurisdiction. Regulations and Guidelines including:

1.6.1.1 *Construction Projects*, O. Reg. 213/91, amended to O. Reg. 327/19, made under The Occupational Health and Safety Act.

1.6.1.2 *Designated Substances*, O. Reg. 490/09, made under The Occupational Health and Safety Act.

1.6.2 Handle and dispose of mould-contaminated material as outlined in:

1.6.3 Environmental Abatement Council of Ontario (EACO) Mould Abatement Guidelines Edition 3 (2015).

1.6.4 Contractor shall ensure that:

1.6.5 Measures and procedures prescribed under the Occupational Health & Safety Act and regulations are carried out.

1.6.6 Every employee and every worker on the project shall comply with applicable act and regulations.

1.6.7 Health and safety of workers and public is protected.

1.6.8 Policies and procedures of Owner are complied with.

1.6.9 All material handling and associated equipment conform to and are operated in accordance with "Workplace Hazardous Materials Information System" (WHMIS).

1.6.10 Advise Owner whenever work is expected to be hazardous to employees and/or public.

1.6.11 Contractor may be requested to provide information on their health and safety record. Workers suffering from known pre-existing allergies, respiratory ailments (including asthma) or other immune-compromising conditions should not be allowed to perform mould remediation work.

1.7 SUPERVISION

1.7.1 Provide onsite, an Overall Superintendent, with authority to oversee all aspects of the work, including but not limited to, estimating and negotiation of changes to the contract, update of submission requirements, scheduling, manpower and equipment requirements, and direct communication and coordination with project representatives and/or the Environmental Consultant.

1.7.2 Provide onsite, in addition to the Overall Superintendent, and for each work shift, a Shift Superintendent who has authority regarding all aspects related to manpower, equipment, and production.

1.7.3 Supervisory personnel must hold a recognised certificate proving attendance at a mould removal training course (two-day minimum duration) and have supervised a minimum of five (5) other mould remediation projects in similar size and/or complexity.

1.7.4 The Overall Superintendent or the Shift Superintendent must be on site at all times during work. Failure to comply with this requirement will result in a stoppage of all work, at no cost to the Owner.

1.7.5 Replace supervisory personnel with approved replacements within one (1) working day of a written request. The Owner reserves the right to request replacement of supervisory personnel without explanation.

1.7.6 Abatement Contractor cannot replace supervisory personnel without written approval from the Owner.

1.8 QUALITY ASSURANCE

1.8.1 Ensure work proceeds to schedule, and meets all requirements of this Section. Perform work so that airborne spores, mould contaminated waste, or water runoff do not contaminate areas outside the mould abatement work area. The Environmental Consultant is empowered to order a shutdown of work when a leak or breech of isolation has occurred or is likely to occur.

1.8.2 Pay cost to the Owner of inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or schedule.

1.8.3 Use only skilled and qualified workers for all trades required for this work.

1.8.4 All work of this section involving electrical, mechanical, carpentry, glazing, etc. shall be performed by licensed persons experienced and qualified for the work required.

1.8.5 The Owner, Consultant, and the Environmental Consultant will not be responsible for and will not have control or charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs required for the work in accordance with the applicable construction safety legislation, other regulations or general construction practice. The Owner, Consultant, and the Environmental Consultant will not be responsible for or have control or charge over the acts or

omissions of the Abatement Contractor, his Subcontractors or their agents, employees, or other persons performing any of the work.

1.9 SUBMITTALS

1.9.1 Mould abatement workers shall be trained in the hazards of mould abatement and in the procedures to be followed. Training at a minimum shall include classroom and site instruction in the hazards of mould, personal protective equipment, including respirator fitting and use, abatement practices and clean-up. General Health and Safety training as required by the Occupational health and safety Act for Construction Sites, waste handling and disposal shall be provided to all workers. Workers must be fit to work with potential mould exposure. Workers with a history of significant allergic disease (asthma, hay fever, hives etc.) or with a potential immuno-compromised status (persons with an immune system disease, taking immune system suppression medication etc.) should consult with an experienced physician to determine whether mould removal activities and the associated potential for exposure to pathogenic materials, would present an unacceptable risk.

1.9.2 Site supervisor must be trained in accordance with the Institute of Inspection Cleaning and Restoration Certification (IICRC) requirements including “Water Damage Restoration” and “Applied Microbial Remediation Technician” or equivalent by a recognized body.

1.9.3 Submit list of existing damage for acceptance by the Owner.

1.9.4 Laws of province of Ontario shall govern this work. Contractor shall observe all such laws and shall obtain and/or pay all permits, notices, fees, taxes, duties as may be required. Likewise, it is responsibility of contractor to comply with Workplace Safety and Insurance Board (WSIB).

1.9.5 Before commencing any work, Contractor shall submit, in writing, confirmation of good standing with Workplace Safety and Insurance Board (WSIB).

1.10 WORKER AND VISITOR PROTECTION

1.10.1 **Instructions:** Before entering mould work area, instruct workers and visitors in use of respirators, dress, wash station, entry and exit from mould work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by Competent Person as defined by Occupational Health and Safety Act.

1.10.2 **PAPR Full Face Respirator:** Provide appropriate respiratory equipment for all persons within mould remediation work area including authorized visitors. During removal and cleanup in enclosed mould work area workers, supervisors, and authorized visitors shall be supplied with and use powered or non-powered air-purifying full-face respirator (PAPR) with P100 filter cartridges (in accordance with NIOSH Part 84 requirements - high efficiency particulate aerosol (HEPA) cartridge filters). Replace filters daily or test according to manufacturer's specifications and replace as indicated. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. Maintain respiratory protection equipment in proper functioning and clean condition.

1.10.3 **Protective Clothing:** Provide workers and visitors in full-enclosure sites with full body coveralls with integral hoods. Once coveralls are worn in mould work area, dispose of as contaminated waste. Workers and visitors shall wear other protective apparel required by Ministry of Labour construction regulations. Workers and visitors shall also wear other protective apparel required by Ministry of Labour construction regulations including rubber Nitrile gloves and boots.

1.10.4 Before entering full-enclosure mould work area(s) the worker shall don clean coveralls, boot covers, and a respirator with new or tested filters in the clean change room. The worker may remove street clothes in clean change room, but this is optional.

1.10.5 Persons leaving full-enclosure mould work area(s) shall remove gross contamination from coveralls before leaving mould work area. Proceed to dirty change room and remove coveralls. Do not remove respirator yet. Place contaminated coveralls in receptacles for disposal with other mould contaminated materials. Hardhats, protective eye wear, and work boots used without boot covers, etc., shall be left in dirty change room for later use. Still wearing respirator proceed to clean change room. Clean respirator to ensure that visible contamination is removed. After having thoroughly cleaned hands and face at the wash station, remove respirator. Remove filters and dispose of in container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Wet clean inside of respirator. Upon completion of mould abatement, dispose of footwear as contaminated waste or clean before removing from equipment and access area, or carry in sealed plastic bag to next contaminated site.

1.10.6 Store respirators in such a fashion as to allow them to be put on prior to entering mould work area at start of next shift If re-entry to mould work area is to take place after having left for eating or drinking, follow procedures listed in item 1.10.4.

1.10.7 Removal of waste and equipment from double bagging room of waste decontamination enclosure system shall be performed by workers entering from outside. These workers shall wear clean coveralls and half-face respirator as specified in item 1.10.2. No worker shall use this system as means to leave or enter mould work area.

1.10.8 Do not eat, drink smoke or chew gum or tobacco at work site.

1.10.9 Workers and visitors shall be fully protected as specified herein when possibility of disturbance of mould exists.

2 PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 **Disinfectant and Sealant:** Standard of acceptance Benefect – 100% Natural Disinfectant & Fungicide, or equivalent.

2.1.2 **Flexible ducting:** Metal reinforced flexible ductwork, 12" diameter minimum.

2.1.3 **Ground Fault Panel**: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch.

2.1.4 **HEPA Vacuum**: See Item 1.5, above. Vacuum to have all necessary fittings, tools, and attachments.

2.1.5 **Mould Waste Receptors**: Two separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness sealable clear polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag. Outer container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal.

2.1.6 **Negative Air Unit:** See Item 1.5, above. Unit shall be fitted with prefilter and HEPA final filter. Air shall pass HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place.

2.1.7 **Polyethylene**: 0.15 mm (6 mil) minimum thickness (Super Six) unless otherwise specified; in sheet size to minimize joints.

2.1.8 **Power Sprayer**: Standard of acceptance - Graco Maxi-wetter, or equivalent.

2.1.9 **Protective Coveralls:** Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark.

2.1.10 **Rip-Proof Polyethylene**: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.

2.1.11 **Sprayer**: Garden type, portable manual sprayer, low velocity, capable of producing fine spray.

2.1.12 **Tape**: Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions.

3 PART 3 - EXECUTION

3.1 PREPARATION

3.1.1 All mould work under this section (Section 02 85 03) shall be completed by the full-enclosure method.

3.1.2 The abatement contractor shall pre-clean movable equipment, furnishings, and stored materials within the work area, then relocated items to a safe and secure on site. Items may be moved for off-site cleaning and/or storage at the discretion of the Owner. All items moved offsite and their condition must be carefully recorded.

3.1.3 All horizontal surfaces shall be pre-cleaned using damp cloth or sponge techniques prior to placement of polyethylene sheeting to any wall or floor surfaces. A disinfectant and/or detergent solution may be used for this task. HEPA equipped vacuum cleaners may also be used to perform this task.

3.1.4 Ensure existing power supply to mould work area is isolated and disconnected where necessary. Provide ground fault electrical system where application of amended water is required for wetting materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.5 If necessary, caulk and seal ducts and duct shafts to remain in service as required, to make airtight. Cut and cap supply ducts with rigid sheet metal caps and seal. Perform work at appropriate time under contaminated conditions if necessary.

3.1.6 Seal off openings such as doorways, windows, vents, service holes in walls and grilles to non-operating ducts with polyethylene sheeting sealed with tape or with polyurethane foam as appropriate.

3.1.7 Cover floor surfaces with polyethylene sheeting sealed with tape. Provide two separately sealed layers of polyethylene sheeting. Separately seal floor drains or openings. Use sufficient layers (2) and necessary sheathing for walking surface to protect floors which may be damaged. Provide additional protection for floors likely to be damaged by amended water, by covering floor with rip-proof polyethylene sheeting sealed with tape.

3.1.8 Cover with polyethylene sheeting, motors, heating units, fire apparatus, door closers, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings which are not being removed from mould work area and which could be damaged and/or which cannot be readily cleaned at completion of this work. Pre-clean surfaces potentially contaminated with mould, with HEPA vacuum or damp cloth with detergent solution prior to installing protection.

3.1.9 Erect a dust-proof enclosure around the Level 3 work area(s). The walls of the enclosure shall have at least one layer of rip-proof polyethylene sheeting that is secured either to existing structure, or where no structure exists, to a framed temporary wall by using metal or wood supports at 16” o.c. (on centre) with top and bottom continuous sill plates. Add additional bracing as necessary to support hoarding wall for site isolation.

3.1.10 If the area of the building where mould abatement is taking place is uncontrolled, install a hoarding on the outside of the polyethylene wall using rigid material such as plywood, drywall, or rigid corrugated plastic sheets (plasticore), wherever the perimeter of the enclosure is not an existing wall. Install a self-closing, lockable door on the entrance to the enclosure.

3.1.11 Establish negative pressure in mould work area as described in item 1.5.9. Negative pressure units shall have total rated capacity with filters in place sufficient to provide a minimum negative pressure of 5 Pascals (0.02 inches of water column) and minimum 4 air changes per hour. Volume of air shall be sufficient to ensure airflow is maintained from clean areas into mould work area. Vent units into building interior with approval from the Environmental Consultant and Owner. Leak test negative air units prior to commencement of abatement at operating position, using DOP/PAO method. Provide reports for unit efficiency test results within 24 hours of testing, including calibration certificates for testing equipment. Venting of exhaust air through occupied area shall be in rigid airtight ductwork. Operate negative pressure units continuously from this time until completion of final air monitoring. Replace pre-filters as necessary to maintain air flow. Maintain negative air pressure of 5 Pascal (0.02 inches water column) pressure differential within mould enclosure with respect to surrounding areas.

3.1.12 Maintain emergency and fire exits from mould work area(s), or establish alternative exits satisfactory to authorities having jurisdiction.

3.1.13 Ensure existing power supply to mould work area is isolated and disconnected where necessary. Do not disrupt power supply to remaining areas of building. Provide ground fault electrical system where application of amended water is required for wetting mould contaminated materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

3.1.14 Provide temporary lighting in mould work area to levels that will permit work to be done safely and well.

3.1.15 Provide fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.

3.2 WORKERS' DECONTAMINATION ENCLOSURE SYSTEM

3.2.1 Construct workers' decontamination enclosure at entrance to each mould work area. Worker decontamination enclosure system shall comprise of two interconnecting rooms.

3.2.2 Provide a set of curtain doorways between each room, and at both dirty and clean entrances to enclosure systems.

3.2.3 **Dirty Change Room:** Build room adjacent to mould work area. Install waste receptor, and storage facilities for worker's footwear and any protective clothing to be re-worn in mould work areas. Dirty change room shall be large enough to accommodate specified facilities, and other equipment needed, and at least one worker allowing sufficient space to undress comfortably. Minimum size 3 square metres (30 sq. ft.).

3.2.4 **Clean Change Room:** Build room outside of enclosures. If the area in which the enclosure is located is uncontrolled, provide vented wood door, with locking passage set at the doorway to the clean change room. Provide hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment.

3.3 WASTE DECONTAMINATION ENCLOSURE SYSTEM

3.3.1 If the size and layout of the Level 3 work area permit, construct system comprised of two linked rooms: Purpose of this system is to provide means to decontaminate drums, scaffolding, material containers, vacuum and spray equipment; and other tools and equipment for which worker decontamination system is not suitable. Provide curtain doorways between rooms and at both dirty and clean entrances to enclosure set-up.

3.3.2 **Double Bagging Room:** Construct a double bagging room adjacent to the mould work area. Once the exterior of the bags has been wiped clean, place a second bag around the bagged waste. Seal the second bag. Transfer the double bagged waste into the waste transfer room for removal by workers entering from the outside of the decontamination facilities.

3.3.3 **Waste Transfer Room:** Build waste transfer room in order to transfer double bagged waste to the outside area. Workers to enter the waste transfer room from outside the decontamination facilities.

3.4 CONSTRUCTION OF DECONTAMINATION ENCLOSURES

3.4.1 **Floor:** Prior to erecting wall framing, lay 1 sheet of rip-proof polyethylene over floor area to be covered by enclosures. Turn 600 mm (24") of rip-proof polyethylene up outside of enclosure, overlapping with polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene to all floors, extending 600 mm up inside of enclosure walls.

3.4.2 **Walls:** If no existing structure is present at enclosure walls, build load bearing walls of 39 mm x 89 mm (2" x 4") wood framing, 400 mm (16") o.c. with continuous top and sill plates. Cover both sides walls with polyethylene sheeting. If the area in which the enclosure is constructed is uncontrolled, the exterior (facing occupied side) of any temporary framed walls shall be covered with min. 9 mm (3/8") plywood sheeting, drywall, corrugated plastic sheeting, or other suitable rigid material. Caulk seal and tape rigid sheet joints.

3.4.3 **Roof:** Polyethylene sheeting may be affixed to existing structure, if the existing structure is capable of supporting the weight of the additional material. If no suitable existing structure is present, support the roof with poles or joists, as necessary. Size of joists shall be determined by span, loads, and use. Where necessary, use as a minimum 39 mm x 138 mm (2" x 6") joists. Cover joists with 19 mm (3/4") plywood sheeting. Seal and tape joints, and cover with two layers of rip-proof polyethylene. At underside of joists, install one layer of polyethylene sheeting.

3.4.4 **Doorways:** Build curtain doorways designed so that when workers or drums and equipment move through doorway, one of two barriers comprising doorway always remains closed.

3.5 MAINTENANCE OF ENCLOSURES

3.5.1 Maintain enclosures in tidy condition.

3.5.2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

3.5.3 Visually inspect enclosures at beginning and end of each working period.

3.6 DO NOT COMMENCE MOULD REMOVAL WORK UNTIL

3.6.1 Arrangements have been made for disposal of waste.

3.6.2 Mould work areas and decontamination enclosures are effectively segregated. Negative pressure equipment is operating continuously.

3.6.3 Tools, equipment and waste materials receptors are on hand.

3.6.4 Arrangements have been made with the Owner and the Environmental Consultant for work area security.

3.6.5 Signs are displayed in areas where access to sealed mould work area is possible. Signs shall read:

CAUTION
Mould Hazard Area
No Unauthorized Entry
Wear Assigned Protective Equipment

3.6.6 Environmental Consultant has been notified of intention to proceed and has reviewed enclosures, equipment and procedures.

3.7 MOULD REMOVAL

3.7.1 The Abatement Contractor shall refer to the DSHM assessment report to determine if asbestos or lead procedures are required in conjunction with mould removal procedures. Refer to Section 02 82 03 for Type 3 asbestos abatement procedures and Section 02 83 00 for Lead abatement procedures.

3.7.2 Concrete base materials and non-porous materials (such as metallic vent grills) shall be aggressively cleaned where surface mould growth, water damage, and water staining are visually identified. Use non-powered hand-held tools and equipment to clean these materials. Once cleaning is complete apply a disinfectant to all surfaces within the work area.

3.7.3 Plaster materials may be aggressively surface cleaned, or may require removal. Confer with Owner and/or Environmental Consultant.

3.7.4 Remove water damaged and mould contaminated drywall to a point at least 30 cm (1') from visible mould growth in all directions.

3.7.5 Remove water damaged and mould contaminated fibreglass insulations at least 60 cm (2') back from visible mould growth, staining, and/or damage. Re-insulation to be completed by others.

3.7.6 Place all general waste into mould waste receptors. Clear double polyethylene bags are to be used, inner bag shall be cleaned of gross contamination and placed in a clean 6 mil outer polyethylene bag in container cleaning room immediately prior to transfer from site.

3.7.7 Treat all materials removed from inside the enclosure as mould-contaminated waste, unless such materials are specified to be reused. In the case that removed materials are also asbestos-containing, dispose of materials as asbestos waste. See Section 02 82 03 for details.

3.8 CLEAN-UP

3.8.1 Evaluate factors that affect the success of disinfectant. These include, but are not necessarily limited to: organic matter present, extent of prior cleaning, type and level of microbial contamination, type of disinfectant required, concentration and time of exposure to the disinfectant required, and the nature of the material to be decontaminated.

3.8.2 Owner must be advised of their right to know about any product being applied in their work environment. Disinfectant must be applied in accordance with label instructions by properly protected persons and only in unoccupied buildings or contained areas. Disinfectant application must comply with applicable local, provincial, or federal licensing requirements.

3.8.3 All surfaces within the work areas must be cleaned (including the polyethylene sheeting and equipment used in the remediation) using the following outline: 1. HEPA vacuum; 2. Wet clean using clean damp cloths and disinfectant; and, 3. HEPA vacuum.

3.8.4 The cloths are to be folded in 8 panel sections, dampened, and used continuously - keep folding and using clean panel to wipe surfaces. When all eight (8) panels have been used, discard cloth as mould contaminated waste. DO NOT contaminate wash water by re-dipping cloth. Cloth is to be dipped only once into the wash water.

3.8.5 Following final clean-up allow minimum of 12 hours flushing time with no disturbance of mould work area. Operate negative air units and air scrubbers during this period.

3.9 DISMANTLING OF PROTECTION

3.9.1 Following sufficient flushing time of 12 hours and upon approval of Environmental Consultant, proceed with final dismantling of enclosure.

3.9.2 Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Carefully roll sheeting away from walls to centre of mould work area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.

3.9.3 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in mould waste receptors for transport. Remove with HEPA vacuum any debris which may have fallen behind sheeting.

3.9.4 Clean/disinfect mould work area(s), equipment, and access area, clean change room, dirty change room and other enclosures that may have been contaminated during work.

3.9.5 Clean/disinfect mould waste receptors and equipment used in work area and remove from mould work area(s) via drum and equipment decontamination enclosure system, at an appropriate time in sequence.

3.9.6 Clean/disinfect any items that were covered with polyethylene sheeting and stored within the mould remediation area such as furniture, shelves, etc.

3.9.7 Remove hoardings, temporary lighting, equipment, and facilities provided for work.

3.9.8 A final review may be carried out by the Environmental Consultant to ensure that no debris remains.

3.10 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

3.10.1 When clean-up is complete re-establish mechanical and electrical systems to remain operative in proper working order. Arrange for, and pay costs of electrical or mechanical repairs needed due to work of this Section.

3.10.2 Make good all damage at completion of work not identified in pre-removal survey.

3.10.3 Mould abatement contractor to re-instate all previously moved items.

3.11 INSPECTION

3.11.1 From commencement of work until completion of clean-up operations, Environmental Consultant may be present on a full or part time basis, both inside and outside contained work areas, at the discretion of the Owner.

3.11.2 If mould work areas or adjacent areas, are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to Owner.

3.11.3 If visual inspection shows that areas inside and outside work areas or decontamination facilities are contaminated, clean these areas in same manner as that applicable to microbial work areas, at no cost to Owner.

3.11.4 Pay cost to provide re-inspection and re-testing of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.12 CLEARANCE INSPECTION AND MONITORING

3.12.1 Environmental Consultant may arrange for air and/or surface samples to be taken during and after completion of all work.

3.12.2 Final air/surface sampling will be performed at the discretion of the Environmental Consultant and will only be done after the Environmental Consultant has completed a thorough visual inspection of all mould work areas and deemed these areas acceptable.

3.12.3 If air monitoring, surface sampling, or visual inspection shows that areas inside or outside current mould work area(s) enclosure or decontamination facilities are contaminated, clean these areas in same manner as that applicable to mould work areas, at no cost to Owner.

3.12.4 Clearance air samples collected within the work area will be compared to samples taken in adjacent areas from where the work area make-up air is being drawn and/or to outdoor air samples. An acceptable condition is indicated when the following is true:

3.12.4.1 Concentrations of airborne fungal particles in the work area are not significantly elevated when compared to concentrations in the control area.

3.12.4.2 The types of fungal particulate present in the work area do not significantly differ from those present in the reference area.

3.12.4.3 The clearance samples may also be compared to any similar measurements taken in the work area prior to the remediation work.

3.12.5 Clearance tape lift samples may also be collected and should show minimal or no mould growth remaining at completion. In addition, the type of settled spores detected on cleaned surfaces (if any) should not be dominated by spore types that are known to have been associated with the mould contamination. If tape lift samples or visual inspection shows that areas inside or outside current mould work area(s) enclosure or

decontamination facilities are contaminated, clean these areas in same manner as that applicable to mould work areas, at no cost to Owner.

3.13 WASTE TRANSPORT AND DISPOSAL

3.13.1 Dispose of all mould-contaminated waste at local landfill. Should landfill reject this waste, an alternative disposal method may be required, such as incineration. All waste to be disposed of in accordance with R.R.O. 1990 Regulation 347, *General – Waste Management*.

3.13.2 Check with dump operator to determine type of waste containers acceptable.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 QUALITY ASSURANCE

.1 Lumber identification: By grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: By grade mark in accordance with applicable CSA standards.

.3 Align and plumb faces of furring and blocking to tolerance of 1:600.

1.3 SUBMITTALS

.1 Test reports: Duplicate copies of flame spread classification test reports by independent testing agency to requirements of CAN/ULC S102.

PART - 2 PRODUCTS

2.1 MATERIAL

.1 Lumber: Acceptable to authorities having jurisdiction and unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with CSA O141 and NLGA Standard Grading Rules for Canadian Lumber, latest edition.

.2 Furring, blocking, nailing strips, grounds, and rough bucks: S2S, Standard or better grade.

.3 Douglas fir plywood: CSA O121, standard construction.

.4 Nailing discs: Flat caps, minimum 25 mm diameter, galvanized sheet metal formed to prevent dishing. Bell or cup shapes not acceptable.

.5 Nails, spikes and staples: CSA B111.

.6 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

PART - 3 EXECUTION

3.1 INSTALLATION - GENERAL

.1 Install members true to line, levels and elevations.

.2 Construct continuous members from pieces of longest practical length.

.3 Install spanning members with "crown-edge" up.

.4 Install materials so that grade-marks and other defacing marks are not visible or are removed by sanding.

3.2 WALL SHEATHING

.1 Install wall sheathing in accordance with manufacturer's printed instructions.

3.3 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support wall and ceiling finishes, facings, and other work as required.

3.4 **NAILING STRIPS, GROUNDS AND ROUGH BUCKS**

.1 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

3.5 **FASTENERS**

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

.3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM):

.1 ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops

.2 Underwriters' Laboratories of Canada (UL Canada):

.1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S104, Standard Method for Fire Tests of Door Assemblies

.3 CAN/ULC-S105, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

.4 CAN/ULC-S115, Standard Method of Fire Test of Firestop Systems.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 Fire rated assemblies: Labelled and listed by a nationally recognized testing agency having factory inspection service in conformance with CAN/ULC-S104 and CAN/ULC-S105 for ratings indicated.

1.4 SYSTEM DESCRIPTION

.1 Work of this Section is inclusive of all firestopping specified herein and indicated on Drawings except for firestopping and smoke seal within mechanical assemblies (i.e. inside ducts, dampers, intumenscent pipe sleeves) and electrical assemblies (i.e. inside bus ducts) shall be provided as part of work of the Mechanical and Electrical Divisions respectively. Firestopping and smoke seals around outside of such mechanical and electrical assemblies, where they penetrate fire rated separations, shall be part of work of this Section.

.2 Fire stopping materials and/or systems intended to act as firestop and smoke seal for any through-penetrating items, termination devices, receptacles or any cut-out openings or joints, including openings and spaces at perimeter edge conditions, with wall and floor assemblies having fire-resistance rating.

.3 Fire stop and seal (draft-tight) gaps, expansion joints and penetrations in fire separations and fire walls against passage of fire, smoke, gasses, fire fighter's hose stream and, where designated, passage of liquids. Smoke seal at angle support at fire dampers.

.4 Materials and systems capable of providing effective barrier against passage of fire, smoke, gasses, and where specifically indicated passage of liquids.

.5 Ensure firestopping system provides fire-resistance rating (flame and temperature) not less than fire resistance rating of surrounding floor, wall or assembly, in accordance with requirements of OBC.

.6 Firestop system rating: Comply with F, FH, FT, or FTH ratings as required by authorities having jurisdiction.

.7 Firestopping seals except for wall joints in visible areas must be of easily identifiable colour, such as red or yellow to be clearly distinguished from other building materials.

.8 Supply asbestos-free and PCB-free materials and systems tested in accordance with CAN/ULC S115, be ULC listed, or be acceptable by authorities having jurisdiction.

.9 Ensure suitability of products for application and compatibility of materials with surfaces to which it will be applied.

.10 Site system assembly shall be in accordance with ULC listed system design limitations, unless proposed assembly is approved by authorities having jurisdiction and meets Consultant's approval.

.1 Technical submissions that propose deviations from a listed assembly must be prepared, stamped and signed by a Professional Engineer, licensed to practice in the Province of Ontario.

1.5 **QUALITY ASSURANCE**

.1 Provide work of this Section using competent installers experienced, trained and approved by material or system manufacturer for application of materials and systems being used. Installers shall have minimum 5 years experience in installation of firestopping materials as systems for multiple trade projects.

.1 Approved applicators of fireproofing materials shall select, with manufacturer’s recommendations, ULC rated assembly to achieve the required fire resistance rating.

.2 Work of this Section shall be by one Sub-Contractor responsible for firestopping materials and systems for all of the Work except as outlined above.

.3 Pre-installation meeting: Prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review procedures to be adopted, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Consultant of the date and time of the meeting.

.4 Manufacturer’s site inspection: Have the manufacturer’s technical representative inspect the work at suitable intervals during application and at conclusion of the work of this Section, to ensure the work is correctly installed. When requested, submit manufacturer’s inspection reports and verification that the work of this Section is correctly installed.

.5 Request inspection by Consultant of completed systems before they are covered.

1.6 **COORDINATION**

.1 Coordinate with Sections involved (and advise dates) where work will take place throughout various areas of Work.

1.7 **DELIVERY, STORAGE AND HANDLING**

.1 Deliver materials to Site in manufacturer's sealed and labelled containers. Materials shall be subject to Consultant's inspection.

.2 Store materials inside building for 24 hours prior to use; store in area designated by Consultant; protect from damage and environmental conditions detrimental to material.

1.8 **ENVIRONMENTAL CONDITIONS**

.1 Maintain minimum temperature of 40 deg F for minimum period of 1 week before application, during application and until application is fully cured.

.2 Conform to manufacturer's recommended temperatures, relative humidity and substrate moisture content for storage, mixing, application and curing of firestopping materials.

.3 Ventilate areas in which firestopping is being applied. Protect water-soluble material from wetting until fully cured.

1.9 **SUBMITTALS**

.1 Shop Drawings: Submit complete and detailed shop drawing for each condition encountered on Site. Indicate following:

.1 ULC assembly number certification, unless proposed assembly is approved by authorities having jurisdiction and meets Consultant's approval

.2 Required temperature rise and flame rating

.3 Hose stream rating (where applicable)

.4 Thickness

.5 Proposed installation methods

.6 Material of firestopping and smoke seals, primers, reinforcements, damming materials, reinforcements and anchorages/fastenings

.7 Size of opening

.8 Adjacent materials

.9 Number of penetrations

.10 Location of penetrations

.2 Product Data: Submit up-to-date manufacturer's product data proposed for use under this Section. Include manufacture printed instructions for installation.

.3 Samples: If requested, submit samples of each type of firestopping systems, smoke seals and accessories. Indicate location where material/system shall be used

.4 Certification: Submit current ULC listings and certified copies of test reports and/or smoke seals indicating that firestopping material/systems conforms to or exceeds specified requirements.

1.10 **WARRANTY**

.1 Warrant work of this Section against defects and deficiencies for period of 5 years commencing at the date of Substantial Performance. Promptly correct any defects or deficiencies which become apparent within warranty period, to satisfaction of Consultant and at no additional cost to Owner. Defects shall include but shall not be limited to cracking, breakdown of bond, failure to stay in place or bleeding.

PART - 2 PRODUCTS

2.1 **MATERIALS**

.1 Primer: As recommended by firestopping material manufacturer for specific substrate and use.

.2 Damming and backup materials, support and anchoring devices: Non-combustible, in accordance with tested assembly and as recommended by manufacturer. Combustible material for damming purpose may be permitted only if they are removed after permanent firestop materials are cured. Sheet steel covers over temporarily unused sleeves shall be minimum 0.8 mm (1/32") thick galvanized steel sheet.

.3 Pipe and duct insulation and wrappings: Compatible with firestopping material; as recommended by manufacturer.

.4 Fire stopping and smoke seals at opening intended for ease of re-entry such as cable: Elastomeric seal. Do not use cementitious or rigid seal at such locations.

.5 Fire stopping and smoke seals at opening around penetrations for ductwork and other mechanical items requiring sound and vibration control: Elastomeric seal. Do not use cementitious or rigid seal at such locations.

.6 Sealants at vertical surfaces: Non-sagging.

.7 Sealants on floor surfaces requiring level finish: Self-levelling.

PART - 3 EXECUTION

3.1 PREPARATION

.1 Remove combustible material and loose material detrimental to bond from edges of penetration. Clean, prime or otherwise prepare substrate material to manufacturer's recommendation.

.2 Do not apply firestop material to surfaces previously painted or treated with sealer, curing compound, water repellent or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.3 Verify openings, dimensions and surfaces conform to fire and smoke seal assembly.

.4 Comply with manufacturer's recommended requirements for temperature, relative humidity, moisture content and presence of any sealer or release agents on substrate during application and curing of materials. Surfaces shall be dry, dust and frost free.

.5 Fully protect walls, windows, floors and other surfaces around areas to be firestopped from marring or damage.

.6 Prime surfaces in accordance with manufacturer's directions. Mask where necessary to avoid spillage on to adjoining surfaces. Remove stains on adjacent surfaces as required.

.7 Remove insulation from area of insulated pipe and duct where such pipes or ducts penetrate fire separation unless ULC certified assembly permits such insulation to remain within assembly.

.8 Provide temporary forming, packing and bracing materials necessary to contain firestopping. Upon completion, remove forming and damming materials not required to remain as part of system.

.9 Install damming and firestopping materials as per manufacturer's instructions.

.10 Mix materials at correct temperature and in strict accordance with manufacturer's directions.

3.2 INSTALLATION

.1 Seal penetrations through and gaps in fire rated separations. Fill gap in accordance with ULC details for tested system selected.

.2 Apply firestopping materials in strict accordance with manufacturer's written instructions and tested designs to provide required temperature and flame rated seal. Apply with sufficient pressure to properly fill and seal openings to ensure continuity and integrity of fire separation. Tool or trowel exposed surfaces as required.

.3 Remove excess compound promptly as work progresses and upon completion.

.4 Examine sizes, anticipated movement and conditions of opening and penetration to establish correct system and depth of backup materials and of firestopping material required. Use firestopping and smoke seals best suited for specific application as required, indicated or specified. Use only components specified in fire test of system. Do not eliminate any component for firestop system that was present in fire tests.

.5 Do not cover materials until full cure has taken place.

.6 Provide firestop systems at following locations, without being limited to:

.1 At openings, voids and penetrations through floor slabs except openings within shafts constructed with a fire resistance rating and slabs on granular fill.

.2 At openings, voids and penetrations through fire rated masonry, concrete and gypsum board walls, partitions and shaft walls.

.3 At openings, voids and penetrations installed for future use through fire rated masonry, concrete and gypsum board walls, partitions and shaft walls.

.4 Around mechanical and electrical assemblies penetrating fire assemblies.

.5 Between perimeter of floor and roof slabs and exterior wall construction, and cladding systems.

.6 Between tops of fire rated walls and partitions and underside of floor or roof slabs.

.7 At all expansion joints in walls, floors and assemblies as detailed

.7 Refer to all other sections of Specifications and the Drawings to ascertain where firestops are to be used and, if noted, type of firestop required.

.8 Cure materials in accordance with manufacturer's directions.

3.3 **CLEANING**

.1 Remove excess materials and debris and clean adjacent surfaces immediately after application to satisfaction of Consultant. Remove and/or correct staining and discolouring of adjacent surfaces as directed.

.2 Remove temporary combustible damming materials after initial set of firestopping materials. Such dams may be required to remain in place if flame spread rating is below 25, in accordance with CAN/ULC-S102.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section for joint sealants as indicated on drawings and as required.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

1.2 REFERNCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM C719, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)

.2 ASTM C834, Standard Specification for Latex Sealants

.3 ASTM C920, Standard Specification for Elastomeric Joint Sealants

.4 ASTM C1248, Standard Test Method for Staining of Porous Substrate by Joint Sealants

.5 ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

1.3 ACTION SUBMITTALS

.1 Product Data: Submit to Consultant Product information from sealant manufacturer prior to commencement of work of this Section verifying:

.1 Selected sealant materials are from those specified.

.2 Composition and physical characteristics.

.3 Surface preparation requirements.

.4 Priming and application procedures.

.5 Suitability of sealants for purposes intended and joint design.

.6 Test report on adhesion, compatibility and staining effect on samples of adjacent materials used on Project.

.7 Sealants compatibility and adhesion with other materials and Products with which they come in contact including but not limited to sealants provided under other Sections, insulation adhesives, bitumens, membranes, stone, concrete, masonry, metals and metal finishes, ceramic tile, plastic laminates and paints.

.8 Suitability of sealants for temperature and humidity conditions at time of application

.2 Samples: Submit duplicate samples of each type of material and colour. Submit samples of primer, bond breaker tape and joint backing material, if requested.

1.4 INFORMATION SUBMITTALS

.1 Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

.2 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.5 **ADMINISTRATIVE REQUIREMENTS**

.1 Pre-installation meeting:

.1 Two (2) weeks prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review with installer preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section.

.2 Establish a procedure to maintain optimum working conditions and to coordinate this work with related and adjacent work.

.3 Advise the Consultant of the date and time of the meeting.

1.6 **QUALITY ASSURANCE**

.1 Applicators: Recognized and established sealant applicators with at least five years experience and having skilled mechanics thoroughly trained and competent in the use of sealant equipment and the specified materials.

.2 Single source responsibility: Use sealants from single manufacturer for each different product required to ensure compatibility.

.3 Pre-installation compatibility and adhesion testing: Provide sealant manufacturer samples of actual materials that will contact or affect their sealants in the Work for compatibility and adhesion testing. This testing will not be required where sealant manufacturer is able to furnish data acceptable to Consultant based on previous testing for adhesion and compatibility to materials matching those of the Work.

.4 Pre-installation field adhesion testing:

.1 Conduct site field-tests for adhesion of sealants to actual joint substrates using proposed preparation methods and materials recommended by manufacturer.

.2 Conduct tests for each type of sealant and substrate.

.3 Locate field-test joints where inconspicuous or as directed by Consultant. Include areas typical of those requiring removal of existing sealants and utilize methods proposed for sealant removal.

.4 Test method: Use manufacturer's standard field adhesion test methods and methods proposed for joint preparation to verify proper priming and joint preparation techniques required to obtain optimum adhesion of joint sealants to joint substrate.

.5 Evaluate and report results of field adhesion testing.

.6 Do not use joint preparation methods or sealants that produce less than satisfactory adhesion to joint substrates during testing.

.5 Standard of acceptance: Retain at least one 1500 mm long acceptable joint for each type of sealant and substrate installed during pre-installation field adhesion testing as standard of acceptability for the Work. Acceptable joints may form part of the Work.

1.7 **DELIVERY, STORAGE, AND HANDLING**

.1 Deliver and store materials in original wrappings and containers with manufacturer's seals

and labels, intact. Protect from freezing, moisture and water.

1.8 **PROJECT CONDITIONS**

.1 Do not proceed with installation of joint sealants under the following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer, or are below 5 deg C (40 deg F).

.2 When joint substrates are wet.

.3 Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

.4 Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART - 2 PRODUCTS

2.1 **MATERIALS - GENERAL**

.1 Provide interior joint sealants establishing and maintaining water tight, water resistant and air tight continuous joint seals without staining or deteriorating joint substrates.

.2 Ensure joint sealants comply with specified type, grade, class and uses.

.3 Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

.4 Provide Products with capability, when tested, for adhesion and cohesion under maximum cyclic movement in accordance with ASTM C719, to withstand required percentage change in joint width existing at time of installation and remain in compliance with other requirements of ASTM C920 for uses indicated.

.5 VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

.1 Architectural Sealants: 250 g/L.

.2 Sealant Primers for Nonporous Substrates: 250 g/L.

.3 Sealant Primers for Porous Substrates: 775 g/L.

.6 Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

.7 Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

.8 Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

.9 Sealants, cleaning solvents and primers: Compatible with each other.

.10 Colours of Exposed Joint Sealants: As selected by Consultant from manufacturer's full range. Allow for special colours as selected by the Consultant.

2.2 **JOINT SEALANTS**

.1 **Sealant Type 1**: Single-component, non-sag, polyurethane joint sealant meeting specified requirements of ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

.1 Dymonic by Tremco (Canada),

.2 SikaFlex 1a by Sika Canada Inc.

.3 MasterSeal NP1 by BASF Construction Chemicals, LLC-Building Systems.

.2 **Sealant Type 2**: Acrylic latex or siliconized acrylic latex joint sealant meeting specified requirements of ASTM C 834, Type OP, Grade NF.

.1 Tremflex 834 by Tremco Incorporated,

.2 MasterSeal by BASF Construction Chemicals, LLC-Building Systems.

.3 **Sealant Type 3**: Single component, non-skinning, non-hardening, non-sag synthetic rubber sealant, tested to reduce airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

.1 Acoustical Sealant by Tremco (Canada).

2.3 **MISCELLANEOUS MATERIALS**

.1 Joint primer: As recommended by sealant manufacturer for substrates, conditions and exposures indicated.

.2 Bond breaker: Polyethylene tape or other adhesive faced tape as recommended by sealant manufacturer to prevent sealant contact where it would be detrimental to sealant performance.

.3 Joint backer: Polyethylene foam rod or other compatible non-waxing, non-extruding, non-staining resilient material in dimension 25 percent to 50 percent wider than joint width as recommended by sealant manufacturer for conditions and exposures indicated. Ensure backing is compatible with sealant, primer and substrate.

.4 Masking tape: Non-staining, non-absorbent tape product compatible with sealants and adjacent joint surfaces that is suitable for masking.

.5 Cleaning Material: Non-corrosive, non-staining, solvent type, xylol, MEK, toluol, IPA or as recommended by sealant manufacturer and acceptable to material or finish manufacturers for surfaces adjacent to sealed areas free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants with joint substrates.

PART - 3 EXECUTION

3.1 **EXAMINATION**

.1 Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting

joint-sealant performance.

.2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **PREPARATION**

.1 Prepare surfaces to receive work in accordance with sealant manufacturer's instructions and recommendations except where more stringent requirements are indicated.

.2 Thoroughly clean joint surfaces using cleaners approved by sealant manufacturer whether primers are required or not.

.3 Remove all traces of previous sealant and joint backer by mechanical methods, such as by cutting, grinding and wire brushing, in manner not damaging to surrounding surfaces.

.4 Remove paints from joint surfaces except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer.

.5 Remove wax, oil, grease, dirt film residues, temporary protective coatings and other residues by wiping with cleaner recommended for that purpose. Use clean, white, lint-free cloths and change cloths frequently.

.6 Remove dust by blowing clean with oil-free, compressed air.

.7 Joint backer: Provide joint backer uniformly to depth required for proper joint design using a blunt instrument. Fit securely by compressing backer material 25 percent to 50 percent so no displacement occurs during tooling. Avoid stretching or twisting joint backer.

.8 Bond breaker: Provide bond-breaker recommended by sealant manufacturer, adhering strictly to the manufacturer’s installation requirements.

.9 Priming: Prime joint substrates where required. Use and apply primer to sealant manufacturers recommendations. Confine primers to sealant bond surfaces; do not allow spillage or migration onto adjoining surfaces.

.10 Taping: Use masking tape, where required, to prevent sealant or primer contact with adjoining surfaces that would be permanently stained or otherwise damaged by such contact or the cleaning methods required for removal. Apply tape so as not to shift readily, and remove tape immediately after tooling without disturbing joint seal.

3.3 **INSTALLATION**

.1 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.2 Install sealants immediately after joint preparation.

.3 Mix, apply and cure sealants in accordance with manufacturer's printed instructions.

.4 Install sealants to fill joints completely, without voids or entrapped air, using proven techniques, proper nozzles and sufficient force that result in sealants directly contacting and fully wetting joint surfaces.

.5 Install sealants to uniform cross-sectional shapes with depths relative to joint widths that allow optimum sealant movement capability as recommended by sealant manufacturer.

.6 Dry tool sealants in manner that forces sealant against back of joint, ensures firm, continuous full contact at joint interfaces and leaves a finish that is smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities.

.1 Tooling liquids that are non-staining, non-damaging to adjacent surfaces and approved by sealant manufacturer may be used if necessary when care is taken to ensure that the liquid does not contact joint surfaces before the sealant.

.2 Provide concave tooled joints unless otherwise indicated to provide flush tooling or recessed tooling.

.3 Provide recessed tooled joints where the outer face of substrate is irregular.

.7 Remove sealant from adjacent surfaces in accordance with sealant and substrate manufacturer recommendations as work progresses.

.8 Do not cover up sealants until proper curing has taken place.

.9 Protect joint sealants from contact with contaminating substances and from damages. Cut out, remove and replace contaminated or damaged sealants immediately, so that they are without contamination or damage at time of Substantial Performance.

3.4 **LOCATION SCHEDULE**

.1 Refer to Drawings for sealing work not specifically listed in this Section.

.2 Use one of the sealants specified for each type in following locations. Ensure sealant chosen from several specified types listed under Part 2 Materials, and recommended by manufacturer for use for conditions encountered:

.3 Seal following joints with Sealant Type 1 one component modified polyurethane sealant:

.1 Interior gypsum board control joints.

.4 Seal following joints with Sealant Type 2 acrylic sealant:

.1 Joints between interior metal frames and adjacent construction in interior partitions.

.2 Interior joints to receive paint finish.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes: Labour, Products, equipment and services necessary to complete the work of this Section, including but not limited to:

.1 Access doors and frames for walls and ceilings.

.2 Floor access doors and frames.

1.2 SUBMITTALS

.1 Product Data: Include construction details, fire ratings**,** materials, individual components and profiles, and finishes.

.2 Shop drawings:

.1 Include plans, elevations, sections, details, and attachments to other work.

.2 Detail fabrication and installation of access doors and frames for each type of substrate

.3 Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

.4 Samples: For each door face material, minimum 75 mm x 125 mm (3” x 5”) in size, in specified finish.

PART - 2 PRODUCTS

2.1 MATERIALS

.1 Product: Refer to the List of Materials as indicated on the Drawings for Product, manufacturer, colour, size and performance requirements.

2.2 FABRICATION – WALL AND CEILING UNITS

.1 Fabricate frames of 14 ga. steel, non-fire rated doors; 16 ga steel for fire rated doors (1 ½ hour rated).

.2 Fabricate door panels of 14 ga. Steel, non-fire rated doors; 18 ga. Steel for fire rated doors (1 ½ hours); filled with 50 mm fire rated fiberglass insulation.

.3 Weld, fill, and grind joints to ensure flush and square unit.

.4 Hardware:

.1 Hinge: 175 degree steel continuous hinge, non-fire rated doors; concealed door with concealed constant force closure spring.

.2 Lock: Screw driver slot for quarter turn cam lock, non-fire rated doors; Cylinder lock with latch, two keys for each unit for fire rated doors.

2.3 FINISH

.1 Base Metal Protection: five stag iron phosphate preparation, prime coat of grey baked enamel.

.2 Finish: as per finish schedule on drawings.

PART - 3 EXECUTION

3.1 EXAMINATION

.1 Examine substrates for compliance with requirements for 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 Comply with manufacturer's written instructions for installing access doors and frames.

.2 Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

.1 Adjust doors and hardware, after installation, for proper operation.

.2 Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 SCHEDULE

.1 Coordinate size, number required and location of access panels with mechanical and/or electrical contractor.

.2 Refer to mechanical and electrical drawings.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes: Labour, Products, equipment and services necessary to complete the work of this Section, including but not limited to:

.1 Non-fire rated acoustic pressed steel frames.

.2 Non-fire rated acoustic wood swing doors.

.3 Perimeter and bottom acoustic seals, and threshold.

.4 Factory finishing.

.2 Related Requirements

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

1.2 REFERENCES

.1 ANSI/WDMA I.S. 1A-13 - Interior Architectural Wood Flush Doors.

.2 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.4 Canadian Steel Door Manufacturers Association (CSDMA), Selection and Usage Guide for Steel Doors and Frames.

.5 FSC – Forest Stewardship Council Standard for Chain of Custody Certification.

.6 HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames.

1.3 PERFORMANCE REQUIREMENTS

.1 Acoustic Performance: minimum Sound Transmission Class (STC) 45 tested to ASTM E90.

.2 STC ratings shall be verified by an acoustical test report included with Shop Drawings and/or submittals by an independent laboratory in accordance with ASTM E90. The door shall be fully operable at the time of the test and shall be opened and closed several times prior to measurement. The test shall be performed on the exact door/frame/seal assembly that is to be supplied for the Project and tested as a complete assembly. A test for the door and a separate test for the acoustical seals is not accptable.

.3 Noise Isolation Class (NIC): field testing no more than five (5) points below the laboratory STC rating.

.4 NIC ratings shall be verified by in-situ testing in accordance with ASTM E2964 by a qualified testing agency approved by the Architect/Owner. If the measured NIC rating differs by more than 1 point when the source and receiving rooms are switched, the arithmetic average of the two measured NIC ratings shall be used to establish acceptance.

.5 Any discrepancies between specified and installed performance shall be repaired or replaced without cost to the Owner

1.4 SUBMITTALS

.1 Product Data: Provide manufacturer’s standard data sheet illustrating standard door and frame construction.

.1 Submit sound seal manufacturer's product data.

.2 Submit manufacturer's installation instructions.

.2 Shop drawings: Indicate door and frame elevations, internal reinforcement, anchor types, closure methods, finishes, location of cut-outs for hardware, and cut-outs.

.3 Samples: Submit manufacturer's door finish sample, frame corner sample as well as perimeter acoustic seals.

.4 Test Data:

.1 Submit test data indicating compliance with the Sound Transmission Class (STC) requirements. Include laboratory name, test report number, and date of test.

1.5 **QUALITY ASSURANCE**

.1 Perform Work to requirements of CSDMA (Canadian Steel Door Manufacturers Association) standards.

.2 Single-Source Responsibility: Provide sound-rated doors and frames, including gaskets, hinges and other hardware items essential for meeting the specified acoustical performance as an assembly and by a single firm specializing in producing this type of work for a minimum of ten (10) years.

.3 Pre-installation Meeting: Convene a pre-installation meeting 2 weeks before start of installation of door and frame assemblies. Require attendance of parties directly affecting work of this section, including contractor, architect, installer, and manufacturer's representative. Review installation and coordination with other work

1.6 **DELIVERY, STORAGE, AND HANDLING**

.1 Comply with the requirements of NAMMA-HMMA 840.

.2 Weld minimum two temporary jamb spreaders per frame prior to shipment.

.3 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage.

.4 Store doors in horizontal position, frames in vertical position, spaced with blocking to permit air circulation between components.

.5 Store materials out of water and covered to protect from damage. Use covering that enables air circulation and does not permit light to penetrate.

.6 Store doors between 10 to 32 degrees C and 25 to 55 percent relative humidity.

.7 Clean and touch up scratches or disfigurement to wood and metal surfaces.

1.7 **WARRANTY**

.1 Manufacturer's Limited Warranty: Five (5) years from date of supply, covering material and workmanship.

PART - 2 PRODUCTS

2.1 **MANUFACTURERS**

.1 Acceptable Manufacturers: Ambico Limited, Ottawa, Ontario, or approved equivalent.

.1 Suppliers:

.1 Allmar Kanata

.2 ARJ

.3 CESS

.4 Division 8 Door Solutions

.5 Merlin Door Systems.

2.2 **MATERIALS**

.1 Sheet Steel:

.1 Galvanized steel to ASTM A653/A653M, galvanized coating designation ZF75 for interior door assemblies.

.2 Reinforcement and Channel: ASTM A653/A653M, ZF75.

.3 Wood door panel: FSC Certified, Urea-formaldehyde free acoustic core with wood veneer facing.

.1 Wood Veneer (WV-1): Refer to Section Finishes Schedule on Drawings.

.2 Door edging:

.1 For wood faced doors, provide hardwood stiles with stiles to match wood face and hardwood rails.

.2 Bottom rail may be omitted if required to meet acoustic performance requirements.

2.3 **ACCESSORIES**

.1 Threshold: To provide a seal for door in closed position.

.2 Acoustic seals: Provide perimeter and bottom seals, manufacturer standard.

.3 Door Hardware: refer to 08 71 00.

2.4 **FABRICATION**

.1 Manufacture doors and frames to STC rating of 45, measured in accordance with ASTM E90.

.2 Wood Doors:

.1 Fabricate doors to ANSI/WDMA IS1A. Provide suitable thickness, design, and acoustic core to achieve specified STC and fire performance ratings.

.2 Reinforce doors where surface-mounted hardware is required.

.3 Drill and tap steel acoustic core for mortised, templated hardware.

.3 Steel Frames:

.1 Sheet steel, metal thickness and appropriate to maintain door STC and fire ratings, mitred corners, fully welded seams.

.2 Factory assemble and weld frames.

.3 Install and adjust perimeter and bottom acoustic seals around frames and mullions.

.4 Affix permanent nameplates to door and frame, indicating manufacturer's name and STC rating.

2.5 **FINISHES**

.1 Metal Frame: Factory applied zinc phosphate primer.

.2 Factory Door Finish: Catalyzed lacquer, premium grade finish to WDMA I.S. 1A, clear coat only.

PART - 3 EXECUTION

3.1 INSTALLATION

.1 Install components including doors, frames, and hardware in accordance with manufacturer's written installation instructions.

.2 Install doors and frames to HMMA 840 standards.

.3 Utilize welders certified by Canadian Welding Bureau (CWB) for field welding.

.4 Coordinate with gypsum board wall construction for anchor placement.

.5 Set frames plumb, square, level and at correct elevation.

.6 Allow for deflection to ensure that structural loads are not transmitted to frame.

.7 Adjust operable parts for correct clearances and function.

.8 Install and adjust perimeter and bottom acoustic seals.

.9 Finish paint door frames in accordance with Section 09 91 00.

.10 Erection Tolerances: Maximum deviation from square, alignment, twist and plumb to be no more than ± 0.75 mm (1/32") in compliance with HMMA standards.

3.2 FIELD QUALITY CONTROL

.1 Provide qualified manufacturer's representative to instruct installers on the proper installation and adjustment of door assemblies.

.2 Provide manufacturer's representative to inspect door installation, and test minimum five (5) cycles of operation. Correct any deficient doors.

END OF SECTION

DOOR HARDWARE

08 71 00

JUSTICE VIDEO NETWORK

JVN JUSTICE VIDEO NETWORK

PROJECT:
MAG Justice Video Tech - PERTH COURTHOUSE **(230601)**
43 Drummond St E
Perth, ON
K7H 1G1

ARCHITECT: NORR
175 Bloor Street E.
North Tower, 15th Floor
Toronto, ON

Prepared By: Chad Connors
Date: March 7, 2025
Revised:

Architectural Hardware Finishes

Door Handing's

Abbreviations

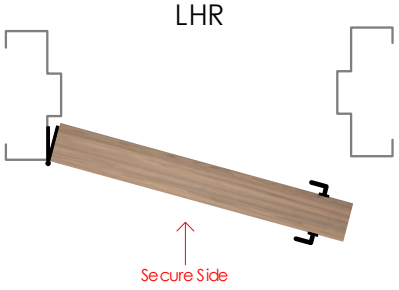
RH = Right Hand	RHA = Right Hand Active	SS = Single Slider
LH = Left Hand	LHA = Left Hand Active	BP = Bi-Parting Slider
RHR = Right Hand Reverse	RHA/LHA = Right & Left Hands Active	BF = Bi-Folding Slider
LHR = Left Hand Reverse	RHRA/LHRA = Right & Left Hand Reverse Active	TS = Telescopic Slider
RHRA = Right Hand Reverse Active	DA = Double Acting	PKT = Pocket Slider
LHRA = Left Hand Reverse Active	DE = Double Egress	

NOTE: The handing of a swing door is determined by placing yourself on the secured or keyed side of the door.

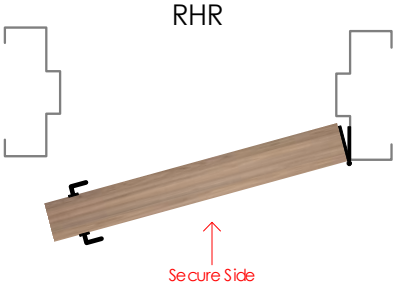
LH

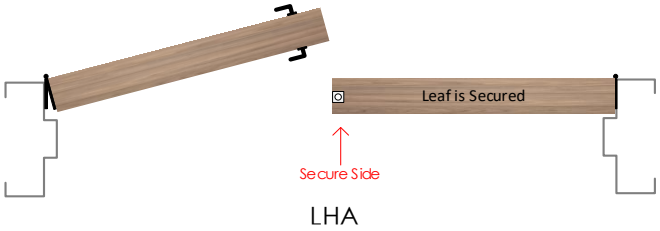
RH

LHR

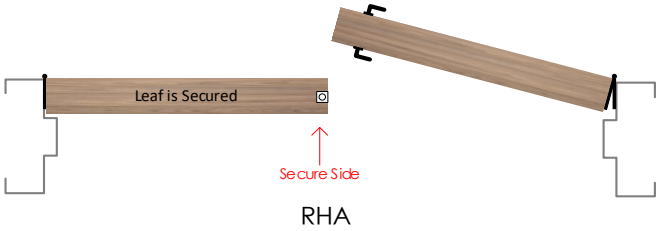


RHR



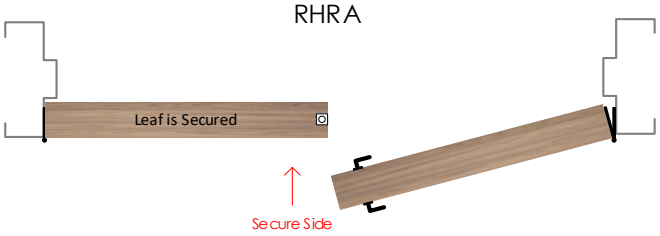


LHA

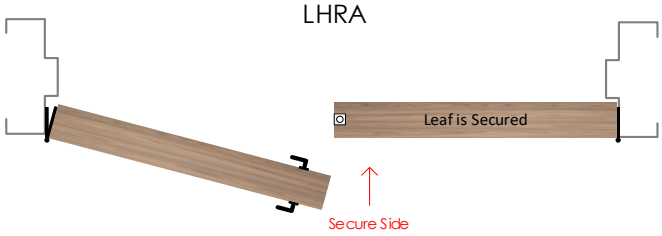


RHA

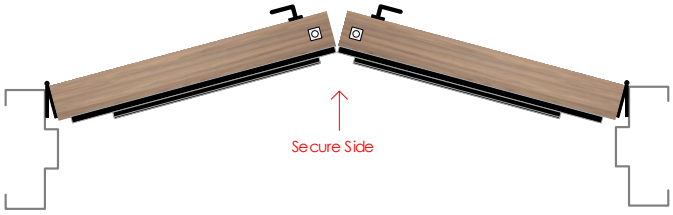
RHRA



LHRA

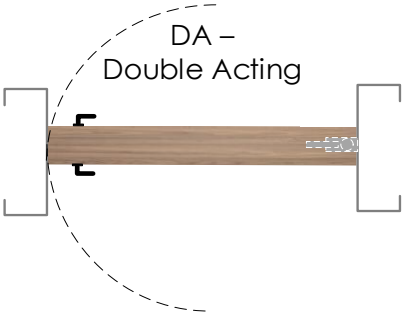


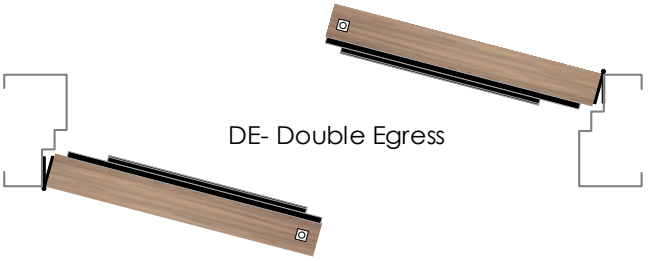
LHRA/RHRA



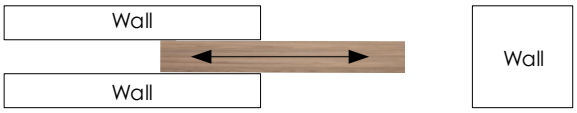
LHA/RHA

DA – Double Acting





DE- Double Egress



PKT- Pocket Door

SS- Single Sliding Door

BP- Bi Parting Sliding Door

BPS- Bi Passing Sliding Door

Products & Alternatives

NOTE: Only those products / brands listed here are acceptable and should be used to form a bid price. No unsolicited products will be considered. If acceptable alternates are listed here those too can be used to form a bid price provided, they are exactly the same as the specified item. If using an alternate product to form a price it is the bidder's responsibility to ensure that product is identical in every way to the specified item. If no alternates are listed, no alternate products are acceptable.

Product Type	Product#	Manufacturer	Alternate Manufacturer 1	Alternate Manufacturer 2
Hinge	TA786	McKinney		
Lockset	10X series	Sargent		
Electric Strike	1500C	HES		
Auto Door Operator	SW200i	Besam		
Column Actuator	CM-7436VR	Camden		
Kick Plate	K10A	Standard Metal		
Floor Stop	S102	Standard Metal		

Symbols

- Door has a fire rating and all associated hardware must have a fire label to suit. Must comply with local requirements.

- Door is automatic and is equipped with an auto operator. Door must meet local barrier free codes

- Door has an electrical requirement and requires power to be brought to the appropriate location above the door or to the latch, for either security or barrier free applications. Refer to security & electrical drawings for further information.

- Door requires security card access. Refer to security / electrical drawings for further information.

Abbreviations

Door:

HMD = Hollow Metal Door
IHMD = Insulated Hollow Metal Door
ALD = Aluminum Door
SSD = Stainless Steel Door
ISSD = Insulated Stainless Steel Frame
STL = Steel Door
IC-ALD = Insulated Clad Aluminum Door
SCWD = Solid Core Wood Door
HCWD = Hollow Core Wood Door
FGD = Frameless Glass Door
FRP = Fiberglass Reinforced Plastic Door
OHD = Overhead Door

Frame:

HMF = Hollow Metal Frame
ALF = Aluminum Frame
Cased Open HMF = Cased Open Hollow Metal Frame
SSF - Stainless Steel Frame
STL = Steel Frame
WDF = Wood Frame
Cased Open WDF = Cased Open Wood Frame
Cased Open Drywall = Cased Open Drywall

Fire Ratings:

0 HR – Zero Hour Fire Rating / Smoke Barrier
20 MIN – 20 Minute Fire Rating
¾ HR – 45 Minute Fire rating
1 ½ HR – 90 Minute Fire Rating
2 HR – 120 Minute Fire Rating
3 HR – 180 Minute Fire Rating

Disclaimer

Weblinks:
Weblinks do change from time to time as manufacturers move around their websites, please inform us if you have a none functioning weblink.

HARDWARE SCHEDULE

Heading# 1

Opening Information					
Opening Type:	Single	**Opening Size:**	900 x 2130 x 50	**STC Rating**	STC 45
Door Material:	HMD	**Frame Material:**	HMF	**Fire Rating**	None

1	**Total Openings**							
1	**Door#**	D01	**Location:**	Corridor	To	Privacy Booth 1-01	**Handing:**	RH

By Hardware Supplier					
3	Heavy Weight Butt Hinge	TA786 – 114 x 102	652 / US26D / Satin Chrome	McKinney	
1	Storeroom Lockset	10XG04 LNP (keyway to match existing)	626 / US26D / Satin Chrome	Sargent	
1	Electric Strike	1500C	630 / US32D / Satin Stainless Steel	HES	
1	Kick Plate	K10A 203 x 862	630 / US32D / Satin Stainless Steel	Standard Metal	
1	Floor Stop	S102	626 / US26D / Satin Chrome	Standard Metal	
1	Threshold	By STC door supplier		MFG	
1	Sound Seal	By STC door supplier		MFG	
1	Door Bottom	By STC door supplier		MFG	
By Automatic Operator Supplier					
1	Auto Door Operator	SW200i	628 / US28 / Clear Anodized	Besam	
1	Column Actuator	CM-7436VR	628 / US28 / Clear Anodized	Camden	
1	Relay	CX-33		Camden	

Notes:

- 120VAC is required at the head of the door for all barrier free door operators, 15A dedicated circuit. Wall/Frame must be reinforced for automatic operator mounting, all conduit and back boxes for actuators, emergency call kits, and washroom locking kits with pull cords are to be provided by the electrical contractor.
- Electrician to confirm wire locations with auto door operator supplier prior to pulling wires.

End of Heading

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 QUALITY ASSURANCE

.1 Conduct pre-installation meeting to verify project requirements, manufacture's installation instructions and manufacturer's warranty requirements.

.2 Have the supervision, administration and servicing of the work of this Section performed by a hardware specialist certified as an Architectural Hardware Consultant (AHC).

.3 Have the installation of hardware performed by a firm which specializes in this work.

.4 Have the hardware installer fully cooperate with the hardware specialist to ensure doors and hardware are properly and securely installed and that the installed doors and hardware are functioning properly.

1.3 SUBMITTALS

.1 Shop Drawings:

.1 The hardware specialist shall prepare and submit shop drawings containing a completely itemized schedule of hardware for review. The schedule of hardware shall list all doors by number (in sequence) and location with complete details of the hardware to be supplied, including installation heights and special instructions. Format of schedule to be approved.

.2 The schedule of hardware shall incorporate the catalogue numbers of hardware as specified and all alternatives which have been accepted.

.3 The Contractor shall furnish copies of final reviewed shop drawings to the doors and frames fabricators and to the door and hardware installers.

.2 Wiring Diagrams: Include complete wiring diagrams indicating all component parts, disconnect switches, conduit, and voltage requirements provided under other Sections, and required to operate assembly.

.3 Samples: The hardware specialist shall submit complete samples of hardware items for review, if so requested.

.4 Templates: The hardware specialist promptly furnish templates and information necessary for proper preparation or doors and frames and for the installation of hardware to the doors and frames fabricator and to the doors and hardware installer, in ample time to facilitate the progress of the work.

.5 Furnish manufacturers' instructions for proper installation of each hardware component.

.6 Maintenance instructions manual: Prior to Date of Substantial Performance, hand over to the Owner, a manual containing a final "as built" hardware schedule, full instructions for the adjustment, maintenance, spare part list etc. of all hardware items, together with special keys, wrenches etc. required to carry out normal adjustments to hardware.

.7 Certification: Prior to date of Substantial Performance, have the hardware specialist provide a letter which certifies that the doors, frames and hardware installations have been inspected and are satisfactory.

1.4 **INSPECTION AND SUPERVISION**

.1 The hardware specialist shall examine the Drawings, Hardware Schedules and shop drawings to determine final dimensions, sizes and quantity of the hardware items required, ensure that the hardware listed shall fit and operate properly and make adjustments to the hardware at no extra cost to the Owner.

.2 The hardware specialist shall obtain electrical characteristics of the security and fire alarm systems from the electrical Subcontractor and furnish electrically operated hardware which suits the electrical characteristics and wiring connection requirements at no extra cost to the Owner.

.3 The hardware specialist shall obtain and examine shop drawings for doors and frames to ensure proper provisions and preparations for hardware are made.

.4 The hardware specialist shall make periodic inspections of the hardware and door installations, report improper and unsatisfactory conditions and expedite the replacement or correction of faulty hardware.

.5 The hardware specialist and the door and hardware installer shall attend job site meetings when so requested.

1.5 **LABELLING, PACKAGING, DELIVERY AND STORAGE**

.1 Deliver and store each hardware item in the manufacturers' original containers. The containers shall be clearly labelled as to content and door on which the hardware is to be installed, in accordance with the shop drawing schedule of hardware.

.2 The hardware specialist shall be responsible for ensuring the timely delivery of hardware so that all on site work progresses without delay and interruptions.

.3 Store hardware in a locked storage room in the building. Lay out all hardware in an organized manner on shelves.

.4 Stockpile items sufficiently in advance to ensure their availability and make all necessary deliveries in a timely manner to ensure orderly progress of the total Work.

.5 Store items in such a manner to allow easy access to each hardware item/group as needed without significantly disrupting storage arrangement.

.6 Review shipments at time of arrival on the site to ensure agreement with respect to items shipped and received, quantity, back ordered or short-shipped items, and adherence to hardware schedule.

1.6 **EXTENDED WARRANTY**

.1 Fully warrant exit devices, locksets, latchsets and door closers for a period of five (5) years from the date of Substantial Performance of the Project.

.2 The warranty shall state expressly that all hardware will be replaced on the doors and frames at no cost to the Owner in the event of breakage or other defect occurring, willful damage excluded.

PART - 2 PRODUCTS

2.1 **HARDWARE SCHEDULE AND ALTERNATIVES**

.1 A hardware schedule specific to each Site is appended to this section. The schedules will be used for the purposes of establishing the hardware requirements and the hardware quality level.

.2 While certain manufacturer's catalogue numbers are used in the schedule of finishing hardware, it is not the intent that these items are specified exclusively. The manufacturer's numbers are used to denote minimum quality, style, design function, finish. Specified items that must be supplied without substitution are electrical strikes, locksets and latchsets, automatic door operators, security contracts, and alarms.

.3 Other manufacturer's products may be used providing the items are equal in all respects to the items specified, except as noted above.

.4 The Hardware Contractor shall submit a complete physical sample of each hardware type for review prior to the preparation of shop drawings. All hardware delivered to the job sites shall be equal in all respects to the accepted sample.

.5 List all manufacturer's names and complete catalogue number of all alternative hardware types proposed for supply and submit this list for review before preparing shop drawings.

.6 The Consultant's decision on the quality of proposed alternative products shall be final.

.7 Any proposed item that in the opinion of the Consultant is not equal to the item specified will be rejected and the supplier shall be required to supply items equal to the one specified at no extra cost.

2.2 **MATERIALS**

.1 General:

.1 Hardware shall be as specified in the hardware schedule prepared under the direction of the Consultant and as specified in this Section.

.2 Installed hardware shall comply with applicable fire and building codes and requirements of local authorities having jurisdiction over doors and hardware.

.3 All hardware applied to metal doors and frames shall be made to template.

.4 Supply hardware complete with all necessary screws, bolts and other fastening of suitable size and type to anchor the hardware in position neatly and properly in accordance with the best practices and to the Consultant's approval.

.5 All fastenings shall harmonize with the hardware as to materials and finishes.

.6 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.

.7 Finish on all stainless steel items (C32D) shall be equal to No. 4 finish.

.2 Hinges:

.1 Hinges for exterior doors shall be non-ferrous metal parts so that rust will not bleed from the bearing or other parts. Screws shall be provided in stainless steel.

.2 Where specified, provide hinges with non-removable pins or with safety stud feature to prevent doors being removed from frames even if pins are removed.

.3 Stamp hinge catalogue numbers on face of leaf of each hinge at factory to enable easy recognition of hinge material and manufacture after doors are hung.

.4 Where doors are required to swing to 180 degrees, furnish hinges of sufficient throw to clear trim.

.5 Furnish non-removable pins at out-swinging exterior doors.

.6 Supply concealed wired electric hinges with ULC label. Hinges to have 8 wires.

.3 Locks and Latches:

.1 Provide and install all locks and latches exactly as specified, complete with cylinders.

.2 Strikes shall be ANSI standard size with curved lip strikes for latch bolts and no lip strikes for dead locks. Provide complete with wrought boxes finished to match strike.

.4 Exit Devices:

.1 All exit devices installed on labelled fire doors shall bear the ULC Label.

.2 Through bolts complete with sleeves for mineral core doors.

.3 Coordinate exit devices with astragals, coordinators, carry open bars and thresholds for correct and safe operation.

.5 Keying:

.1 All locks and exit devices with cylinder operation shall be grand masterkeyed to Owner's requirements.

.2 Prepare a detailed keying schedule and submit to the Consultant for review. Revise as necessary to suit Owner's requirements before ordering cylinders. The Consultant will hand over to the hardware supplier a list of the Owner masterkeying requirements.

.3 Stamp all keys "DO NOT DUPLICATE".

.4 Provide 2 change keys for each lock. 3 keys for each submaster level and 6 grand master keys. In the case of keyed alike groups, supply 6 (six) cut keys only and supply the balance as blanks.

.5 Allow for keying as required including key alike sets and keyed different sets.

.6 Construction Keying:

.1 All lock cylinders shall have a construction masterkey system.

.2 The construction key system to be inoperative once the Owner's keys are inserted in the cylinders.

.3 Provide 12 construction master keys.

.7 Closers:

.1 All door closers shall be hydraulically controlled and full rack and pinion in operation.

.2 Each closer shall have adjustable general speed, latch speed and back check control.

.3 The swing power of door closers shall be adjustable.

.4 Supply to the Owner special closer keys and wrenches as usually packed with closers.

.5 Install all necessary attaching brackets, mounting channels, cover plates, etc. where necessary for correct application of door closers.

.6 Closers to have parallel arms at out swinging exterior doors and at interior doors where specified.

.7 Coordinate closers with overhead holders.

.8 Through bolts complete with sleeves for mineral core doors.

.8 Thresholds:

.1 Provide and install thresholds exactly as specified in required widths and lengths to suit door openings.

.2 The ends of the thresholds shall be cut to follow exactly the door frame profile.

.3 All thresholds shall be supplied in aluminum and installed complete with lead shields and stainless steel screws.

.9 Push Plates and Kickplates

.1 Provide and install stainless steel plates in C32D finish and install secure with screw fastening.

.2 Length of kick plates shall be 40 mm less than door width for single doors and 3/4" less than door width for doors in pairs.

.3 All stainless steel plates are to be 1.3 mm thick, free of rough or sharp edges. Corners and edges to be slightly radiuses. Install kick plates and armor plates on both sides of the door with 3M tape.

.4 Engrave pushplates with pictographs as noted in hardware schedule.

.10 Door Push/Pulls:

.1 Where door pulls are scheduled on one side of door and push plates on other side issue installations instructions to ensure that the pull is secured through door from reverse side and countersunk flush with door installation of push plate. Locate push plate to cover fasteners for door pulls.

.11 Door Stops:

.1 Wall stops shall not be installed on drywall partitions.

.2 Floor stops shall be installed so as not to create a tripping hazard and allows maximum opening of doors.

.3 Furnish door stops of height to engage doors.

.12 Door Seals:

.1 Provide and install door seals, top door sweeps and astragals.

.13 Electronic Hardware Items:

.1 Ensure electrical characteristics are compatible with card readers and related security systems provided by other Sections.

.2 Obtain electrical power and wiring characteristics from the Electrical Subcontractor and from the Electronic Security Subcontractor and provide the hardware to suit.

.3 Power Door Operators: Install operators by skilled trade persons who have been specifically trained in the installation and operation of these devices by a manufacturer's factory representative.

.4 All wiring shall be supplied and installed by Division 26 including conduit, boxes and other electrical appurtenances, including connection and termination.

.5 Be responsible for ensuring that all wiring work is performed at appropriate times to coordinate with installation of frames, doors and finish hardware. It is also responsible for ensuring that all electrical work is done in accordance with electronic hardware manufacturer's wiring diagrams and directions and that boxes, cut-outs, connections etc. are installed properly.

.6 Arrange for testing and commissioning of electronic finish hardware by manufacturer or system. Submit a copy of reports to Consultant.

.14 Miscellaneous Accessories:

.1 All other items, not specifically described but required for complete and proper installation of finish hardware, shall be as selected by Hardware Supplier subject to approval of the Consultant.

.15 Hardware Finish Codes:

	BHMA	Canadian Code	US Code	Description
.1	600	CP	USP	Primed for Paint
.2	602	C2C	US2C	Cadmium Plated
.3	603	C2G	US2G	Zinc Plated
.4	605	C3	US3	Brightened Brass, Clear Coated
.5	606	C4	US4	Satin Brass, Clear Coated
.6	612	C10	US10B	Satin Bronze, Clear Coated
.7	613	C10B	US10B	Oxidized Satin Bronze Oil Rub
.8	619	C15	US15	Satin Nickel Plate, Clear Coat
.9	625	C26	US26	Bright Chromium Plated
.10	626	C26D	US26D	Satin Chromium Plated
.11	627	C27	US27	Satin Aluminum Clear Coated
.12	628	C28	US28	Satin Aluminum Clear Anodize
.13	629	C32	US32	Polished Stainless Steel
.14	630	C32D	US32D	Satin Stainless Steel
.15	671	AL		Black Anodized
.16	689	SBL, AL	US28	Aluminum Paint
.17	690	DBL, STAT	US20	Dark Bronze Paint
.18	691	ES, SB		Bronze Lacquer
.19	692	TAN		Tan Lacquer
.20	693	KPD, BLACK		Black Lacquer
.21	696	EAB, SB		Satin Brass Lacquer

.16 keying symbol/codes:

.1	GGMK	Great Grand Master Keyed
.2	GMK	Grand Master Keyed
.3	MK	Master Keyed
.4	KA	Keyed Alike
.5	KD	Keyed Different
.6	SK	Separate Key (no masters)

.17 Hardware codes:

.1	LH	Left Hand
,2	RH	Right Hand
.3	LHR	Left Hand Reverse
.4	RHR	Right Hand Reverse
.5	LHA	Left Hand Active
.6	RHA	Right Hand Active
.7	LHRA	Left Hand Reverse Active
.8	RHRA	Right Hand Reverse Active
.9	SGL,SGLE	Single
.10	PR	Pair
.11	D/A	Double Acting
.12	O/S	Opposite Swing
.13	D/E	Double Egress
.14	DR	Door
.15	FR	Frame
.16	HM	Hollow Metal
.17	AL	Aluminum
.18	PS	Pressed Steel
.19	P/LAM	Plastic Laminate
.20	KAL	Kalamein
.21	HMD	Hollow Metal Door
.22	HMF	Hollow Metal Frame
.23	CIF	Channel Iron Frame
.24	PSF	Pressed Steel Frame
.25	WD	Wood
.26	WD/DR	Wood Door
.27	WD/FR	Wood Frame
.28	CYL	Cylinder
.29	H/O	Hold Open
.30	O/H	Overhead
.31	U/C	Undercut
.32	B/S	Back Set
.33	NRP	Not Removable Pin
.34	TB	Thru Bolts

.35	CTB	Countersunk Thru Bolts
.36	TMS	Template Machine Screws
.37	MS	Machine Screws
.38	STS	Self Tapping Screws
.39	WS/LS	Wood Screws & Lead Shields
.40	TRR	Labeled for Temperature Rise Rating.
.41	A Label, 3 Hour Label or 180MFR	Labeled for 180 minutes (3 hour) Fire Protection Rating.
.42	B Label, 1-1/2 Hour Label or 90 MFR	Labeled for 90 minutes (1-1/2hour) Fire Protection Rating.
.43	C Label, 3/4 Hour Label or 45 MFR	Labeled for 45 minutes (3/4 hour) Fire Protection Rating.
.44	20 MIN Label or 20 MFR	Labeled for 20 minutes Fire Protection Rating.

PART - 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: Examine doors, frames, related items and conditions under which work of this section is to be performed and identify conditions detrimental to proper and timely completion. Do not proceed until unsatisfactory conditions have been corrected.

.2 Confirm kickplate and threshold sizes before ordering.

3.2 INSTALLATION

.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide to Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association, except as otherwise indicated in this Section and elsewhere in the Contract Document.

.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

.3 Barrier Free Access: Mount all hardware in full conformity with authorities having jurisdiction. Confirm mounting heights with Consultant prior to commencement of frame and door preparation.

.4 Install all miscellaneous hardware as shown on details and specified.

.5 Do not use wall stops on gypsum board, demountable or moveable partitions.

.6 Mineral core doors: Pre-drill 3 mm diameter pilot holes for all hardware items. Manual turn fasteners into pilot holes. If installer does not follow this method, it may void door manufacturer warranty.

.7 Provide even margins between doors and jambs and doors and flooring and/or thresholds as follows:

.1 Hinge side: 1.6 mm.

.2 Latchside and head: 1.6 mm.

.3 Flooring and/or thresholds: 12 mm.

.4 Flooring, fire rated assemblies: 6 mm.

3.3 **HARDWARE MOUNTING HEIGHTS**

.1 Install and mount hardware as follows:

.1 Door knobs and lever: 965 mm centre line from finish floor

.2 Deadlock cylinder: 1370 mm centre line from finish floor

.3 Deadlatch cylinders: 1370 mm centre line from finish floor

.4 Door pulls: 1069 mm centre line from finish floor

.5 Push plates: 1090 mm centre line from finish floor

.6 Push bars: 1069 mm centre line from finish floor

.7 Top hinges: 125 mm down from top of door to top of hinge

.8 Bottom hinges: 250 mm up from finish floor to bottom of hinge

.9 Intermediate hinges: equally spaced between top and bottom hinges

.10 Floor stops: maximum 150 mm from lock edge when door is in fully open position

.11 Exit devices: to manufacturer's instructions

.12 Kickplates: maximum 3 mm from bottom of door to bottom of kickplate

3.4 **ADJUSTING AND CLEANING**

.1 Clean hardware with materials and methods as recommended by hardware manufacturer. Repair or replace defective hardware.

.2 Remove protective material where present.

.3 Adjust operable parts for correct function.

.4 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

.2 This Section includes glazing work not specified in other Sections. Refer to other Sections for other glazing.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Handle and store materials and products in accordance with manufacturer's recommendations. Deliver and store packaged materials and products in original, undamaged containers with manufacturer's labels and seals intact.

1.3 WARRANTY

.1 Warrant mirrors against defects in materials and workmanship for a period of 5 years against silver deterioration and for a period of two years against loosening the metal frames or fastening, and against cracking of the mirrors.

PART - 2 PRODUCTS

2.1 GLASS

.1 General:

.1 Glass: Each unit bearing manufacturer's label indicating quality and thickness.

.2 Thickness of glass: As shown on the Drawings except as specified herein.

.2 Tempered Safety Glass (GL-T):

.1 ASTM C1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), and meeting requirements of ANSI Z97.1, tong and roller marks free, minimum thickness 6 mm.

.2 Ensure surface compression is equal to or greater than 68.9 MPa (10 000 psi)

.3 Tempered glass material to come from one tempering furnace and be tempered to minimize distortion variance.

.1 Roller-wave distortion not to exceed 0.127 mm (0.005") from peak to valley.

.2 Maximum peak to valley roller-wave 0.8 mm (0.003”) in the central area and 0.20 mm (0.008”) within 267 mm (10.5”) of the leading and trailing edge.

.3 Maximum bow and warp 0.79 mm per lineal 305 mm (1/32” per lineal foot).

.3 Laminated Tempered Glass:

.1 Clear transparent laminated tempered glass conforming to ASTM C1172, Kind LT and meeting requirements of ANSI Z97.1, with two or more lites of flat glass, all of which are tempered safety glass as specified above, and bonded by an interlayer material.

.2 Fabricate laminated glass products free of foreign substances and air or glass pockets, in autoclave with heat plus pressure

.3 Laminate glass with interlayer to comply with interlayer manufacturer's written recommendations. Use materials that have a proven record of no tendency to bubble, discolour, or lose physical and mechanical properties after fabrication and installation

.4 Protect laminated glass interlayer from damage or discolouration resulting from contact with deleterious and incompatible sealants, substances, and materials. Comply with manufacturer's recommended installation instructions.

.5 Interlayer Type: Ionoplast interlayer, product DuPont SentryGlas® ionoplast or approved equivalent.

.4 Miscellaneous Glazing Materials: Provide materials with proven record of compatibility with surfaces contacted in installation.

.1 Cleaners, Primers and Sealers: Provide type recommended for compatibility by sealant and glass manufacturers.

.2 Blocking: Provide neoprene, EPDM or silicone blocks as required for compatibility with all glazing components. Size 100 mm long with width 1.5 to 3 mm greater than glass thickness and with blocking thickness as specified.

.1 Acceptable Products; subject to compliance with specified requirements:

.1 Advance Elastomer Systems, L.P.; Santoprene®.

.2 Tremco, Inc.; Dense Elastomeric Silicone Rubber Extrusions.

.2 Setting Blocks: 80 to 90 Shore A durometer hardness; 6 mm thick, unless otherwise indicated.

.3 Edge Blocks: 60 to 70 Shore A durometer hardness; 3 mm thick, unless otherwise indicated.

.3 Glazing Tape: Provide preformed glazing tape, size as indicated unless noted otherwise; manufacturer's special shimless formulation resistant to long term squeeze out except provide preshimmed where required by manufacturer for exterior exposure or large lights.

.1 Shimless Tape, 3 mm thickness, 13 mm width:

.1 Acceptable Products; subject to compliance with specified requirements:

.1 H.B. Fuller Company; PTI 303 Glazing Tape.

.2 Tremco, Inc.; 440 Tape.

.2 Characteristics: Preformed, cross-linked butyl tape, 100% solids.

.2 Preshimmed Tape, 3 mm thickness ,10 mm width:

.1 Acceptable Products; subject to compliance with requirements provide one of the following:

.1 H.B. Fuller Company; PTI 303 Spacer Rod Tape.

.2 Tremco, Inc.; Polyshim II Tape.

.2 Characteristics: Preformed, cross-linked butyl or polyisobutylene tape with integral continuous encased shim, 100% solids.

.5 Translucent film: As indicated on Finishes Schedule located on Drawings.

2.2 **FABRICATION**

.1 Accurately size glass to fit openings allowing clearances recommended by the Flat Glass Marketing Association. Cut glass clean and free of nicks and damaged edges. Grind smooth and polish exposed glass edges. Do not cut or abrade tempered, heat treated, or coated glass.

PART - 3 EXECUTION

3.1 **EXAMINATION**

.1 Verify dimensions at the site before proceeding with fabrication or glazing units.

.2 Ensure that openings are free from distortion, and that surfaces are free from protrusions that will obstruct face and edge clearances.

.3 Ensure that wood is sealed; ferrous metals are painted or zinc coated; and that surfaces are suitable for adhesion of the glazing materials.

.4 Ensure that movable units to be glazed are adjusted for proper operation.

.5 Ensure that ambient and surface temperatures are above 5 degree C.

3.2 **PREPARATION**

.1 Inspect hollow metal and other glass framing for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners, existence of minimum required face or edge clearances, and effective sealing of joinery.

.2 Provide written report listing conditions detrimental to performance of glazing work.

.3 Do no glazing work prior to correction of unsatisfactory conditions. Commencement of installation indicates Installer's acceptance of substrate.

.4 Ensure rabbets, stops and glass edges are free of dust, dirt, moisture, oil and other foreign matter detrimental to, or, obstructing the glazing material.

.5 Clean contact surfaces with solvent and apply primers to surfaces to receive tapes and sealants in accordance with the manufacturer's instructions. Ensure surfaces are free of moisture and frost.

.6 Clean glazing channels and other framing members to receive glass, immediately before glazing.

.1 Remove coatings which are not firmly bonded to substrates.

.2 Promptly complete glazing both sides of a lite once started, to prevent re-entry of dust and dirt in glazing channels.

3.3 **INSTALLATION**

.1 Comply with GANA recommendations for Wet Glazing with Preformed Tape and Cap Bead of Gunnable Elastomeric Sealant except where more stringent requirements are called for by technical reports of the manufacturer of the glass or glazing products and these specifications.

.2 Verify glazing channel dimensions. Provide 25 mm, plus or minus 1.5 mm, bite on glass, unless otherwise indicated. Provide edge and face clearances, and glazing tape and sealant dimensions indicated.

.3 Protect glass from damage during handling and installation; use a rolling block as required in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups as required to shift glass units within openings; do not raise or

drift glass with a pry bar. Rotate glass with flares or bevels as required along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weaken glass and impair performance and appearance.

.4 Install blocking in glazing channels, located one quarter of glass width from each corner, but no closer than 150 mm, unless otherwise indicated. Set blocks in thin course of sealant acceptable for heel bead use. Provide setting blocks at sills. Provide edge blocks at jambs and heads, unless otherwise indicated.

.5 Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

.6 Provide continuous glazing tape around the entire perimeter on both sides of the glass. Set glazing tape down 6 mm from top of stop as backer for cap bead sealant. Remove and reinstall any glass closer than 3 mm to frame or stops.

.7 Provide 6 mm deep cap bead sealant at all locations, unless otherwise indicated. Apply primers to joint surfaces where required for adhesion of sealant, as determined by sealant substrate testing. Force sealant into channel to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces. Tool exposed surfaces of sealant to provide a substantial "wash" away from glass.

.8 Remove non-permanent labels promptly after installation and promptly clean adhesive and other residue from both surfaces of all glass.

.9 Installation – Translucent Film

.1 Do not proceed with installation until finishing work has been completed in and around work area.

.2 Comply with manufacturer’s installation instructions.

.3 Install film using permanent adhesive. Follow manufacturer’s recommendations to prevent formation of air bubbles, wrinkles, blisters and other defects.

.4 Remove air bubbles, wrinkles and blisters.

3.4 POST INSTALLATION PROTECTION AND CLEANING

.1 Protect glass from contact with contaminating substances resulting from construction operations or cleaning of adjacent materials.

.2 Remove and replace glass which is broken, chipped, cracked, abraded, scratched or damaged in other ways during the construction period, including natural causes, accidents and vandalism.

.3 Clean glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of Substantial Performance in each area of project. Clean glass by method recommended by glass manufacturer.

.4 Upon completion of the work, remove all debris, equipment and excess material resulting from the work of this Section from the site.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes: Labour, Products, equipment and services necessary to complete the work of this Section, including but not limited to:

.1 Interior gypsum board.

.2 Load and Non-load-bearing steel framing systems for interior gypsum board assemblies.

.3 Suspension systems for interior gypsum ceilings, soffits, and grid systems.

.2 Related Requirements:

.1 Read and Comply with Conditions of the Contract and Division 01 - General Requirements.

1.2 ACTION SUBMITTALS

.1 Product Data:

.1 For each type of product, confirming compliance with the specified or named product or material.

.2 Prior to ordering products or materials, submit manufacturer's printed product datasheets for each type of product. Include product characteristics, performance criteria, physical size, finish and limitations for products listed in selected designs.

1.3 QUALITY ASSURANCE

.1 Install work level to tolerance of 3 mm in 3000 mm.

.2 Select studs with maximum deflection of L/360 at lateral force of 240 Pa for maximum heights indicated.

.3 Fire test response characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

.4 Sound transmission characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Install work only in areas closed and protected against weather, and maintained between 10 degree C and 21 degree 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.

.3 Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

.1 Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

.2 Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.5 **DELIVERY, STORAGE, AND HANDLING**

.1 Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

.2 Store materials inside, under cover, and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

PART - 2 PRODUCTS

2.1 **PERFORMANCE/DESIGN CRITERIA**

.1 Single source responsibility: Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

.2 Fire resistance rating: Where gypsum board systems with fire resistance ratings are indicated or required, provide materials and installations that are identical with those of applicable assemblies tested by fire testing laboratories acceptable to authorities having jurisdiction.

.3 Follow applicable requirements of ASTM C754 for installation of steel framing.

.4 Design system members to withstand own dead load, super-imposed dead loads, to maximum allowable deflection of L/240, without permanent deformation.

.5 Loads on walls acting as guards: Where the floor elevation on one side of a wall, including a shaftwall, is more than 600 mm (24") higher than the elevation of the floor or ground on the other side, the wall shall be designed to resist the lateral design loads prescribed in the building code or 0.5 kPa (0.07 PSI), whichever produces the greatest effect.

.1 For walls acting as guards provide engineered shop drawings, load diagrams, and design calculations signed and stamped by a professional engineer licensed in the Province of Ontario.

.2 Upon completion of the parts of the Work covered by the engineered submittal, the professional engineer responsible for the preparation of the engineered submittal, shall prepare and submit to the Consultant and authorities having jurisdiction, as required, a letter of conformance for those parts of the Work, certifying that they have been provided in accordance with the requirements of the Contract.

.6 Sheet metal thicknesses indicated herein pertains to the “minimum base steel thickness exclusive of coating”.

2.2 **GYPSUM BOARD PANELS**

.1 Gypsum board: ASTM C 1396/C 1396M, paper faced, regular and fire rated Type X core, 1200 mm (48") wide x maximum practical length, ends square cut, square edged base layer and taper edged face layer, thickness as indicated; CGC Sheetrock Brand Firecode X Gypsum Panels.

2.3 **FRAMING SYSTEMS**

.1 General: Metal gauges specified in this Section are minimum required thickness. Refer to Drawings for specific gauge requirements and applications.

.2 Steel studs: ASTM C645, minimum 0.46 mm (0.018") base metal thickness, hot-dipped galvanized to ASTM A653/A653M G60 (Z180) zinc coating, roll formed, widths as indicated, with knock-out holes for mechanical and electrical services. Use 20 gauge studs for cement board and fiber reinforced panels.

.1 Refer to Drawings for specific steel stud gauges and applications.

.3 Floor and ceiling tracks: ASTM C645, minimum 0.46 mm (0.018") base metal thickness, hot-dipped galvanized to ASTM A653/A653M G60 (Z180) zinc coating, roll formed, width to suit studs.

.4 Furring runners and channels: ASTM C645, minimum 0.46 mm (0.018") base metal thickness, hot-dipped galvanized to ASTM A653/A653M G60 (Z180) zinc coating, roll formed.

.5 Resilient steel furring channels: ASTM C645, 12.7 mm x 65 mm, 0.46 mm (0.018") base metal thickness, hot-dipped galvanized to ASTM A653/A653M G60 (Z180) zinc coating, roll formed; Hat shaped resilient furring channel for direct wall furring where resilient channels are indicated.

.6 Sound Isolation Clip: unibody moulded rubber and galvanized steel mount for acoustic wall assemblies.

.1 Product: GenieClip RST or approved equivalent.

.7 Channel bridging: 1.37 mm (0.0538") bare steel thickness, 38 mm (1-1/2") deep with minimum 12.7 mm (1/2") wide flange.

.8 Backing plate: Galvanized steel sheet for blocking and bracing in length and width indicated, minimum base metal 0.8 mm (0.0312") thick.

.9 Hangers, tie wires, inserts, anchors: Manufacturer's standard.

2.4 **TRIM ACCESSORIES AND AUXILIARY MATERIALS**

.1 Attachment clips: Sized to suit acoustical ceiling grid members, complete with screws and other fastening system, Revoe Clips by Revoe Manufacturing Ltd.

.2 Insulating strip: Rubberized, moisture resistant 3 mm (1/8") thick foam strip, 12 mm (1/2") wide, with self-sticking adhesive on one face, lengths as required.

.3 Casing beads, corner beads: 0.48 mm (25 gauge) hot dipped galvanized steel, perforated flanges, designed to be concealed with joint compound; one piece length per location.

.4 Reveal trims: Extruded 6063-T5 aluminum, designed to be concealed with joint compound, maximum lengths, reveal width and depth as indicated, Final Forms I 500 Series by Gordon Inc. or other approved equivalents.

.5 Acoustical sealant: Acoustical sealant by Tremco Ltd.

.6 Joint and laminating compounds: As recommended by gypsum board and cement board manufacturer, high bond, low shrinkage and asbestos-free.

.7 Joint tape: 50 mm (2") wide reinforced tape.

.8 Acoustical insulation: AFB by Roxul Inc., or SAFB by Fibrex, or QuietZone Acoustic Batt Insulation by Owens Corning Canada LP, or other approved equivalent; width to match stud spacing.

.9 Preformed partition end closure: aluminum trim of extruded alloy 6063 T5, in clear anodized finish; Drywall Molding End Closure by Fry Reglet Corporation, in required sizes for partitions indicated.

.10 Adjustable partition closure: spring loaded aluminum closure of extruded alloy 6063 T5, in clear anodized finish; Mullion/Mate Partition Closure by Gordon Interior Specialties Division, in required sizes for openings indicated.

PART - 3 EXECUTION

3.1 EXAMINATION

.1 Examine areas and substrates including welded hollow-metal frames and framing for compliance with requirements and other conditions affecting performance.

.2 Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION - GENERAL

.1 Comply with ASTM C840, Standard Specification for Application and Finishing of Gypsum Board.

3.3 INSTALLATION - PARTITION AND WALL FRAMING

.1 Align partition top and bottom tracks and secure by screws at 600 mm o.c. maximum.

.2 Place studs vertically at 400 mm oc, unless otherwise noted, and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in top and bottom tracks.

.3 Screw attach end studs to top and bottom tracks. Screw attach intermediate studs to bottom tracks. Secure intermediate studs to top tracks by crimping or by other means of fastening acceptable to Consultant.

.4 Continuously cross brace steel studs at 1500 mm on center to provide rigid installation to manufacturer's instructions.

.5 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

.6 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using clips or other approved means of fastening placed alongside frame anchor clips.

.7 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

.8 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.9 Provide stud, furring channel, and backing plates secured between studs for attachment of fixtures, electrical boxes, grab bars, washroom accessories, and other items. Comply with details indicated and with stud and gypsum board manufacturers' written recommendations.

.10 Terminate partitions at ceiling height except where indicated otherwise.

.11 Install continuous insulating strips to isolate studs from exterior window framing.

.12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.13 Apply two continuous beads of acoustical sealant at junctions of metal framing and structure, including bottom and top tracks, where partitions abut fixed building components. Fill junction completely and continuously from floor to ceiling, or to structure for full height partitions.

.14 Frame for gypsum board faced vertical bulkheads within and at termination of ceilings.

.15 Mechanically fasten resilient channels perpendicular to wall framing starting at 50 mm up from floor and end with 150 mm to the underside of structure at no more than 610 mm o.c. Install where indicated.

3.4 **INSTALLATION – ATTACHMENT CLIPS**

.1 Place attachment clips over acoustic ceiling main/cross tee from top. Line up pre-drilled hole on clip with hole on main/cross tee and screw clip to main/cross tee with 13 mm wafer screw. Screw through pre-drilled holes in attachment clip into top track of stud partition. Do not screw through ceiling grid.

.2 Do not damage ceiling grid system during installation of these clips.

3.5 **INSTALLATION - WALL FURRING**

.1 Space wall furring runners vertically at 600 mm o.c., and secure through alternate flanges of runners. Shim runners as required to present a true, plumb line for application of gypsum board.

.2 Locate furring not more than 50 mm away from all openings, interior corners, intersections, frames, jambs, control joints and the like.

.3 At windows, doors or similar openings having returns, and around corners, install lengths of mitred and bent pieces of furring horizontally spaced approximately 600 mm o.c. Form mitres by cutting the flanges and bending the web. Do not cut web to form corners.

.4 Mechanically fasten resilient channel perpendicular to wall framing starting at 50 mm up from floor and end within 150 mm to the underside of structure, at no more than 600 mm o.c. Install where indicated.

3.6 **INSTALLATION - SUSPENDED CEILING FRAMING**

.1 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.

.2 Provide additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of light fixtures and diffusers.

.3 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.4 Seismic Bracing: Sway-brace suspension systems with hangers used for support.

3.7 **INSTALLATION - GYPSUM PANELS**

.1 Do not apply gypsum panels until bucks, anchors, blocking, electrical and mechanical work are approved.

.2 Apply gypsum panels to furring or framing using screw fasteners, at 300 mm oc., and at closer spacings as required for fire resistance rated assemblies. Space fasteners in tile baker boards a maximum of 200 mm o.c.

.3 Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

.4 Install gypsum panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1.6 mm of open space between panels. Do not force into place.

.5 Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

.6 Attach gypsum panels to framing provided at openings and cutouts.

.7 Control Joints

.1 Prior to installation review exact locations of control joints with the Consultant. Install purpose made control joint metal trim at following locations:

.1 Where partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.

.2 Furring or partition abuts a structural element or dissimilar wall or ceiling.

.3 Ceiling abuts a structural element, column or dissimilar wall, partition, or other vertical penetration.

.4 Construction changes within a partition or ceiling.

.5 Partition or furring runs exceeding 9100 mm (30 ft) and total area between control joints exceeding 84 m^2 (900 sq.ft.).

.6 Partition and ceiling runs on column lines or at joints in ceiling runs.

.7 In interior ceilings without perimeter relief exceeding 9100 mm (30 ft.) in either direction and total area between control joints exceeding 84 m^2 (900 sq.ft.).

.8 In interior ceilings with perimeter relief exceeding 15000 mm (50 ft.) and total area between control joints exceeding 230 m^2 (2500 sq.ft.).

.9 In exterior ceilings or soffits exceeding 9100 mm (30 ft.) in either direction and total area between control joints exceeding 84 m^2 (900 sq.ft.).

.2 Install control joints full height floor to ceiling or door header to ceiling in partitions and furring runs.

.3 Install control joints from wall to wall in ceiling areas.

.8 Cover both faces of steel stud partition framing with gypsum panels in concealed spaces.

.1 Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 0.7 sq.m. (8 sq.ft.) in area.

.2 Fit gypsum panels around ducts, pipes, and conduits.

.3 Where partitions intersect open joists and other structural members projecting below underside of slabs and decks, cut gypsum panels to fit profile formed by joists and other structural members; allow 6 mm to 10 mm wide joints to install sealant.

.9 Gypsum board single layer application:

.1 On ceilings, apply gypsum panels before wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.

.2 On partitions and walls, apply gypsum panels parallel to framing, unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints.

.3 Stagger abutting end joints not less than one framing member in alternate courses of board.

.10 Gypsum board multilayer application - ceilings: Apply gypsum board indicated for base layers before applying base layers on partitions and walls; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face layer joints one framing member, 400 mm minimum, from parallel base layer joints, unless otherwise indicated or required by fire resistance rated assembly.

.11 Gypsum board multilayer application – partitions and walls: Apply gypsum board indicated for base layers and face layers parallel to framing with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. For acoustic rated partitions greater than STC 40 offset the horizontal joints of the face-layer by 400 mm minimum from the base-layer joints. Stagger joints on opposite sides of partitions.

.1 Furring members: Apply base layer parallel to framing and face layer either vertically parallel or perpendicular to framing with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

.12 Single layer fastening method: Fasten gypsum panels to supports with steel drill screws.

.13 Multilayer fastening method: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners, unless otherwise indicated or required by fire resistance rated assembly.

.14 Laminating to substrate: Where gypsum panels are indicated as directly adhered to a substrate, comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.8 **INSTALLATION - ACOUSTICAL INSULATION**

.1 Install acoustical insulation to partitions indicated. Provide continuous coverage between studs and run continuously from floor to ceiling, or to structure for full height partitions, over door frames and openings and around corners.

.2 Pack acoustical insulation around cut openings in gypsum board, behind outlet boxes around plumbing, heating or structural items passing through the system and at abutting walls.

.3 Secure acoustical insulation to one interior face of gypsum board with adhesive or mechanical fasteners or by other approved means.

.4 For partitions receiving acoustical insulation, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications, and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.9 **INSTALLATION - FIRE RATED ASSEMBLIES**

.1 Construct fire rated assemblies where indicated, to requirements of authorities having jurisdiction.

3.10 **INSTALLATION - ACCESSORIES**

.1 Erect casing beads, corner beads straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured by screw fasteners. Fit corners accurately, free from rough edges.

.2 Provide corner beads at external corners of gypsum board partitions and where indicated.

.3 Provide casing beads at gypsum board terminations, at gypsum board wall/ceiling junctions, where gypsum board butts against surfaces having no trim concealing junction and where indicated.

.4 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint. Provide continuous polyethylene dust barrier behind and across control joints.

3.11 **INSTALLATION - TAPING AND FILLING**

.1 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:

.1 Levels of finish:

.1 Level 1 (in plenum areas above ceilings or in areas where the assembly would generally be concealed)

.2 Level 2 (where water resistant gypsum backing board is used as a substrate for tile)

.3 Level 3: for surfaces receiving medium- or heavy-textured finishes before painting or heavy wallcoverings where lighting conditions are not critical.

.4 Level 4 (where wall coverings or paint finishes are applied)

.5 Level 5 (where writable painted surfaces are applied. On partitions scheduled for writable painted surfaces.

.2 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.

.3 Apply joint compounds and reinforcing tapes in accordance with manufacturer's specifications.

.4 Fill joints and apply joint compounds by three-coat method. Apply cover coat 175 mm wide, level coat 250 mm wide, and skim coat 300 mm wide.

.5 Embed reinforcing tape in a cover coat of joint compound. Apply level coat of joint compound when cover coat has dried. Apply skim coat of compound when level coat has dried.

.6 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.

.7 At internal corners: First fill gaps between boards with joint compound. Imbed creased reinforcing tape into a thin coat of joint compound applied 50 mm wide at each side of corner. Apply cover coat. Apply skim coat to one side of joint, and when dry apply skim coat to other side.

.8 At external corners: Fill to nose of corner bead with joint compound and sand smooth.

.9 At screwheads and nailheads: Fill holes and depressions with a two coat application of joint compound and sand smooth.

.10 Finish gypsum board joints above finished ceiling with tape and first coat of joint compound.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 QUALITY ASSURANCE

.1 Installer: Trained and approved by the manufacturer and having a minimum three years experience in the installation of the work described in this Section and can show evidence of satisfactory completion of projects of similar size, scope and type. If requested, provide letter of certification from manufacturer stating that installer is certified applicator of its products, and is familiar with proper procedures and installation requirements required by the manufacturer.

.2 Finish ceiling system: Square with adjoining walls and level within 1:1000, in true plane, free from distorted, warped, soiled or damaged panels or grid.

.3 Comply with ASTM C635/C635M Intermediate Duty and C636/C636M except as otherwise specified herein.

.4 Maximum deflection of completed ceiling system: 1/360 of span.

.5 Design suspended ceiling system for adequate support of electrical fixtures as required by Electrical Safety Authority.

.6 Pre-installation meeting: Two weeks prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Consultant of the date and time of the meeting.

1.3 SUBMITTALS

.1 Product Data:

.1 For each type of product, certifying compliance with the specified or named product or material.

.2 Prior to ordering products or materials, submit manufacturer's printed product datasheets for each type of product. Include product characteristics, performance criteria, physical size, finish and limitations for products listed in selected designs.

.2 Samples: Duplicate full size samples of each type acoustical units and 300 mm long grid members.

.3 Provide shop drawings, load diagrams, and design calculations signed and stamped by a professional engineer licensed in the Province of Ontario. Ensure that the proposed ceiling and suspension system comply with the requirements of the Ontario building Code 2006, and with the seismic requirements for the project location.

.1 Shop drawings: Indicate typical plans, reflected ceiling plans, and sections of the suspended ceiling system as well as details on connections to the building, suspension system layout, spacing, locations, member sizes and thicknesses, fasteners, hangers, and all relevant accessories. Indicate materials and finishes.

.2 Load diagrams: Indicate dead and live loads to be carried by the building structure, and method in which vertical building deflections are handled.

.3 Design calculations: Provide complete set of design calculations showing design and seismic loads. Indicate seismic vulnerability for project location.

1.4 **ENVIRONMENTAL CONDITIONS**

.1 Permit wet work to dry before commencement of installation.

.2 Maintain uniform minimum temperature of 15°C and humidity of 20 - 40% before and during installation.

.3 Store materials in work area 48 hours prior to installation.

1.5 **EXTRA STOCK**

.1 Provide two percent of each pattern and type of acoustical units. Store where directed. Extra stock to be same production run as installed materials.

PART - 2 PRODUCTS

2.1 **MATERIALS**

.1 Basis of Design – Acoustic Tile Products: Refer to the List of Materials indicated on drawings for complete list of acoustic tile products, designations, manufacturers, sizes and colours.

.1 Products by other manufacturers similar in function, design, performance, and construction complying with requirements of this Section may be incorporated into the Work subject to Consultant's acceptance in accordance with Section 01 00 00, Product Substitution Procedures.

.2 Exposed main tee: Hot dipped galvanized steel to ASTM A653/A653M minimum Z90 coating designation, 24 mm exposed face and 38 mm high bulb tee design with double web and separate exposed cap piece, maximum length, with reversible and integral splice. Prefinish tee in baked enamel, standard colour.

.3 Exposed cross tee: Hot dipped galvanized steel to ASTM A653/A653M minimum Z90 coating designation, exposed face to match main tees, 38 mm high bulb tee design of same fabrication as main tee, with override stepped ends to allow cross tee flange to sit on main tee flange providing flush exposed faces, and with positive interlock to main tee, grid module to suit acoustical panels. Finish to match main tees.

.4 Main tee splices: Designed to lock lengths of main tees together so that joined lengths of tee function structurally as a single unit with tee faces at joint perfectly aligned and presenting a tight seam.

.5 Hangers and wires: Galvanized hangers and 2.6 mm minimum galvanized steel wire.

.6 Hold-down clips: Spring steel clips by the grid system manufacturer.

.7 Wall moulding: Prefinished galvanized steel, nominal 25 mm x 25 mm with nominal 25 mm exposed face, hemmed edges. Finish to match main tees.

.8 Shadow wall moulding: Prefinished galvanized steel, 19 mm x 19 mm reveal with nominal 25 mm exposed face, hemmed edges. Finish to match main tees.

.9 Adhesive: Recommended by acoustic unit manufacturer.

PART - 3 EXECUTION

3.1 **INSTALLATION - GENERAL**

.1 Install work in accordance with ASTM C636/C636M and to manufacturer's instructions except where specified otherwise.

.2 Do not commence installation until work above ceiling has been inspected by Consultant.

.3 Lay out system in accordance with reflected ceiling plans.

.4 Ensure work is co-ordinated with location of related components.

3.2 **INSTALLATION - GRID SYSTEM**

.1 Centre acoustical ceiling suspension systems on room axis; install equal border pieces, unless otherwise indicated.

.2 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.

.3 Install supplemental suspension system where ducts or other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support suspension system members. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

.4 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

.5 Do not bend or twist hangers as a means of levelling. Form double loops tightly and lock to prevent vertical movement or rotation within the loop.

.6 Install wall moulding at intersection of ceiling and vertical surfaces to provide correct ceiling height.

.7 Provide additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of light fixtures and diffusers.

.8 Use longest practical lengths of tees, furring and running channels to minimize joints. Make joints square, tight, flush and reinforced with concealed splines. Assemble framework to form a rigid and interlocking system.

.9 Run main tees at right angles to length of light fixtures.

.10 Interlock cross tees to main tees to provide rigid assembly.

.11 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

3.3 **INSTALLATION - ACOUSTICAL PANELS**

.1 Neatly cut acoustic units for mechanical and electrical and other services.

.2 Carefully fit acoustic units in place; no broken edges permitted.

.3 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

.4 Provide hold-down clips at acoustical system to hold units tight to grid system within 6000 mm of an exterior door and an operable window.

.5 Install adhesive bonded acoustic units to clean, dry and firm substrate.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 SUBMITTALS

.1 Product Data: Manufacturer's date sheets for each Product specified, including:

.1 Preparation instructions and recommendations.

.2 Storage and handling requirements and recommendations.

.3 Installation methods.

.2 Samples: Submit duplicate samples of acoustical panels to the Consultant for approval. The samples shall fully represent the materials to be applied in colour, texture, finish and construction.

.3 Submit Shop Drawings indicating elevations, sizes and mounting details, complete layout of acoustical panels, and fastening details.

.4 Certification: Manufacturer's certification that Products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. Indicate acoustical performance.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Products shall be delivered to the project site in original, unopened packages.

.2 Prior to installation the Site must be free of all wet and dusty trades and the climatic conditions stabilized to normal operational levels.

.3 Acoustic Panels shall be stored in a fully enclosed space. For a minimum of 72 hours immediately prior to installation, store panels in the room in which they will be installed. Temperature and humidity of the room shall closely approximate those conditions that will exist when the building is occupied.

.4 Store panels minimum 150 mm off the ground.

1.4 QUALITY ASSURANCE

.1 Installer Qualifications:

.1 Installation work to be performed by a firm whose personnel have a minimum of three (3) years of successful experience on projects of similar size, requirements and complexity.

PART - 2 PRODUCTS

2.1 MATERIALS

.1 Product: Refer to the List of Materials as indicated on the Drawings for Product, manufacturer, colour, size and performance requirements.

.2 Acoustic Door Seal: Provide a solid heavy duty neoprene seal where indicated on Drawings.

.1 Colour to be selected by Consultant from manufacturer's standard range.

PART - 3 EXECUTION

3.1 INSTALLATION – GENERAL

.1 Installation shall be by skilled mechanics, approved by the manufacturer of the acoustical panels, and in strict accordance with system manufacturer's printed directions to produce a first-class finished surface.

.2 Do not begin installation until substrates have been properly prepared.

.3 If substrate preparation is the responsibility of another installer, notify Consultant of unsatisfactory preparation before proceeding.

3.2 INSTALLATION - ACOUSTIC WALL COVERING

.1 Install acoustic panels plumb, level and properly aligned in locations indicated.

.2 Provide cut outs for any wall mounted equipment that may be present in panel locations.

3.3 CLEANING

.1 Remove and dispose of shipping containers and debris.

.2 Touch-up, repair or replace damaged Products before the date of Substantial Performance.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 QUALITY ASSURANCE

.1 Applicator experience: Having minimum of five years proven satisfactory experience. When requested, provide a list of the last three comparable projects including, name and location, consultant, start and completion dates, and value of the painting work.

.2 Applicator qualification: Qualified journeypersons, painters, as defined by local jurisdiction shall be engaged in painting and decorating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.

.3 Materials, preparation and quality of work: In conformance with requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute, referred to as the MPI Painting Manual in this Section, issued by the local MPI Accredited Quality Assurance Association having jurisdiction.

.4 Manufacturers and products: Listed under the Approved Product List section of the MPI Painting Manual.

.5 Maintenance seminars: Provide, to the Owner, training seminars and recommendations on Product maintenance procedures.

.6 Pre-installation meeting: Two weeks prior to commencing work of this Section, arrange for manufacturer's technical representative to visit the site and review preparatory and installation procedures to be followed, conditions under which the work will be done, and inspect the surfaces to receive the work of this Section. Advise the Consultant of the date and time of the meeting.

.7 Manufacturer’s site inspection: Have the manufacturer’s technical representative inspect the Work at suitable intervals during application and at conclusion of the work of this Section, to ensure the Work is correctly installed. When requested, submit manufacturer’s inspection reports and verification that the work of this Section is correctly installed.

.8 All surfaces requiring painting shall be inspected by the Consultant who shall notify the Contractor in writing of any defects or problems, prior to commencing painting work, or after the prime coat shows defects in the substrate.

1.3 SAMPLES AND MOCK-UPS

.1 Samples: Provide duplicate minimum 300 mm square samples of surfaces or acceptable facsimiles requested painted with specified paint or coating in colours, gloss, sheen and textures required to MPI Painting Manual standards for review. When approved, samples become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

.2 Sample installations: When requested by the Consultant prepare and paint designated surface, area, room or item in each colour scheme to requirements specified, with specified paint or coating showing selected colours, gloss, sheen, textures and quality of work to MPI Painting Manual standards for review and approval. When approved, surface, area, room and items become acceptable standard of finish quality and workmanship for similar on-site work.

1.4 **SUBMITTALS**

.1 List of painting materials: Submit duplicate copy of list of painting materials for review prior to ordering materials. If requested, provide an invoice list of all paint materials ordered for project work to Consultant indicating manufacturer, types and quantities for verification and compliance with specification and design requirements.

.2 Material Safety Data Sheets (MSDS): Submit duplicate copies prior to commencement of work for review and for posting at job site as required.

.3 Project Data Manual: At project completion provide an itemized list complete with manufacturers' application instructions, paint type and colour coding for all colours used for Owner's later use in maintenance.

1.5 **PRODUCT DELIVERY, STORAGE AND HANDLING**

.1 Deliver all painting materials in sealed, original labelled containers bearing manufacturer's name, brand name, type of paint or coating and colour designation, standard compliance, materials content as well as mixing and/or reducing and application requirements.

.2 Store all paint materials in original labeled containers in a lockable, dry, heated and well ventilated single designated area meeting the minimum requirements of both paint manufacturer and authorities having jurisdiction and at a minimum ambient temperature of 7 degree C. Only material used on this project to be stored on site.

.3 Where toxic, volatile, explosive, flammable materials are being used, provide adequate fireproof storage lockers and take all necessary precautions and post adequate warnings such as no smoking signs as required.

.4 Take necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Store materials that constitute a fire hazard in suitable closed and rated containers and removed from the site on a daily basis.

.5 Comply with requirements of authorities having jurisdiction, in regard to the use, handling, storage and disposal of hazardous materials.

1.6 **SCHEDULING**

.1 Schedule painting operations to prevent disruption of and by other Sections.

.2 Schedule painting operations in occupied facilities to prevent disruption of occupants in and about the building. Perform painting in accordance with Owner's operating requirements. Schedule work such that painted surfaces will have dried before occupants are affected. Obtain written authorization from Consultant for changes in work schedule.

1.7 **PROJECT CONDITIONS**

.1 Unless specifically pre-approved by the Consultant, and the product manufacturer, do not perform work when the ambient air and substrate temperatures are below 10 degree C for interior work.

.2 Do not perform interior work unless adequate continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above minimum requirements for 24 hours before, during and 48 hours after work is complete, unless required otherwise by manufacturer's instructions. Provide supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.3 Do not perform work when the relative humidity is above 85% or when the substrate temperature is less than 3 degree C above the measured dew point.

.4 Do not perform work when the maximum moisture content of the substrate exceeds:

.1 12 % for concrete and masonry.

.2 15% for wood.

.3 12 % for plaster and gypsum board.

.5 Conduct all moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.

.6 Test concrete, masonry and plaster surfaces for alkalinity as required.

.7 Apply work only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

.8 Do not perform work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted or decorated.

1.8 **EXTRA STOCK**

.1 At project completion provide 4 liters of each type and colour of paint from same production run used in unopened cans, properly labeled and identified for Owner's later use in maintenance. Store where directed.

1.9 **WASTE MANAGEMENT AND DISPOSAL**

.1 Paint, stain and wood preservative finishes and related materials such as thinners, solvents are regarded as hazardous products and are subject to regulations for disposal. Obtain information on these controls from applicable authorities having jurisdiction.

.2 Separate and recycle waste materials. Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility. Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.4 Strictly adhere to the following procedures to reduce the amount of contaminants entering waterways, sanitary and storm drain systems or into the ground:

.1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.

.2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.

.3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

.4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

.5 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

PART - 2 PRODUCTS

2.1 MATERIALS

.1 Only materials listed in the latest edition of the MPI Approved Product List (APL) are acceptable for use on this project. Provide material from a single manufacturer for each system used.

.2 Other materials not listed in the APL shall be the highest quality product of an MPI listed manufacturer and shall be compatible with paint materials being used as required.

.3 All materials used shall be lead and mercury free and shall have low VOC content where possible.

.4 Where required, use only materials having a minimum MPI Environmentally Friendly E2 or E3 rating based on VOC (EPA Method 24) content levels.

.5 Where indoor air quality is an issue, use only MPI listed materials having a minimum E2 or E3 rating.

.6 Provide materials having good flowing and brushing properties and capable to dry or cure free of blemishes, sags, air entrapment.

.7 Where required, paints and coatings shall meet flame spread and smoke developed ratings to code requirements and authorities having jurisdiction.

2.2 EQUIPMENT

.1 Painting and Decorating Equipment: to best trade standards for type of product and application.

.2 Spray Painting Equipment: of ample capacity, suited to the type and consistency of paint or coating being applied and kept clean and in good working order at all times.

2.3 **MIXING AND TINTING**

.1 Unless otherwise specified or pre-approved, provide materials ready-mixed and pre-tinted. Re-mix materials in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

.2 Mix paste, powder or catalyzed materials in strict accordance with manufacturer's written instructions.

.3 Do not exceed amount of thinner beyond manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based materials.

.4 If required, thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

2.4 **FINISH AND COLOURS**

.1 Refer to the List of Materials on Drawings for Product, manufacturer, identification and location of colours.

.2 Where required by authorities having jurisdiction, finish exit and vestibule doors in contrasting colour to walls and a different colour than any other door in the same area.

2.5 **GLOSS AND SHEEN RATINGS**

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following MPI values:

Gloss Level	Description	Units@ 60 degrees	Units@ 85 degrees
G1	Matte or Flat finish	Max. 5	Max. 10
G2	Velvet finish	Max. 10	10 to 35
G3	Eggshell finish	10 to 25	10 to 35
G4	Satin finish	20 to 35	Min. 35
G5	Semi-Gloss finish	35 to 70	
G6	Gloss finish	70 to 85	
G7	High-Gloss finish	More than 85	

PART - 3 EXECUTION

3.1 **CONDITION OF SURFACES**

.1 Prior to commencement of work thoroughly examine and test as required conditions and surfaces scheduled to be painted. Do not commence work until adverse conditions and defects have been corrected and surfaces and conditions are acceptable to the Consultant.

3.2 **SURFACE PREPARATION**

.1 Prepare all surfaces in accordance with MPI requirements.

.2 Sand, clean, dry, etch, neutralize and test surfaces under adequate illumination, ventilation and temperature requirements.

.3 Remove and securely store miscellaneous hardware, surface fittings and fastenings such as electrical plates, mechanical louvers, door and window hardware, hinges, knobs, locks, trim, frame stops, removable rating/hazard/instruction labels, light fixture trim, from wall and ceiling surfaces, doors and frames, prior to commencement of work. Carefully clean and replace items upon completion of work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes. Remove doors to finish bottom and top edges and re-hang doors when work is complete.

.4 Protect all adjacent interior surfaces and areas, including rating/hazard/instruction labels on doors, frames, equipment, piping, from painting operations and damage using drop cloths, shields, masking, templates, or other suitable protective means and make good damages caused by failure to provide such protection.

.5 Make good substrate defects and sand ready for finishing particularly after the first coat is applied. Start of finishing on defective surfaces indicates acceptance of substrate and any costs of making good defects shall be borne by this Section including re-painting of entire defective surface.

.6 Confirm preparation and primer used with fabricator of steel items.

3.3 **APPLICATION**

.1 Do not perform work unless substrates are acceptable and until heating, ventilation, lighting and completion of work of other Sections are acceptable for applications of products.

.2 Apply materials in accordance with MPI Painting Manual Premium Grade finish and manufacturers' requirements.

.3 Work specified is intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.

.4 Tint each coat of finish progressively lighter to enable confirmation of number of coats.

.5 Unless otherwise approved by the Painting Inspection Agency, apply a minimum of four coats of paint where deep or bright colours are used to achieve satisfactory results.

.6 Sand between each coat to provide an anchor for next coat and to remove defects visible from a distance up to 1000 mm.

.7 Do not apply finishes on 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.

.8 Paint finish shall continue through behind all wall-mounted items.

.9 Unless noted otherwise, field-apply finish paint to all structural steel work, which will remain exposed and subject to normal view by pedestrians or occupants on the completed interior of the building.

3.4 **INTERIOR FINISHING SYSTEMS**

.1 Finish interior surfaces in accordance with MPI Painting Manual requirements:

.2 Plaster and Gypsum Board:

.1 INT 9.2B, High performance architectural latex; G3 finish.

3.5 **FIELD QUALITY CONTROL AND STANDARD OF ACCEPTANCE**

.1 Painted interior surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent to the Consultant:

.1 Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.

.2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.

.3 Damage due to touching before paint is sufficiently dry or any other contributory cause.

.4 Damage due to application on moist surfaces or caused by inadequate protection from the weather.

.5 Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

.2 Painted surfaces will be considered unacceptable if any of the following are evident under final lighting source (including daylight) for interior surfaces:

.1 Visible defects are evident on vertical and horizontal surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm.

.2 Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.

.3 When the final coat on any surface exhibits a lack of uniformity of colour, sheen, texture, and hiding across full surface area.

.3 Make good painted surfaces rejected by the inspector to approval of Consultant and at the no extra cost to the Owner. Touch up small affected areas. Repaint large affected areas or areas without sufficient material dry film thickness. Remove runs, sags of damaged paint by scraper or by sanding prior to application of paint.

3.6 **PROTECTION**

.1 Protect interior surfaces and areas, equipment and any labels and signage from painting 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.

.2 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.7 **CLEAN-UP**

.1 Remove paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.

.2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.

.3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.

.4 Clean equipment and dispose of wash water / solvents as well as all other cleaning and protective materials (e.g. rags, drop cloths, masking papers, etc.), paints, thinners, paint removers / strippers in accordance with the safety requirements of authorities having jurisdiction.

3.8 **EXISTING SURFACES**

.1 Finish or refinish existing surfaces of items or rooms where noted, including new work which has been incorporated into the existing work and existing work which has been damaged, altered or otherwise disturbed during renovation operations.

.2 Refinish surfaces or rooms adjacent to rooms where alterations or renovations have been carried out and which have been damaged or otherwise disturbed by the alterations or renovations. Where such damages occur, refinish completely.

.3 Remove from existing surfaces rust, scale, oil grease, mildew, chemicals and other foreign matters.

.4 If coatings on existing surfaces have failed so as to affect the proper performance or appearance of materials to be applied, or if such coatings can be easily removed, remove them and prepare the substrates properly. Dull hard or glossy surfaces by sanding, sandblasting or by other abrasive methods prior to finishing.

.5 Refinish surfaces entirely between changes of planes which have been incorporated into the existing work and existing work which has been damaged, altered or otherwise disturbed during renovation operations.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section Includes:

.1 Labour, Products, equipment and services necessary to complete the work of this Section.

1.2 SUBMITTALS

.1 Product Data:

.1 For each type of product, confirming compliance with the specified or named product or material.

.2 Prior to ordering products or materials, submit manufacturer's printed product datasheets for each type of product. Include product characteristics, performance criteria, physical size, finish and limitations for products listed in selected designs.

.2 Shop Drawings:

.1 Provide shop drawings showing the finished appearance, construction details, bracing materials, finishes, connections and fastenings of each item.

.2 Underline, ring or otherwise point out any deviation from the specification or drawings.

.3 Operation and Maintenance Data:

.1 Submit manufacturer’s operation and maintenance instructions.

.2 Submit copy of manufacturer’s program for image tile replacement.

.4 Samples: When requested by the Consultant submit samples of materials, colour and finish, and if required include the complete item.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver products in manufacturer’s original packaging. Store materials indoors in location that is secure, dry and has stable temperature. Handle in accordance with manufacturer’s instructions to prevent damage.

1.4 PROJECT CONDITIONS

.1 Do not commence work until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at levels indicated for Project when occupied for its intended use.

PART - 2 PRODUCTS

2.1 PHONE LOCKBOX

.1 Vandal resistant, keyed, lockable, non metallic telephone enclosure complete with spring loaded door. Colour to be selected by Consultant.

.1 Acceptable manufacturers:

.1 Ceeco.

.2 Gal-Troncics.

.3 Or approved equivalent.

PART - 3 EXECUTION

3.1 EXAMINATION

.1 Examine area receiving work of this Section to identify conditions that may adversely affect installation. Do not begin installation until adverse conditions have been remedied.

3.2 INSTALLATION

.1 Submit manufacturer's information and templates required for installation of work of this section, and assist or supervise, or both, setting of anchorage devices, and construction of other work incorporated with Products specified in this section in order that they function as intended.

.2 Install work to meet manufacturers' recommended specifications, true, tightly fitted, and level or flush to adjacent surfaces, as suitable for installation.

.3 Fit joints and junction between components tightly and in true planes, conceal and weld joints where possible.

.4 Supply handling instructions, anchorage information, roughing-in dimensions, templates and service requirements for installation of the work of this section, and assist or supervise, or both, the setting of anchorage devices and construction of other work incorporated with Products specified in this section.

3.3 ADJUSTMENT AND CLEANING

.1 Verify under work of this section that installed Products function properly, and adjust them accordingly to ensure satisfactory operation.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 General provisions which are applicable to and govern all Sections of this Division and of Division 23.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.3 The terms “Mechanical Work”, “Mechanical Contractor”, “Mechanical Division” or their derivatives includes all the Work of Divisions 20 and 23 unless otherwise specified.

.4 These Specifications are arranged generally in accordance with the specification-writing standard MasterFormat, latest edition. Sections of this Division are not intended to delegate functions or to delegate work to any specific trade.

1.2 DEFINITIONS

.1 “Provide” means to supply and install the products and services specified.

.2 “Work” means the total construction required by the Contract Documents, and includes all labour, products, and services.

.3 “Products” means all material, machinery, equipment, and fixtures forming part of the completed Work as required by the Contract Documents.

1.3 INTENT

.1 Provide all Work, including items, articles, materials, operations, and methods listed, mentioned, and scheduled in the Contract Documents. Include all labour, equipment, tools, scaffolds, and other incidentals necessary and required for the complete installation.

.2 Consider the Specifications as an integral part of the Drawings, which accompany them. Do not use the Drawings or the Specifications alone. Consider any item or subject omitted from one, but mentioned or reasonably implied in the other, as properly and sufficiently specified and provided under the Mechanical Work.

.3 This installation shall be made in strict accordance with the Drawings, Specifications, and all applicable codes, regulations, standards, bylaws, including the requirements of Authorities having jurisdiction, Owner's Insurer, and NFPA regulations.

.4 All equipment and devices used shall be UL/cUL listed and/or CSA certified where applicable.

.5 Each Contractor performing any part of the Mechanical Work is considered an expert in their field.

1.4 CODES, REGULATIONS AND STANDARDS

.1 Comply with the requirements of the following codes, regulations and standards:

.1 Municipal and Provincial Regulations and/or Codes;

.2 National Building Code in areas where Municipal or Provincial Regulations and/or Codes are not mandatory;

.3 Rules and Regulations of Authorities having jurisdiction;

.4 Occupational Health and Safety Act and Regulations for Construction Projects, Ontario Regulation 691;

.5 Relevant CSA Standards;

.6 Applicable standards of the Underwriters' Association.

.7 Owner's Health and Safety Requirements.

.2 Codes, standards, and regulations referenced by these Specifications shall be the latest edition as applicable at the time of building permit application unless noted otherwise or specifically defined under the Provincial or National Building Code.

.3 Codes, regulations and standards constitute an integral part of these Specifications. In case of conflict; codes, regulations and standards take precedence over the Contract Documents.

.4 In no instance reduce the level of construction standard established by the Drawings and Specifications by applying any of the codes, regulations and standards referred to herein.

1.5 **ABBREVIATIONS**

.1 Abbreviations with respect to government agencies, testing agencies, technical societies, and approval agencies are as listed below:

.1	AMCA	Air Moving and Conditioning Association
.2	ANSI	American National Standards Institute
.3	ARI	Air Conditioning and Refrigeration Institute
.4	ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
.5	ASME	American Society of Mechanical Engineers
.6	ASTM	American Society for Testing and Materials
.7	AWWA	American Water Works Association
.8	CSA	Canadian Standards Association
.9	FM	Factory Mutual, FM Global
.10	MICA	Midwest Insulation Contractors Association
.11	NBFU	National Board of Fire Underwriters (currently American Insurance Association)
.12	NEMA	National Electrical Manufacturers Association
.13	NFPA	National Fire Protection Association
.14	OBC	Ontario Building Code
.15	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
.16	ULC/cUL	Underwriters' Laboratories of Canada

1.6 **EXAMINATION OF SITE AND CONTRACT DOCUMENTS**

.1 Before Bid submission, visit the Site of the proposed Work and obtain all information as to existing conditions and limitations.

.2 Examine the Specifications and all Drawings including the Specifications and Drawings of all other Divisions before commencing any portion of the Mechanical Work.

.3 No allowance will be made for any consideration that may have been overlooked.

.4 Unless exceptions are specifically noted at the time of Bid, the submission of a Bid confirms that the Bid Documents and site conditions are accepted without qualification.

1.7 **CONTRACT DRAWINGS AND DOCUMENTS**

.1 The Contract Drawings are diagrammatic performance drawings; they describe the design intent, indicate general arrangement and approximate location of apparatus, fixtures, and pipe runs, but do not show the exact details for the installation. The Contract Drawings are not fabrication or installation drawings.

.2 The Work is suitably outlined on the Drawings with regard to sizes, locations, intended arrangements, and the routing of services has been generally coordinated. The routing of ductwork and piping, and equipment arrangement represent a close approximation of the intent, except in certain cases the Drawings may include details conveying the exact locations and arrangements required.

.3 Final and exact location of equipment and services shall be determined by the Contractor using the reviewed shop drawings together with actual site conditions. The Consultant reserves the right to make reasonable adjustment of up to 1 m to the location of equipment, fixtures, routing of major piping and ductwork, at no additional cost to the Owner.

.4 Where specific installation dimensions for the location of equipment and access space requirements are indicated on the Drawings, the installation shall adhere to these requirements.

.5 Do not scale Drawings; obtain information involving accurate dimensions to structure from dimensions shown on architectural. Consult general construction Drawings as well as detail drawings to become familiar with all conditions affecting the Mechanical Work and verify spaces in which the Work will be installed.

1.8 **PERMITS AND INSPECTIONS**

.1 Apply for, obtain, and pay for all permits, licenses, inspections, examinations, and fees required.

.2 Material approvals

.1 Obtain special inspection and approvals by CSA and/or local authorities, for materials where specified.

.2 Obtain such approval for the particular installation with the co-operation of the material supplier.

.3 Permits

.1 Before starting any work, obtain the required number of copies of Drawings and Specifications from the Consultant for submission with application for permits. Submit all documents to the Authorities for their approval and comments. Comply with any changes requested as part of the Work, but notify the Owner immediately in writing of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

.4 Inspections

.1 Arrange for inspection of all Work by the Authorities having jurisdiction over the Work. On completion of the Work, present to the Owner the final unconditional certificate of approval of the Inspection Authorities.

.2 Arrange, provide documentation, and pay for registration and inspection of the following systems and equipment:

.1 HVAC

1.9 CONTRACTOR COORDINATION RESPONSIBILITIES

.1 Provide the services of a mechanical/electrical coordination supervisor, to coordinate the Mechanical Work, as well as providing coordination with Contractors of other Divisions. This supervisor may be full time or part time on site, as appropriate for the work stage and complexity of the Work, at the discretion of the Owner.

.2 Where multiple Subcontractors are required to execute the Mechanical Work, the mechanical coordinating supervisor shall be the lead coordinator.

.3 The Owner reserves the right to require the coordinating supervisor to increase their attendance at the Site, at no cost to the Owner, if in the Owner's opinion, the current level of coordination is insufficient for the progress of the Work.

.4 Make changes and modifications to location and routing of equipment and services as necessary to ensure that the installation of the Mechanical Work is coordinated, to avoid interference and conflicts with the Work performed by Contractors of other Divisions while maintaining the design intent.

.5 Make, at no additional cost to the Owner, all changes or additions to materials and/or equipment necessary to accommodate structural conditions such as runs around beams or columns.

.6 The arrangement and layout of equipment and systems shown on the Contract Drawings is based on the requirements of one manufacturer for each equipment type. The installation on Site shall follow each manufacturer's installation requirements for the specific equipment supplied by the Contractor.

1.10 MEASUREMENTS AND DEVIATIONS

.1 Refer to architectural drawings where Mechanical Work is specifically located by dimensions on the Drawings, check and verify and coordinate these dimensions with all contractors involved.

.2 Where site conditions require minor deviations from indicated arrangements or locations, make such changes upon approval by the Consultant without additional cost to the Owner.

.3 If a substantial interference or existing, unforeseen condition is encountered during the installation of the Mechanical Work that necessitates a major revision to the Mechanical Work or the Work of Contractors of other Divisions, notify the Consultant immediately and obtain written authorization before proceeding with the Work.

1.11 **SUBMITTALS**

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Assume responsibility for accuracy of equipment dimensions related to available space and accessibility for maintenance and service, and for compliance with code and inspection authority requirements.

.3 Shop drawings showing more than one size or model will not be considered unless the exact model and options to be provided are clearly marked.

.4 Shop drawings shall be certified by the manufacturers as ready for construction.

.5 Identify equipment shop drawings with designations (tags) as shown on the Drawings or in the Specifications.

.6 For all equipment, include the following:

.1 Manufacturer's name and model number.

.2 Equipment dimensions and weights.

.3 Itemized product description with optional items clearly marked as being included.

.4 Time required to fabricate and to deliver.

.5 All variations from Contract Documents.

.6 Field connection details

.7 Clearly indicate the materials and/or equipment being supplied:

.1 Details of construction, finish, accurate dimensions, capacities and performance.

1.12 **'AS-BUILT' RECORD DRAWINGS**

.1 Submit as-built drawings in printed and electronic (AutoCAD) format in accordance with Section 01 77 00 - Contract Closeout.

.2 Maintain a printed set of Contract Drawings on site and record all deviations from the Contract Documents. Recording shall be done on the same day a deviation was made.

.3 Prepare as-built drawings showing the following:

.1 Dimensioned location of all services embedded in the structure.

.2 Dimensioned location of all services left for future Work.

.3 Diagram of interconnecting services between items of equipment including equipment supplied by Owner and under the scope of other Divisions.

.4 All Addendum changes.

.5 All changes to the Work due to Change Orders.

.6 All changes to the Work during construction.

.7 Location and designation of all items requiring access or service in a hidden location.

.8 All changes to Specifications, details and equipment schedules.

.4 Obtain one set of AutoCAD drawing files from the Consultant and transfer all as-built information from the printed set to the AutoCAD files at the completion of construction. Note that the Consultant's AutoCAD drawing files are copyrighted and may not be used for any other purpose other than that described above. The drawing files shall be provided solely to assist the Contractor in the preparation of as-built drawings. The Consultant assumes no liability for any errors, omissions, incomplete information, incorporation of latest changes, or other instructions. While the Consultant takes precautions to ensure that no computer virus is transmitted, scanning for viruses upon receipt is recommended.

.5 Identify each as-built drawing as final for this purpose. Remove any reference to the Consultant such as Consultant's name, company logo and professional seal.

.6 Prior to Testing, Adjusting and Balancing (TAB) and commissioning, provide printed copies of all current as-built drawings to the Contractors performing the Testing and Balancing Work (TAB Contractor) and to the Commissioning Agent.

1.13 **OPERATING AND MAINTENANCE MANUALS**

.1 Submit operating and maintenance manuals in accordance with Section 01 77 00 - Contract Closeout.

.2 In addition, include the following in the manuals:

.1 Non-dimensional layout showing location of all electrical devices on mechanical equipment.

.2 Operating instructions, including start-up and shut-down procedure.

.3 A copy of the following:

.1 Certificates from all equipment manufacturers.

.2 Warranties and letters of guarantee from contractors and equipment manufacturers.

.3 Copies of permits, licenses and certificates.

.3 All the above applies to component parts of equipment whether they are manufactured by the supplier of the equipment or are supplied as a component part of an equipment.

1.14 **CLEANING, TESTING AND APPROVAL RECORDS**

.1 Maintain records of all tests inspections and approvals.

.2 Upon completion of each test and cleaning operation, forward a copy of each record to the Consultant for review.

.3 Forward the reviewed records to the Owner upon completion of the Work in accordance with Section 01 33 00 – Submittal Procedures.

1.15 **DIMENSIONS AND QUANTITIES**

.1 Dimensions

.1 Dimensions shown on Drawings are approximate.

.2 Verify dimensions by reference to shop drawings and field measurement.

.2 Quantities

.1 Quantities or lengths indicated in any of the Contract Documents are approximate only and shall not be held to gauge or limit the Work.

.3 Requirements

.1 Trade workers shall have a Certificate of Qualification as Journeyman or Apprentice Registration for the province where the work is performed or an Interprovincial Certificate.

.2 Ratio of journeyman to apprentice shall not to exceed the defined ratio in the Apprenticeship Act of Ontario.

.3 On award of Contract, submit a list of trade journeyman and apprentices, together with their Certificate and Registration numbers.

.4 Certificates and Registration shall be provided to the Consultant on request.

.5 Maintain on-site an up-to-date record listing journeyman and apprentices working on site.

PART - 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Use new materials and equipment, free from defects impairing strength and durability, as specified or specified equivalent.

.2 Material and equipment shall be of Canadian manufacture wherever possible, and labelled or listed as required by applicable Codes and/or have special approval of the inspection authority having jurisdiction for their respective functions and environments.

.3 Provide products of same manufacture for similar applications unless noted otherwise.

.4 Design of the mechanical systems is based on the listed supplier and/or model number/size stated on the equipment schedules and in the Specifications. Bear all costs due to physical or performance differences between stated equipment and proposed equipment. These differences may include but are not limited to physical size, layout, arrangement, connection size, location and/or quantity of connections, or performance differences such as noise, power requirements, flow, throw.

2.2 ALTERNATES AND SUBSTITUTIONS

.1 Substitute products will only be considered when tendered products become unobtainable.

.2 Provide detailed specifications and Shop Drawings with complete performance characteristics of the proposed alternate with the submission to the Consultant.

.3 Assume responsibility and pay for any additional installation cost incurred by the Contractors of all other Divisions resulting from the substitution.

.4 Refer to Division 01 for product substitution procedures.

2.3 **STANDARD SPECIFICATIONS**

.1 Ensure that the chemical and physical properties, design, performance characteristics and methods of construction of all products provided comply with the latest issue of applicable Standard Specifications issued by the authorities having jurisdiction.

.2 Do not apply such Standard Specifications to decrease the quality of workmanship, products and services required by the Contract Documents.

2.4 **MANUFACTURER'S NAMEPLATES**

.1 Metal nameplates

.1 Provided with raised or recessed lettering, on each piece of equipment.

.2 Mechanically fasten nameplate on a metal stand-off bracket arranged to clear insulation.

.3 Mount on the same stand used for ULC and/or CSA registration plates.

.2 Nameplate data to indicate:

.1 Size

.2 Capacity

.3 Equipment model

.4 Manufacturer's name

.5 Serial number

.6 Voltage

.7 Cycle

.8 Phase and power of motors

PART - 3 EXECUTION

3.1 **CONSTRUCTION REVIEW**

.1 The construction review will include milestone and periodic reviews.

.2 Milestone Reviews:

.1 Specific milestone reviews will be performed by the Consultant to ascertain reasonable conformity with the Contract Drawings and Specifications, and the applicable Municipal, Provincial and Federal Codes and Standards. Milestone reviews may include the following:

.1 Before closure of ceilings

.2 Reviews will include portions of the Mechanical Work which may be concealed. If the Work is enclosed prior the Consultant reviewed the installation, the Consultant may direct the Contractor to expose the Work for it to be examined, at no additional cost to the Owner including rework affecting the Work of Contractors of other Divisions.

.3 If deficiencies are noted during any review related to Work that will be enclosed, correct noted deficiencies and have them reviewed by the Consultant prior to the Work being enclosed.

.4 Provide a minimum of seven (7) calendar days written notice to the Consultant when requesting a review date.

.5 The Consultant will provide a check-list to the Contractor of required milestone reviews which must be completed. Maintain this list on Site along with identified test reports, and make available for Consultant's review when requested. When completed, include this checklist form with the Test Reports forms specified in Section 20 05 83 - Start-Up and Performance Testing.

.3 Final Review

.1 The Consultant will conduct a final review only after the Contractor submits a declaration that all of the following has been completed:

.1 Noted deficiencies have been corrected,

.2 Final Record Drawings have been submitted to the Owner,

.3 Final Operating and Maintenance Manuals have been submitted to the Owner,

.4 All systems have been balanced, tested, commissioned and are operational,

.5 The Owner has been instructed in the operation and maintenance of all equipment,

.6 Cleaning up is finished in all respects,

.7 Final test reports have been submitted to the Owner.

.2 The Consultant will only review the deficiency list to confirm that these deficiencies have been corrected.

3.2 ADJUSTMENT AND OPERATION OF SYSTEMS

.1 When the Work is complete, adjust equipment for proper operation within the framework of the design intent and the operating characteristics as published by the equipment manufacturers.

.2 The Consultant reserves the right to require the services of an authorized representative of manufacturers in the event any equipment is not adjusted properly.

.1 Arrange for such services and pay all costs thereof.

.2 After completion of adjustments, place systems in full operating condition and advise the Consultant that the Work is ready for acceptance.

3.3 ACCEPTANCE

.1 After all equipment has been installed, adjusted and balanced:

.1 Conduct performance tests in the presence of the Commissioning the Owner's representative.

.2 Arrange a time for these tests at the convenience of Commissioning Agent and the Owners representative.

.2 During these tests:

.1 Demonstrate the correct performance of all equipment and of the systems they comprise.

.2 Should any system or equipment fail to function as required, make changes, adjustments or replacements necessary to meet the performance requirements.

.3 Repeat the tests until all requirements have been fully satisfied and all systems have been accepted by the Consultant.

3.4 COORDINATION WITH TESTING, ADJUSTING AND BALANCING WORK

.1 Review with the Contractor performing the Testing, Adjusting and Balancing Work (TAB Contractor) prior to fabrication:

.1 Location of balancing devices

.2 Location of access openings

.2 Report conditions which could affect optimum system performance.

.3 Inspection:

.1 Ensure that all testing, balancing and metering devices are installed properly at the preselected locations, and are fully operational.

.2 Report any errors to the Consultant.

.3 Obtain the approval from the Contractor performing the TAB Work before relocating these devices due to field conditions.

.4 Coordination with the TAB Contractor:

.1 The TAB Contractor will give adequate prior notification in case the services of any tradesmen is requested.

.2 Coordinate efforts so that items requiring replacement or having longer delivery time (sheaves, motors) are tested as early as possible.

.3 Schedule sufficient time so that the initial TAB Work can be completed before occupancy begins and coordinate with all Subcontractors involved.

.4 Keep the TAB Contractor informed of any major change made during the construction and provide the TAB Contractor with a set of Record Drawings and reviewed Shop Drawings.

.5 Provide balancing devices, test connections access openings, balancing probe inlets and plugs.

.6 Clean and pre-run all equipment and systems into full operation for each working day of the TAB Work.

.7 Provide immediate labour from pertinent mechanical Subcontractors, and all tools, equipment and materials to make required equipment and system alterations and adjustments as the TAB Work progresses, including control adjustments.

.8 Make available all equipment data (Shop Drawing performance data and Operating Instructions) to the TAB Contractor.

.9 As part of the coordination effort, be fully responsible for all Mechanical systems constructed, installed and adjusted to provide optimum performance as required by

the design intent. Any re-adjusting required as the result of spot checks by the Consultant shall be done at no increase to the Contract Price.

.10 No Work assigned in this Article voids the responsibility of the Mechanical Contractor for the Mechanical systems constructed, installed and adjusted to achieve the design intent.

3.5 **INSTRUCTION TO OWNER**

.1 Instruct the Owner's personnel in all aspects of the operation of systems and equipment. Refer to requirements for demonstration in the respective equipment sections.

.2 Submit to the Consultant at the time of final inspection a complete list of systems, stating for each system:

.1 Date when instructions were given to the Owner's personnel;

.2 Duration of instruction;

.3 Names of personnel instructed;

.4 Signatures of the Owner's personnel stating that they properly understood the system installation, operation and maintenance requirements.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Articles that are of a general nature, applicable to each Section of Division 23.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.2 Section 20 00 13 – Mechanical General Provisions shall apply to and govern this Section.

1.2 SUBMITTALS

.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit product data for all products described in this Section of the Specification. Submittal shall include dimensions, weights, capacities, ratings, electrical characteristics, metal gauges, finishes of materials, and construction details.

.3 Submit detailed and coordinated drawings showing location and type of all access doors.

.4 Submit fire stopping shop drawings, including ULC/cUL listing number, installation drawings for each type of penetration and description of installation materials.

1.3 MATERIALS AND EQUIPMENT

.1 Use only new materials and equipment of manufacture as specified or shown on the Drawings. Ensure that equipment and materials for similar applications are of the same manufacturer.

.2 If the Contractor wishes to substitute materials of manufacturers other than those listed for specific products, the name of the alternate manufacturer and a complete description of the materials to be substituted shall be listed in the Contractor's Tender submission, along with the amount representing the adjustment to the Bid price.

.3 Ensure that materials not specified to a specific manufacture are of high commercial standard and quality.

1.4 REFERENCE STANDARDS

.1 ASTM A780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

.2 ASTM E84 / UL 723 - Standard Test Method for Surface Burning Characteristics of Building Materials.

.3 CAN/CSA-G164 - Hot Dip Galvanizing of Irregularly Shaped Articles.

.4 CAN/ULC-S115 - Fire Tests of Fire stop Systems

PART - 2 PRODUCTS

2.1 NO PRODUCTS TO SPECIFY

PART - 3 EXECUTION

3.1 GENERAL

.1 Execute the Work in accordance with requirements specified in the various Sections of Divisions 20and 23.

.2 Lay out Work of each mechanical trade Contractor so that it does not interfere with Work of other Divisions' Contractors.

.3 Make good any damage to Owner's property or other Contractor's Work caused by improperly locating or carrying out Work.

.4 Location of pipes, ductwork, raceways and equipment may be altered without extra cost provided the alteration is made before installation.

3.2 WORKMANSHIP

.1 The Consultant's Drawings and instructions govern the general location of all items.

.2 Install ducts and pipes parallel and perpendicular to the building planes and concealed in chases, behind furring or above ceiling, except in unfinished areas. Install all exposed systems neatly and grouped together, to present a neat appearance. No exposed piping or ductwork shall be installed in areas with dropped ceiling unless specifically reviewed and accepted by the Consultant. Installation shall permit free use of space and maximum headroom.

.3 Install all equipment and apparatus requiring maintenance, adjustment, or replacement with sufficient clearance for servicing.

.4 Do not use explosive activated tools.

.5 Install all ceiling mounted components (diffusers, grilles, sprinklers) in accordance with reflected ceiling drawings reviewed by the Consultant. Layout of each device in finished areas is critical in terms of symmetry and location.

.6 Leave space clear and install all Work to accommodate future materials and/or equipment as indicated and to accommodate equipment and/or material supplied under the scope of another Division of Work. Verify space requirements in which Work is to be installed. Install all pipe and duct runs to maintain headroom and clearances, and to conserve space in shafts and ceiling spaces .

.7 Confirm on Site the exact location of outlets and fixtures.

.8 The location and size of existing services shown on the Drawings are based on the best available information. The actual location of existing services shall be verified on Site before work is commenced. Particular attention shall be paid to buried services.

.9 Cap off and seal all open ends of installed ductwork to prevent entrance of foreign matter.

.10 Equipment Installation

.1 Align, level and adjust equipment as required for satisfactory operation.

.11 Noise and Vibration

.1 Noise and vibration levels of equipment and systems shall be within design intent.

.2 If noise or vibration levels created by any mechanical equipment and systems, transmitted to occupied portions of building or other mechanical work are over the allowable noise levels set out for this Project, make all necessary changes and additions as approved by the Consultant without additional cost.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary for installation within the confines of an existing building.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.2 Section 20 00 13 – Mechanical General Provisions shall apply to and govern this Section.

1.2 CO-ORDINATION BETWEEN NEW AND EXISTING INSTALLATION

.1 Check and co-ordinate all systems in the new building addition which are extended to or from existing systems to ensure their proper operation.

.2 Provide interfacing components between new and existing systems as necessary for proper performance and operation.

.3 Route pipes, ducts, conduits and other services to avoid interference with existing installation.

.4 Relocate existing services and equipment to suit installation of new Work without any adjustment to the Bid Price.

.5 Provide temporary dust screens, barriers, warning signs in locations where renovation and alteration Work is performed adjacent to areas that are operational during the time the Work is performed.

.6 Arrange Work to minimize interruption of physical access to the building.

1.3 PENETRATIONS THROUGH EXISTING STRUCTURE

.1 Do all cutting and core drilling for the Work of Divisions 20and 23. Obtain Consultant's approval before proceeding.

.2 Provide sleeves and follow Consultant's instructions where necessary to completely penetrate existing floors, walls, ceiling, roof or structural members.

.3 Refer to Section 20 00 19 – Basic Materials and Methods for general requirements of cutting and patching Work.

.4 If any fire proofing material or insulation on building structure is damaged where mechanical equipment has been removed or added, Contractor to repair at this Division's expense.

.5 Provide fire stopping as required by code at each location where existing penetration through fire rated wall or floor assembly remains due to removal of existing piping, ductwork or other mechanical service.

1.4 **USE OF EXISTING MATERIAL AND EQUIPMENT**

.1 Test existing equipment which is to remain in areas being renovated for proper operation. Identify required repairs in written report to the Consultant.

.2 Repair or replace, without any adjustment to the Bid Price, all existing equipment and fixtures, which are damaged in the process of relocation.

.3 Unless noted otherwise provide additional equipment or fixture of the same type and manufacture where required to supplement existing equipment.

.4 Review existing equipment on site to determine operating conditions prior to Bid Submission.

1.5 **SALVAGE MATERIALS**

.1 Remove from the site all material in renovated areas of the existing building which are not to remain or be reused, unless noted as remaining the property of the Owner.

1.6 **EXISTING SERVICES**

.1 Disconnect and remove all existing products which are abandoned.

.2 Allow for all work necessary to complete the alterations, rerouting and/or repositioning of existing services and equipment, and all interconnections of new and existing systems.

.3 Verify the location and size of all existing services before proceeding with the Work.

.4 Maintain heating and cooling in the building as required to protect the building and equipment and to provide comfort conditions for the occupants.

.5 Protect all existing systems, indicated to remain, and finished new work from damage. Should any existing mechanical or electrical service, fire proofing or insulation on the building structure be damaged or interrupted by the Work carried out under the scope of Divisions 20, 21 and 23, make all required repair at no expense to the Owner. Notify the Owner immediately whenever an existing service was damaged.

1.7 **INTERRUPTION OF SERVICES**

.1 Maintain all mechanical services to all parts of the building which are in use. Provide temporary services as necessary.

.2 Notify the Owner in writing minimum one (1) week in advance of any planned system shutdown, or as set out in the Owner's base building construction manual. Shutdowns of any portion of an existing base building system shall be performed by the Owner's operations staff and/or coordinated with the Owner in regards to time and duration. Arrange for all necessary signage to be posted. Perform shutdown of major services outside of regular working hours at the Owner's request.

1.8 **PREMIUM TIME**

.1 Include the cost of premium time in Bid Price for work during nights, weekends or other time outside normal working hours necessary to maintain all mechanical services in operation.

1.9 **FIRE PROTECTION**

.1 Maintain fire protection and life safety systems operational at all times in accordance with the governing authorities' rules and regulations.

1.10 **BUILDING AUTOMATION AND CONTROLS**

.1 Existing equipment downtime

.1 Make written requests and obtain the Owner's approval prior to disconnecting any controls and obtaining equipment downtime.

.2 Existing control system devices

.1 Inspect, calibrate, and adjust as necessary to place in proper working order all existing devices which are to be reused.

.3 New controls wiring surface mounted shall be enclosed with raceway colour to match wall.

PART - 2 PRODUCTS

2.1 **SURFACE RACEWAY**

.1 Enclose all new controls wiring surface mounted raceway with removable cover.

.2 Elbows, tees, couplings and hanger fittings manufactured as accessories for wireway supplied.

.3 Acceptable Manufacturers:

Wiremold

PART - 3 EXECUTION (NOT USED)

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section for the following:

.1 Performance testing and balancing of air distribution pre-construction and final balancing. Requirements include measurement and establishment of the air quantities of the mechanical system as required to meet design requirements as per consultant comments on pre-construction TAB report.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.2 Section 20 00 13 – Mechanical General Provisions shall apply to and govern this Section.

1.2 QUALITY ASSURANCE

.1 The TAB Contractor must be an independent agency and member in good standing with the National Environmental Balancing Bureau (NEBB), the Canadian Associated Air Balance Council (CAABC) or the National Building Comfort Testing Association (NBCTA).

.2 The TAB Contractor shall have a minimum three years of documented experience in the field of TAB work. The Contractor shall provide suitable evidence of past performance, including references, justifying the TAB Contractor's capabilities.

1.3 SUBMITTALS

.1 Submit all documentation in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit proof of certification for the TAB Contractor's CAABC / NBCTA / NEBB membership within 14 days after the award of the TAB contract.

.3 Submit an outline of the proposed TAB procedures, or alternatively, provide a copy of the latest edition of the CAABC / NBCTA / NEBB procedural standards.

.4 During construction, when the duct installation is ongoing, submit written field review reports prepared to notify of any anticipated problems that could adversely affect the TAB Work.

.5 Submit layout drawings and report format prior to the commencement of the TAB Work.

.1 Layout drawings

.1 Identify specific location of all adjusting, balancing and permanent measuring devices, neatly marked on a set of plans. A set of reproducible drawings will be furnished by the Consultant for this purpose upon request.

.2 Propose additional devices deemed necessary for satisfactory operation and completion of the Mechanical Work.

.2 Report format

.1 Submit the proposed format of each report type.

.2 Include a complete list of instruments and tests for which they are to be used as they relate to this project, including proof of date for the last calibration.

.6 Submit start-up reports, interim and final TAB reports as detailed in this Section of the Specification.

1.4 **PERFORMANCE STANDARDS**

.1 Perform TAB Work in accordance with the current issue of:

.1 CAABC / NBCTA / NEBB procedural standards

.2 SMACNA HVAC Systems Testing, Adjusting and Balancing guidelines.

.3 ASHRAE Guide - Testing, Adjusting and Balancing from the latest ASHRAE Application Handbook

.4 ANSI/ASHRAE Standard 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems

1.5 **DEFINITIONS**

.1 For the purposes of this Section, the following definitions apply:

.1 “Balancing” - To proportion and regulate flows within the distribution system (subsystems, branches, mains, terminals) at appropriate pressures in accordance with the design intent. This includes setting discharge volume and patterns of terminal devices, and individual return and exhaust air volumes.

.2 “Testing" - To measure, interpret and report in writing, such parameters as may be required to verify design compliance and as specified herein.

1.6 **COORDINATION**

.1 The TAB Contractor shall:

.1 Review with each Mechanical Subcontractor before fabrication, the location of balancing devices, test connections, access openings, and report conditions which could negatively affect optimum system performance.

.2 By inspection, ensure that all testing, balancing and metering devices have been installed properly and in their pre-selected locations. The Mechanical Contractor shall obtain the approval of the TAB Contractor prior to adjusting the location of these devices due to field conditions.

.2 The Mechanical Contractor shall provide the following assistance and services to the TAB Contractor:

.1 Ensure that all Mechanical systems are complete and ready for testing, adjusting and balancing by the TAB Contractor. Associated tasks shall include:

.1 Allow access to all components requiring testing, balancing, and servicing.

.2 Verify that installation conforms with the design Drawings and Specifications.

.3 Promptly correct deficiencies of materials and Work that may delay the completion of the TAB Work.

.4 Provide Operation and Maintenance Manuals. Manuals must include the following:

.1 The manufacturers' method for adjusting and setting components for correct operation under actual load conditions.

.2 The manufacturers' recommended tolerance for maximum and minimum operating conditions.

.3 The recommended correction or Ak factors, to allow adjustment of flow, rpm, etc.

.4 Pressure drops for air flows through the component or unit at design flow rate.

.5 Start up according to the following conditions:

.1 Smoke and fire damper operation (left in full open position) is correct.

.2 Volume and control dampers (left in a neutral or wide-open position) function properly.

.3 Verification that duct-leakage test has been performed and ducts are sealed to the minimum tolerance specified.

.4 Verification that all registers, grilles, and diffusers are of the correct type, have been properly installed, and are in the open position.

.5 Verification that the controls are complete and operational.

.2 Provide a copy of all start-up report for each piece of equipment, including initial tabulated data required for the start-up of the system, to the TAB Contractor to be used as reference for the TAB Work.

.3 Provide immediate labour from pertinent Mechanical Subcontractors, tools, equipment and materials to make equipment and system alterations and adjustments as required including control adjustments.

.4 Technical representative of the Existing Building Automation System (BAS) Contractor shall operate the BAS during air and water balancing testing.

.5 Make available all equipment data (Shop Drawing performance data and operating instructions) to the TAB Contractor.

.3 As part of the coordination effort, the Mechanical Contractor will be fully responsible for the Mechanical system constructed, installed and adjusted to provide optimum performance as required by the design intent. Any re-adjusting required as the result of spot checks by the Consultant shall be done at no additional cost to the Owner. Provide all equipment, labour, instruments and incidentals and pay for all power and fuel to carry out the tests.

PART - 2 PRODUCTS

2.1 **NOT APPLICABLE**

PART - 3 EXECUTION

3.1 REQUIRED REPORTS

.1 Provide the following reports:

.1 Air balancing report (pre construction balancing report and final balancing report)

.2 Report format

.1 Prepare test forms in MS Excel or Word format.

.2 Include the following header information for each test report:

.1 Owner's name

.2 Project name

.3 Contractor's name

.4 Consultant's name

.5 Title of report

.3 Submit the above reports in a hardcopy form, separately bound from the Operations and Maintenance Manuals, and in Adobe Acrobat PDF format, in accordance with Section 01 33 00 - Submittal Procedures.

3.2 GENERAL REQUIREMENTS

.1 Site visits

.1 The TAB Contractor shall visit the Site as required prior to the testing and balancing of systems, and advise the respective Subcontractors of their requirements for probe inlets. Submit a report to the Consultant after each site visit.

.2 Balancing tolerances

.1 Balance all systems to the performance parameters indicated on Drawings and in the Specifications.

.2 If interpretation, clarification or additions to performance parameters are required, request such information from the Consultant.

.3 Air flow rates ±10% of flow

.3 Drawing review

.1 Review all pertinent Drawings, Specifications, Shop Drawings and other documentation to become fully familiar with the systems and their specified and intended performance.

.4 Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

.5 Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

.6 Patch insulation, ductwork, and housings, using materials identical to those removed.

.7 Seal ducts and piping, and test for and repair leaks. Seal insulation to re-establish integrity of the vapour barrier.

.8 As part of the scope of this Section, the Contractor shall make any changes in the pulleys, belts, or sheaves, as required, for correct balance at no additional cost to the Owner.

3.3 MEASUREMENTS

.1 Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified. Instruments shall be properly maintained and protected against damage.

.2 Use only those instruments that have the maximum field measuring accuracy and are best suited to the function being measured.

.3 Apply instrument as recommended by the manufacturer.

.4 Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

.5 When averaging values, take a sufficient quantity of readings that will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until two (2) consecutive identical values are obtained.

3.4 AIR BALANCING

.1 General

.1 Balance air flows within acceptable tolerances.

.2 Test procedures

.1 Air quantities in main ducts shall be measured using Pitot tube traverses of the entire cross section area of the duct. Openings in ducts for Pitot tube insertion shall be sealed with approved plugs. Outlet and inlet air quantities shall be determined in accordance with the CAABC / NBCTA / NEBB procedures.

.2 Total air quantities shall be obtained by adjustment of fan speeds. Branch duct air quantities shall be adjusted by volume dampers. Damper positions shall be permanently marked after TAB Work is complete.

.3 Adjusting of individual outlets shall be performed as per CAABC / NBCTA / NEBB procedures or as otherwise approved by the Consultant. Outlets shall be set for the air pattern required and all main supply air dampers shall be adjusted and set for the design indicated. All required changes in air patterns or setting necessary to achieve correct air balance and to minimize drafts shall be performed by the TAB Contractor.

.4 Each variable air volume (VAV), fan powered VAV (both series and parallel type), and constant volume (CV) supply, return air and exhaust terminal unit shall be adjusted to deliver the maximum and minimum air quantities specified in all specified modes of operation. Use the prescribed procedures for each type terminal device. The individual supply outlets for each zone shall be adjusted after the respective control unit is set to the minimum and maximum design airflow settings. Factory calibration of all types of VAV and high velocity fan powered/reheat units shall be verified and reset as required by the TAB Contractor.

.5 Balance the low pressure side of the terminal units after ensuring that there is sufficient pressure at the unit inlet. Obtain from the Consultant the diversity assumed for the air handler. After all of the low pressure systems have been balanced, adjust the BAS to open the diversity amount of the VAV boxes to the

maximum airflow. Ensure the variable frequency drive maintains the appropriate pressure levels to satisfy the design intent.

.6 Check that stratification has been eliminated before taking measurements. Make temperature traverse readings after each mixing compartment.

.7 Perform the tests and compile the data required. In addition to the tabulation forms, provide schematic diagrams showing all system components cross-referenced to form tabulations. The lists provided hereinafter shall be considered minimum requirements. All information required to prove system balance shall be provided.

.3 Data Required

.1 Submit the following data as a minimum. If contractor's standard forms provide for additional data, also submit such additional data. Indicate if tests were not specifically made. Do not repeat design data or other values not specifically tested.

.2 Air distribution systems (including inlets and outlets):

.1 Grille, register or diffuser reference number and manufacturer

.2 Grille, register or diffuser location

.3 Design velocity

.4 Design airflow L/S

.5 Effective (or free) area factor and size

.6 Measured velocity

.7 Measured airflow L/S

3.5 **DEFICIENCIES**

.1 Immediately report to Consultant any deficiency in the systems or equipment performance resulting in design requirements being unobtainable.

3.6 **DRAFT REPORT**

.1 Upon completion of the start-up, testing, adjusting and balancing of all systems, submit to the Consultant, two (2) typewritten copies of a full report on all testing, adjustments, and balancing performed, including the following:

.1 Summary of all systems

.2 Testing methods and instrumentation

.3 Air systems testing and balancing data

.4 Attachments including systems schematics.

.2 At the request of the Consultant, repeat the balancing procedure on 10% of any system or portion of a system (as selected by the Consultant). If the re-measured data is within the required tolerance of the reported data, the system shall be considered acceptable and the report accepted. If the data is not within the required tolerance of the reported data, the Consultant can request that the entire system or systems be rebalanced.

3.7 **FINAL REPORT**

.1 Submit the final report to the Consultant following the completion of testing and balancing. Submit three (3) typewritten copies and an electronic copy in Adobe Acrobat PDF format as the draft report specified above.

3.8 **ACCEPTANCE**

.1 The Substantial Performance of the Mechanical Work will be considered reached when the Interim TAB Report has been accepted by the Consultant and, in the opinion of the Consultant, all systems have been satisfactorily installed, operated, tested, balanced, and adjusted to meet the specified and design performance.

.2 The Total Performance of the Mechanical Contract will not be considered reached until the alternate season testing and balancing has been completed and the Final Report submitted and accepted by the Consultant.

3.9 **ADDITIONAL TESTING**

.1 The Consultant may request such additional testing in connection with this project as deemed necessary.

.2 Additional testing and balancing shall be performed at the rates quoted and costs shall be withdrawn from the Mechanical Contractor's allowance for the TAB Work as approved by the Consultant.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 This Section supplements all Sections of Division 23 – HVAC.

.3 The intent of the Division 23 – HVAC Specifications and the accompanying Drawings is to provide complete and workable heating, ventilation and air conditioning (HVAC) systems as shown, specified and required by applicable codes. Include all work specified under Division 23 - HVAC and shown on the accompanying Drawings.

.4 The Drawings that accompany the Division 23 – HVAC Specifications are diagrammatic. It is the responsibility of this Contractor to ensure that adequate and appropriately sized air distribution and hydronic systems are provided. The Contract Drawings do not show each offset, bend, tee, or elbow which may be required to install the HVAC Work in the space provided and to avoid conflicts. Follow the Drawings as closely as is practical to do so and install additional bends, offsets and elbows where required by local conditions from measurements taken at the Site, subject to approval, and without additional cost to the Owner.

.5 Major aspects of the HVAC Work shall include but not necessarily be limited to, the following items:

.1 Revisions to existing HVAC system to accommodate architectural RCP revisions.

.2 Refer to the following Sections of the Division 23 – HVAC Specification for further details:

.1 Ducts and Casings – Section 23 31 00

.2 Duct Accessories – Section 23 33 00

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.2 Section 20 00 13 – Mechanical General Provisions shall apply to and govern this Section.

1.2 QUALITY ASSURANCE

.1 Manufacturer Qualifications:

.1 Companies specialized in manufacturing heating, ventilation, air conditioning, natural gas, and fuel oil products specified under the Sections of Division 23 – HVAC with minimum three years of documented experience.

.2 Installer Qualifications:

.1 Companies specialized in performing work of the type specified under the Sections of Division 23 – HVAC:

.1 Minimum three years of experience, or

.2 Approved by product manufacturers.

.3 Conform to CSA, municipal, provincial and federal building codes', Owner's HVAC Standard requirements as applicable for this project.

.4 Layout drawings:

.1 HVAC systems layout drawings shall take into consideration architectural, structural, mechanical and electrical layouts. Ductwork branches must be arranged to not interfere with any of the aforementioned systems and equipment.

1.3 **DESIGN CRITERIA**

.1 Noise and vibration

.1 Noise levels due to equipment and ductwork shall permit attaining sound pressure levels in all eight (8) octave bands in occupied spaces conforming to noise criteria (NC levels listed (in Table 1 in 'Sound and Vibration Control' in the below table.

Noise Criteria	
Space Usage	**Max. Noise Level (NC)**
Privacy Booth	30-35

.2 Install equipment, piping and ductwork in accordance with good noise and vibration control engineering practices in order to meet the requirements specified in this Section.

.3 If noise or vibration levels created by any mechanical equipment and systems transmitted to the occupied portion of the building or to other mechanical work, are over the maximum allowable levels, make all necessary changes to reduce the noise and vibration levels without any additional cost to the Owner.

1.4 **SUBMITTALS**

.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data for flashing system.

1.5 **PERMITS AND INSPECTIONS**

.1 Submit layout drawings to the municipal Building Department; apply for and obtain permits required for HVAC Work and pay all costs levied for permits and inspections.

PART - 2 PRODUCTS

2.1 **THERMAL INSULATION**

.1 In accordance with Section 20 07 00 - Mechanical Insulation.

PART - 3 EXECUTION

3.1 GENERAL

.1 Execute the HVAC Work in accordance with requirements specified in the various Sections of Division 23 – HVAC.

.2 Install complete HVAC ductwork in accordance with the municipal, provincial and federal building codes, standard trade practice and as specified in this Specification.

3.2 HVAC DEMOLITION

.1 Refer to Division 01 – General Requirements, Division 02 – Existing Conditions and Section 20 00 23 – Work in Existing Buildings for general demolition requirements and procedures.

.2 Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

.1 Equipment to be removed and reinstalled: disconnect and cap services; remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

.3 If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.3 TESTING

.1 Execute HVAC systems and equipment tests in accordance with the requirements of municipal, provincial and federal codes. For testing procedures of specialty systems refer to the respective Sections of the Division 23 - HVAC Specifications.

.2 Execute tests in the presence of the Owner's authorized representative.

.3 Test ductwork following the procedure described under Section 23 31 00 - HVAC Ducts and Casings.

.4 Promptly repair defects which develop during tests, and then re-test system to complete satisfaction of authorized inspectors. Repairs to piping shall be made with new materials. Caulking of screwed joints or holes is not acceptable.

3.4 COMPLETION

.1 Provide written certification to the Owner that the HVAC systems were installed, and tested in accordance with appropriate codes, approved plans and calculations, and confirming the following:

.1 HVAC inspections completed. Issue the necessary certificates.

3.5 **DEMONSTRATION**

.1 Prior to final acceptance of the HVAC systems, the Division 23 - HVAC Contractor shall provide operational training in all aspects of these systems to the Owner's key personnel. Training shall include emergency procedures, safety requirements, and demonstration of the systems, including all interfaces with the Control and Building Automation Systems.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Supply and install HVAC duct systems including:

.1 Ducts for air exhaust, supply and air transfer.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.2 Section 20 00 13 – Mechanical General Provisions and 23 05 00 - Common Works for HVAC shall apply to and govern this Section.

.3 Definitions

.1 SMACNA Standards as used in this Section: 'HVAC Duct Construction Standards, Metal and Flexible', latest edition.

.2 Seal or sealing: the use of liquid or mastic sealant, with or without compatible tape overlay, or gasketing of flanged joints, to keep air leakage at duct joints, seams and connections to an acceptable minimum.

.3 Exposed duct: exposed to view in a finished room.

1.2 RELATED WORK

.1 Fire stopping: Section 07 84 00 – Fire Stopping and Smoke Seals

1.3 SUBMITTALS

.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data for rigid and flexible ductwork, and all related materials, including:

.1 Rectangular ducts:

.1 Schedules of duct systems, materials and selected SMACNA construction alternatives for joints, sealing, thickness and reinforcement.

.2 Sealants, tapes and gaskets.

.2 Round and flat oval duct construction details:

.1 Manufacturer's details for duct fittings.

.2 Sealants, tapes and gaskets.

.3 Installation instructions.

1.4 **REFERENCE STANDARDS**

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible

.2 SMACNA HVAC Air Duct Leakage Test Manual

.3 SMACNA HVAC Systems Testing, Adjusting and Balancing guidelines.

.4 SMACNA Duct Cleanliness for New Construction guidelines.

.5 ASHARE 62.1 - Ventilation for Acceptable Indoor Air Quality

.6 ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

.7 ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.8 ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

.9 ASTM B32 - Standard Specification for Solder Metal

.10 ASTM C582 – Standard Specification for Contact–Molded Reinforced Thermosetting Plastic Laminates for Corrosion Resistant Equipment

.11 ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials

.12 NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems

.13 NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.14 ULC-S110 – Standard Methods of Test for Air Ducts

1.5 **QUALITY ASSURANCE**

.1 Duct system construction and installation:

.1 SMACNA Standards are the minimum acceptable quality.

.2 Manufacturer:

.1 Ductwork systems to be provided by firm having an established reputation in this field.

PART - 2 PRODUCTS

2.1 **MATERIALS**

.1 Galvanized steel:

.1 Lock forming quality: to ASTM A653/A653M, G90 zinc coating for unpainted indoor duct work and for outdoor duct work;

.2 A25 zinc coating to ASTM A653/A653M for painted duct work.

.3 Thickness, fabrication and reinforcement: to SMACNA except as noted in this Section.

.2 Aluminum:

.1 ASTM B209, alloy 3003 H-14 or 5052-H32 for sheet material, alloy 6061-T6 for plate material, alloy 6061-T4 or T6 for shapes material.

.2 Thickness, fabrication and reinforcement: to SMACNA except as noted in this Section.

.3 Gaskets in flanged joints:

.1 Soft neoprene

.4 Sealant:

.1 Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer. Generally provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger. Oil base caulking and glazing compounds are not acceptable. Use only non-solvent based (low VOC) type sealant.

.2 Standard of Acceptance:

.1 3M

.2 Foster

.3 Hardcast

.4 Duro-Dyne

.5 Transcontinental Equipment

.6 Bakor

.7 DuctMate

.5 Tape:

.1 Polyvinyl treated open weave glass fibre tape, 50mm wide. Use only tape specifically designated by the sealant manufacturer and apply only over wet sealant. Pressure sensitive tape shall not be used on bare metal or on dry sealant.

.6 Reinforcing and supporting material

.1 Mill-rolled structural steel conforming to ASTM A36/A36M. Whenever in contact with sheet metal ducting, provide galvanized steel in accordance with ASTM A123/A123M.

2.2 DUCT CONSTRUCTION AND FABRICATION

.1 Regardless of the pressure and seal classifications outlined in the SMACNA Standards, fabricate and seal the ductwork in accordance with the following pressure classifications:

Duct Pressure and Seal Classification		
System	Pressure Class	Seal Class
Constant volume supply	+500 Pa	A
Variable volume supply, upstream of terminal units	+750 Pa	A

Duct Pressure and Seal Classification		
System	Pressure Class	Seal Class
Variable volume supply, downstream of terminal units	+250 Pa	A
Air exhaust and air transfer ductwork	+/-500 Pa	A

.2 Rectangular ductwork

.1 Make up longitudinal seams with Pittsburgh lock, with sealant applied prior to hammering of joint.

.2 Seal transverse joints as required to suit seal classification.

.3 Cross-break flat surfaces of uninsulated duct between joints, or between joints and intermediate reinforcements, to prevent vibration or buckling.

.3 Round and flat-oval ductwork

.1 Furnish duct and fittings made by the same manufacturer to ensure good fit of slip joints. When submitted and approved in advance, round and flat oval duct, with size converted on the basis of equal pressure drop, may be furnished in lieu of rectangular duct design shown on the Drawings.

.2 Elbows: Diameters 80mm through 200mm shall be two sections die stamped, all others shall be gored construction, maximum 18 degree angle, with all seams continuously welded or standing seam. Coat galvanized areas of fittings damaged by welding with corrosion resistant aluminum paint or galvanized repair compound.

.3 Provide flat side reinforcement of oval ducts as recommended by the manufacturer and SMACNA Standards. Because of high pressure loss, do not use internal tie rod reinforcement unless approved by the Consultant.

.4 Flexible ductwork:

.1 Return and Non-return air plenums: insulated aluminum flex duct with a polyethylene vapour barrier manufactured by using a dead soft aluminum strip, spirally wound and mechanically joined together with an inner duct that is covered with a thick fiberglass insulation and a flame retardant, non-toxic polyethylene vapour barrier, to ULC-S110.

.2 Acoustic flex duct: manufactured by using a dead soft aluminum strip which is perforated, spirally wound and mechanically joined together. The inner duct is covered with thick fiberglass insulation and sleeved by a triple-lock aluminum jacket. The acoustic flex duct includes a perforated core with an open area of 20-25%.

.3 Standard of Acceptance:

.1 Thermoflex

.2 Flexmaster

.3 Hart Cooley

2.3 FITTINGS

.1 Fabrication: to SMACNA Standards.

.2 Radiused elbows:

.1 Rectangular: Centreline radius: 1.5 times width of duct.

.2 Round: smooth radius or five piece. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:

.1 Up to 400 mm: with single thickness turning vanes.

.2 Over 400 mm: with double thickness turning vanes.

.4 Branches:

.1 Rectangular main and branch: with radius on branch 1.5 times width of duct or 45º entry on branch.

.2 Round main and branch: enter main duct at 45º with conical connection.

.3 Provide volume control damper in branch duct near connection to main duct.

.5 Transitions:

.1 Diverging: 20º maximum included angle.

.2 Converging: 30º maximum included angle.

.6 Offsets:

.1 Full short radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles: as for transitions.

PART - 3 EXECUTION

3.1 GENERAL

.1 Production and site delivery

.1 To maintain cleanliness during transportation, all ductwork shall be sealed either by blanking or capping duct ends, bagging small fittings, surface wrapping or shrink wrapping.

.2 Protection

.1 Temporarily cap-off duct work openings while other finishing operations are in progress to protect against dirt accumulation inside the ductwork.

.2 Cover open ends or registers of active exhaust/return ducts with 25 mm thick filter media secured with tape. Maintain media until dust producing finishing operations are completed and general cleaning completed

.3 Installation

.1 Install ductwork in a clean and dry work area, protected from elements. Remove protective covering from duct ends only immediately before installation. Wipe internal surfaces of unprotected ductwork without internal lining to remove excess dust.

.2 Install ductwork in locations and at elevations appropriate to ceiling heights shown on Architectural Drawings. Where required to be concealed, install ductwork in furred spaces provided in walls and ceilings. Complete installation with rectangular ductwork system connection during privacy booth installation on site.Where there is no provision for concealment install duct as close as possible to walls, partitions and overhead structures to attain maximum headroom and clearance.

.3 Wherever ductwork is required at locations where sprayed fireproofing is applied to the building structure, install ductwork only after fireproofing work is complete. Do not compromise fire rating of sprayed fireproofing.

3.2 DUCTWORK

.1 General

.1 Fabricate and install ductwork and accessories in accordance with the requirements of the SMACNA Standards, NFPA-90A and NFPA-90B.

.2 Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, terminal units, diffusers, grilles, and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid.

.3 Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties. Where rectangular ductwork is shown, round or flat oval ductwork of equivalent cross-sectional area is acceptable.

.4 Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards, Chapter 2. Provide streamliner, when an obstruction cannot be avoided and must be taken in by a duct. Repair galvanized areas with galvanizing repair compound.

.5 Where shape of duct changes, install transition piece so that angle of side of transition piece does not exceed 15 degrees from straight run of duct being connected, unless shown otherwise on Drawings.

.6 Provide bolted construction and tie rod reinforcement in accordance with SMACNA Standards.

.7 Where flanged duct joints are used, do not locate joints in wall or slab openings, or immediately at wall or slab openings. Do not use flanged joints for exposed uninsulated ducts in finished areas.

.8 Hammer edges and slips to leave smooth finished surface inside duct.

.9 Fabricate duct work free from vibration, rattle or drumming under operating conditions; reinforce, brace, frame, place gaskets as required to comply with the acoustical performance criteria.

.10 Connections such as spin-in taps and other branch fittings inserted into cut openings in duct, access door frames, insertion type control elements and duct joints at equipment are to be treated as transverse joints.

.11 Place galvanized screens of 13 mm x 13 mm mesh x 2.7 mm diameter wire for air intakes, exhausts and open ends of duct work.

.12 Where dissimilar metal ducts are to be connected, isolate ducts by means of flexible duct connection material. Wherever bare aluminum ductwork comes in contact with ferrous metal or copper, paint ferrous metal or copper surface with a heavy, 100% covering coat of zinc chromate paint, asphalt paint or otherwise isolate direct contact with the bare aluminum.

.2 Sealant Application

.1 Store duct sealant at room temperature for 24 hours before use.

.2 Seal all ductwork to SMACNA Class A, except for round duct with self-sealing gasketed fittings and couplings which does not require site applied sealant.

.3 Apply sealants by brush or gun to cleaned metal surfaces. Where bare ductwork is exposed apply neat uniform lines of sealant. Randomly brushed, sloppy looking sealant applications will be rejected and must be repaired or replaced with a neat application of sealant.

.4 On bell and spigot style joints apply sealant on male section with caulking gun and spread sealant evenly on mating surface with brush.

.1 Insert fitting and secure with sheet metal screws;

.2 Brush sealant onto outside of assembled joints in 50 mm wide band covering fastener heads.

.5 Allow for 40 hours of curing time before pressure testing.

3.3 DUCT HANGERS AND SUPPORTS

.1 Install duct hangers and supports in accordance with SMACNA Standards Chapter 4.

.2 Support vertical ducts with angles screwed or bolted to duct and bearing on building structureStrap hangers:

.1 Support rectangular ducts up to 750 mm width using strap-type hangers attached at not less than three places to not less than two duct surfaces in different planes.

.2 Perforated strap hangers are not acceptable.

.3 Maximum spacing of straps shall be 2.4 m on centre.

.3 Round and flat oval ductwork

.1 Support round and flat oval ducts in accordance with the SMACNA Standards.

.2 Hang uninsulated and insulated ducts exposed in finished areas using pre-manufactured round duct strap bracket secured at top of duct to a hanger rod. For insulated ducts, size strap bracket to suit diameter of insulated assembly.

.3 For uninsulated ductwork, as an alternative, at the contractor's discretion except within pool enclosures, the use of Gripple type wire hanger system is permitted.

.4 Unless otherwise specified, duct support hardware for metal duct shall be constructed of the same material as the duct. Duct strap shall be one material thickness heavier than the duct it supports.

.5 Where ductwork system contains heavy equipment, excluding air-diffusion devices and single-leaf dampers, hang such equipment independently of the ductwork by means of rods or angles of adequate size to support the load.

.6 In finished areas, where diffusers, registers and grilles cannot be installed to avoid seeing inside the duct, paint the inside of the duct with flat black paint to reduce visibility.

.7 Touch-up galvanized steel damaged as a result of fabrication, including welding, with zinc dust galvanized primer.

.8 In finished areas, paint all ductwork (insulated and uninsulated) exposed to view; colour to be determined by Interior Designer.

3.4 **CLEANING**

.1 Clean all new horizontal and vertical ducts (supply, return, exhaust, transfer), as well as, existing supply and return ductwork connected to new fan systems.

.2 Prior to start-up of fans, blow out complete systems of ductwork with high velocity air for not less than two hours using where possible the installed air handling equipment at full capacity and by blanking off duct sections to achieve the required velocity. Do not install air filters prior to blow-out of duct work systems. Use auxiliary portable blowers for cleaning where installed fan systems are not adequate to blow out the complete system free from dust and dirt.

.3 After duct systems have been blown out, clean interior of plenums, coils, and register, grille or diffuser outlet collars with industrial type vacuum cleaner. On completion of cleaning process, install filters before placing systems in final operation.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Ductwork accessories, including balancing dampers and internal sound attenuation.

.2 Related requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

.2 Sections 20 00 13 – Mechanical General Provisions and 23 05 00 - Common Works for HVAC shall apply to and govern this Section.

1.2 SUBMITTALS

.1 Shop Drawings

.1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit product data for all duct accessories. Shop drawings shall indicate dimensions, weights, required clearances, construction details. approach velocity for range of blade angles from 0 to 90 deg, torque requirements.

1.3 REFERENCE STANDARDS

.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible

.2 SMACNA HVAC Systems Testing, Adjusting and Balancing guidelines.

.3 ASHRAE 62.1 - Ventilation for Acceptable Indoor Air Quality

.4 ANSI/ASHRAE 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems

.5 Midwest Insulation Contractors Association (MICA) Standards Manual

.6 NPS 15-69 - Standards specification for Custom Contact-Molded Reinforced - Polyester Chemical - Resistant Process Equipment

.7 AMCA 503 - Fire Ceiling (Radiation), Smoke, and Fire/Smoke Dampers Application Manual.

.8 ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method

.9 ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation

.10 ASTM C1071 - Standard specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)

.11 ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings

.12 ASTM C1534 - Standard Specification for Flexible Polymeric Foam Sheet Insulation Used as a Thermal and Sound Absorbing Liner for Duct Systems

.13 ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

.14 UL 181 - Standard for Factory-Made Air Ducts and Air Connectors

.15 CAN/ULC S109 – Standard Method for Flame Tests for Flame-Resistant Fabrics and Films

1.4 **QUALITY ASSURANCE**

.1 Duct accessories construction and installation:

.1 SMACNA Standards are the minimum acceptable quality.

PART - 2 PRODUCTS

2.1 **FLEXIBLE DUCT CONNECTIONS**

.1 Not accepted. Hard connections to diffuser and R/A grille to match existing.

2.2 **BALANCING DAMPERS**

.1 Splitter dampers

.1 Single thickness construction, of same material as duct, one sheet metal thickness heavier where both dimensions of damper blade are less than 300 mm.

.2 Double thickness construction, one metal thickness lighter than duct, where either dimension of damper blade is 300 mm or larger.

.3 Of height equal to full depth of branch duct and length 1-½ times branch duct width.

.4 Fitted with piano hinge pivot, control rod, and locking device accessible from outside fitting.

.5 Folded leading edge.

.2 Single blade dampers in rectangular ductwork

.1 Shop fabricated of the same material and sheet metal thickness as the duct, stiffened with longitudinal V-grooves.

.2 Maximum aspect ratio: 3:1.

.3 Maximum blade height: 300 mm

.4 Fitted with locking quadrant, inside and outside nylon or bronze end bearings, and shaft extension to suit insulation thickness.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

.6 Fabrication shall follow SMACNA Standard Figure 2-12.

.3 Multi-blade dampers in rectangular ductwork

.1 Shop fabricated or factory manufactured of the same material and sheet metal thickness as duct, stiffened with longitudinal V-grooves.

.2 Opposed blade configuration

.3 Channel frame with angle blade stop.

.4 Maximum blade height: 100 mm.

.5 Maximum blade length: 1,200 mm.

.6 Bearings with bronze bushings.

.7 Shaft extension to suit insulation thickness with locking quadrant.

.8 Channel frame of same material as adjacent duct, complete with angle stop.

.9 Fabrication shall follow SMACNA Standard Figure 2-13.

.10 Maximum leakage: 2 % at 500 Pa

.4 Single blade dampers in round ductwork

.1 Shop fabricated butterfly type with round edged 3.5 mm disk set in round sheet metal housing, fitting snugly when closed, 10 degrees from vertical.

.2 Fitted with rubber packing glands, shaft extension, wing nuts, and indexing device to indicate disk position.

.3 Fabrication shall follow SMACNA Standard Figure 2-12.

2.3 ACOUSTIC TREATMENT

.1 Acoustic duct lining

.1 General

.1 Mineral fibre duct liner: air surface coated mat facing, or

.2 Soft elastomeric foam: closed cell fibre-free, low VOC, with antimicrobial protection.

.3 Fungi resistance: to ASTM C1338, ASTM G21.

.2 Rigid fibreglass:

.1 Use on flat surfaces where indicated

.2 25 mm thick, to ASTM C1071, Type 2, fibrous glass rigid board duct liner.

.3 Density: 48 kg/m³ minimum.

.4 Thermal resistance to be minimum RSI-0.76 for 25 mm thickness when tested in accordance with ASTM C177, at 24ºC mean temperature.

.5 Maximum velocity on faced air side: 20.3 m/s.

.6 Minimum NRC of 0.70 at 25 mm thickness based on Type A mounting to ASTM C423.

.3 Flexible fibreglass:

.1 Use on round or oval surfaces.

.2 25 mm thick, to ASTM C1071 Type 1, fibrous glass blanket duct liner.

.3 Density: 24 kg/m³ minimum.

.4 Thermal resistance to be minimum RSI-0.74 for 25 mm thickness, when tested in accordance with ASTM C177, at 24ºC mean temperature.

.5 Maximum velocity on coated air side: 25.4 m/s.

.6 Minimum NRC of 0.65 at 25 mm thickness based on Type A mounting to ASTM C423.

.4 Soft elastomeric foam:

.1 For all surfaces, at the contractor's choice.

.2 25 mm thick, to ASTM C1534, elastomeric, thermal and acoustical duct liner.

.3 Thermal conductivity (k) shall be maximum 0.036 W/m K for 25 mm thickness, when tested in accordance with ASTM C177, at 24ºC mean temperature.

.4 Maximum velocity on air side: 50.8 m/s.

.5 Minimum NRC of 0.6 at 25 mm thickness based on Type A mounting to ASTM C423.

.5 Adhesive:

.1 Fibreglass lining: water-based fire retardant type.

.2 Elastomeric lining: low VOC adhesive.

.6 Fasteners:

.1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm square.

.7 Joint tape:

.1 Poly-vinyl treated open weave fiberglass membrane 50 mm wide.

.8 Standard of Acceptance:

.1 Owens Corning

.2 Johns Manville

.3 Knauf Fibreglass

.4 Manson

.5 Armaflex (for elastomeric)

.2 Crosstalk silencers and Air transfers

.1 Pre-manufactured or field fabricated as shown on the Drawings.

.2 Pre-manufactured:

.1 0.76 mm solid galvanized steel casing;

.2 0.45 mm solid galvanized steel internal noses at inlet and outlet;

.3 20 mm dual density absorptive fiberglass media. Acoustic media shall be shot-free inorganic glass fiber with long, resilient fibers, bonded with thermosetting resin. Glass fiber shall be in accordance with erosion requirements of UL 181, and shall conform to the physical properties and requirements of ASTM C1071.

.4 Cross talk silencers shall be fastened with the use of button lock, Pittsburgh lock, and welds. Screws and other types of mechanical fasteners shall not be acceptable.

.5 Standard of Acceptance:

.1 Price

.2 Vibro-Acoustics

.3 Kinetics

.4 Ruskin

.3 Field fabricated:

.1 Housing: galvanized steel, to SMACNA pressure class 250 Pa standard.

.2 Liner: rigid coated fibreglass or closed cell elastomeric duct liner.

.3 Size: as shown on the Drawings.

.4 Shape: as shown on the Drawings.

.5 Provide a sheet metal nosing at the open ends of duct to close off the cut edge of liner.

PART - 3 EXECUTION

3.1 GENERAL

.1 Install miscellaneous steel framing, supports, and braces as required to hang or support equipment and duct accessories as specified herein, and as shown on the Drawings.

3.2 BALANCING DAMPERS

.1 Locate dampers to allow adjustment of blade position and locking of quadrant.

.2 Provide balancing dampers in all locations necessary for the complete balancing of the air system, even if balancing dampers are not specifically shown on the Drawings.

.3 Bolt all dampers in plenums to a counter frame using a neoprene gasket between damper and wall.

.4 In stainless steel ducts, cover the neoprene gaskets with Teflon tape.

.5 Use splitter dampers in supply ductwork where main ducts are split into two trunks and where specifically shown on the Drawings.

.6 Use low pressure butterfly dampers at the following locations:

.1 At branch connections on the downstream side of terminal boxes;

.2 At individual branch outlets serving grilles or diffusers.

.7 Use medium pressure butterfly dampers at the following locations:

.1 At floor connections to supply air riser ducts;

.2 In return ductwork where main ducts are split into two or more trunks;

.3 At branch duct connections to main or trunk ducts;

.4 Where shown.

.8 Use rectangular opposed blade dampers at the following locations:

.1 At floor connections to riser shafts/ducts;

.2 In supply and return ductwork where main ducts are split into two more trunks;

.3 At rectangular branch duct connections to main or trunk ducts;

.4 Where shown.

.9 Dampers supplied with diffusers or grilles are to be used to balance ±10% of the indicated airflow and do not substitute branch dampers.

.10 Install access panels in the ceiling where the dampers are located above gypsum board or other fixed type ceiling.

.11 Install remote damper control or cable operated type dampers for locations not reachable using a stepladder and in finished areas where the installation of access panels is not desirable due to the type of finish installed (e.g. specialty ceilings). Refer to reflected ceiling plans for direction.

.12 Support cables of cable operated dampers at each change of direction and at 0.9 m3 ft intervals using retaining clips provided by damper manufacturer. Install cables taut with minimum 102 mm radius turns.

3.3 ACOUSTIC TREATMENT

.1 Acoustic duct lining

.1 Install internal acoustic insulation in specific sections of ductwork and/or plenums as follows:

.1 In air transfer ducts for full length.

.2 In exhaust air duct for full length.

.3 In all ductwork serving spaces with noise criteria of NC-30 or lower.

.4 Where indicated on the Drawings.

.2 Duct dimensions, as indicated, are measured inside the duct lining.

.3 Fasten liner to interior sheet metal surface with 100 % coverage of adhesive to ASTM C916.

.4 Exposed leading edges and transverse joints to be factory coated or coated with adhesive during fabrication.

.5 In addition to adhesive, for fibreglass liner install weld pins not less than 2 rows per surface and not more than 432 mm on centres impact driven mechanical fasteners to compress duct liner sufficiently to hold it firmly in place. Spacing of mechanical fasteners shall be in accordance with SMACNA Standard and TIAC.

.6 Seal butt joints, exposed edges, weld pin and clip penetrations and damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's written recommendations, and as follows:

.1 Bed tape in sealer.

.2 Apply two coats of sealer over tape.

.7 Protect leading and trailing edges of duct sections with sheet metal nosing having 15 mm overlap and fastened to duct.

.8 Adhere new acoustic lining to match existing to inside of access panel or door to ensure continuity of acoustic properties of system.

.2 Cross talk silencers:

.1 Install air transfer silencers according to manufacturer's written installation instructions.

.2 Support air transfer silencers independently from other ductwork.

.3 Ensure air transfer silencers are installed with airflow arrows in direction of airflow.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

1.2 CODES, PERMITS AND INSPECTIONS

.1 Applicable Codes

.1 Ontario Electrical Safety Code

.2 Ontario Building Code

.3 Ontario Fire Code

.2 Comply with Ontario Electrical Safety Code, all local, provincial and federal laws, where applicable and with authorities having jurisdiction. Make any changes or alterations required by authorized inspector of authority having jurisdiction.

.3 Equipment and material must be acceptable to Electrical Safety Authority.

.4 Where materials are specified which require special inspection and approval, obtain such approval for the particular installation with the co-operation of the material supplier.

.5 Obtain and pay for permits and inspections required for work performed.

.6 Supply and install warning signs, nameplates and glass covered Single Line Diagrams as required by Electrical Safety Authority.

.7 Submit required Documents and shop drawings to authorities having jurisdiction in order to obtain approval for the Work. Copies of Contract Drawings and Specifications may be used for this purpose.

1.3 REFERENCE STANDARDS

.1 These Specifications supplement the referenced standards.

.2 Where standards differ between authorities, the most rigid apply.

.3 Where requirements of the specifications exceed referenced standards, the specifications apply.

1.4 COORDINATION

.1 Carefully examine Work and Drawings of all related trades and thoroughly plan the Work so as to avoid interferences. Report defects which would adversely affect the Work. Do not commence installation until such defects have been corrected.

.2 Coordinate Work of this Division such that items will properly interface with Work of other Divisions.

.3 Architectural Drawings, or in the absence of Architectural Drawings, Mechanical Drawings govern all locations.

.4 Coordinate work of this Division to ensure that damage does not occur to the fireproofing work of any other Division.

1.5 **SUBSTITUTIONS**

.1 When only one manufacturer's catalogued trade name is specified, provide only that catalogued trade name, material or product.

.2 When more than one manufacturer's trade name is specified for a material or product, the choice is the bidders.

.3 No substitution is allowed upon award of contract.

1.6 **DIMENSIONS AND QUANTITIES**

.1 Dimensions shown on Drawings are approximate. Verify dimensions by reference to shop drawings and field measurement.

.2 Quantities or lengths indicated in Contract Documents are approximate only and shall not be held to gauge or limit the Work.

.3 Make necessary changes or additions to routing of conduit, cables, cable trays, and the like to accommodate structural, mechanical and architectural conditions. Where raceways are shown diagrammatically run them parallel to building column lines.

1.7 **EQUIPMENT LOCATIONS**

.1 Devices, fixtures and outlets may be relocated, prior to installation, from the location shown on the Contract Drawings, to a maximum distance of 3 m, without adjustment to Contract price.

.2 Switch, control device and outlet locations are shown diagrammatically.

1.8 **WORKING DRAWINGS AND DOCUMENTS**

.1 Where the word "HOLD" appears on Drawings and other Contract Documents, the Work is included in the Contract. Execute such Work only after verification of dimensions and materials and obtaining Consultant's written permission to proceed.

1.9 **INSTALLATION DRAWINGS**

.1 Prepare installation drawings for equipment, based upon approved Vendor drawings, to check required Code clearances, raceway, busway and cable entries, sizing of housekeeping pads and structure openings. Submit installation drawings to Consultant for review.

.2 For existing buildings, verify locations of existing junction boxes, pull boxes etc., to ensure existing access requirements are maintained. Identify these locations to other disciplines.

1.10 **"AS BUILT" RECORD DRAWINGS**

.1 Maintain a set of Contract Drawings on site and record all deviations from the Contract Documents. **As a mandatory requirement, recording must be done on the same day deviation is made. Be responsible for full compliance with this requirement.**

.2 Mark locations and quantities of all data and feeder conduits, junction and terminal boxes and ducts or conduits.

.3 Where conduit and wiring are underground or underfloor, furnish field dimension with respect to building column lines and inverts with respect to finished floor levels or grades.

.4 Record deviations from branch circuit numbers shown on Drawings.

.5 Prepare diagrams of interconnecting wiring between items of equipment including equipment supplied by Owner and under other Specification Sections.

.6 Provide drawings in Autocad format as as-built record drawings at time of building turnover.

1.11 **TEST REPORTS**

.1 For each check and test performed prepare and submit a Test Report, signed by the Test engineer, and where witnessed, by the Consultant.

.2 Include record of all tests performed, methods of calculation, date and time of test, ambient conditions, names of testing company, test engineer, witnesses, also calibration record of all test instruments used together with manufacturers name, serial number and model number.

.3 Include calibration record, percentage error and applicable correction factors.

.4 Submit a Certified Test Report from each manufacturer, signed by the certifying inspector, confirming correct installation and operation of each product and part of Work. Include name of certifying inspector, date and times of inspection, ambient conditions.

1.12 **SHOP (VENDOR) DRAWINGS AND PARTS LISTS**

.1 Submit for review, manufacturer's or vendor's drawings for all products being furnished except cable (up to 1000V), wire and conduit. Include rating, performance, specification sheets, descriptive literature, schematic and wiring diagrams, dimensional layouts and weights of components as well as complete assembly.

.2 Drawings for equipment assemblies, such as switchgear and unit substations, must include the entire assembly on a single drawing having a minimum size of 420 mm x 594 mm .

1.13 **OPERATING AND MAINTENANCE MANUALS**

.1 Refer to and comply with Division 01.

1.14 **SERIES RATED COMBINATIONS**

.1 Series rated combination of over-current protective devices are not permitted.

1.15 **WARRANTY**

.1 In addition to the warranty requirements of Division 00 and 01, warranties for work of Division 26, and 27 to begin after equipment is commissioned, training is complete and building handover is substantially complete.

PART - 2 PRODUCTS

2.1 APPROVALS AND QUALITY

.1 Provide new materials bearing certification marks or labels acceptable under Ontario Electrical Safety Code.

.2 Equipment must bear, on manufacturer's label, certification mark or label acceptable under Electrical Safety Authority.

.3 Provide units of same manufacture where two or more units of same class or type of equipment are required.

.4 Manufacturer's names are stated in this Specification to establish a definite basis for tender submission and to clearly describe the quality of product that is desired for the work.

2.2 STANDARD SPECIFICATIONS

.1 Ensure that the chemical and physical properties, design, performance characteristics and methods of construction of all products provided comply with latest issue of applicable Standard Specifications issued by authorities having jurisdiction, but such Standard Specifications shall not be applied to decrease the quality of workmanship, products and services required by the Contract Documents.

2.3 SPRINKLER PROOF EQUIPMENT

.1 Ensure that electrical equipment installed in electrical rooms and other areas containing sprinklers is constructed such that exposure to water from the sprinkler heads does not impair the effectiveness of the enclosed equipment.

.2 Provide a separate cover or roof on all 2285 mm high equipment. Provide an overhang at the front, rear and sides to effectively prevent the entrance of water either at the top or through projecting faceplates, meters, etc.

.3 Where penetrations are made in drip shields, flash and seal using manufacturer's approved caulking to maintain drip shield integrity.

.4 Ensure that enclosure louvres are of outdoor design such that falling water or water running down the sides will not enter the enclosure.

.5 Where enclosure openings in the top or sides are required for outgoing conduits, provide waterproof conduit fittings.

.6 Provide panels and transformers with hoods.

.7 Provide sprinkler proof busways.

.8 In electrical rooms containing sprinklers provide wall mounted equipment such as pull boxes, junction boxes, splitter troughs, wireways, auxiliary gutters, cable troughs and disconnect switches located below the level of the sprinkler heads with the following accessories:

.1 Gaskets on doors and drip shields on equipment, panelboards, panels and enclosures.

.2 Louvres facing outward and downward where openings are required for heat dissipation. Expanded metal screening is not acceptable.

2.4 **FIRE BARRIERS**

.1 Where electrical material or devices pass through fire rated separations, make penetrations and provide fire barrier seals with a fire resistance rating equivalent to the rating of the separation.

.2 Prior to installation, submit for review, proposed fire barrier seal materials, method of installation and ULC system number.

.3 Acceptable Manufacturers:

.1 A/D Fire Protection Systems

.2 Dow Corning

.3 Fire Stop Systems

.4 IPC Flamesafe Firestop

.5 Nelson Electric

.6 3M

.7 Tremco

.4 Firestop Putty Pad

.1 Hilti CP-617 series to suit outlet box.

2.5 **MISCELLANEOUS METAL FABRICATIONS**

.1 Provide miscellaneous structural supports, platforms, braces, brackets and preformed channel struts necessary for suspension, attachment or support of electrical equipment..

2.6 **ACCESS DOORS**

.1 Minimum size: 200 mm x 200 mm size, unless otherwise specified on the Drawings or in other divisions of the Specifications, or as required to replace or repair said equipment.

.2 Material:

.1 Fabricated of 2.5 mm bonderized steel.

.2 Fabricated of 2.5 mm stainless steel in areas finished with tile or marble surfaces.

.3 Flush mounted, concealed hinges and screwdriver lock.

.4 Plast lock and anchor straps.

.3 Doors to be of a type and fire rating to suit the particular type of wall or ceiling construction in which they are to be installed.

.4 Doors in painted partitions to be painted to match adjacent partition. Doors shall be installed prior to final painting. Bear all costs for repainting of partition/ceiling and doors resulting from failure to do so.

2.7 **EQUIPMENT COLOUR CODING**

.1 Exterior finish paint colour for switchgear, control panels, panelboards and devices on emergency and UPS systems:

.1 Emergency systems: red

.2 UPS systems: blue

PART - 3 EXECUTION

3.1 MANUFACTURER'S ATTENDANCE

.1 Provide manufacturer's representatives to initially start-up each part of the Work, as specified, to check, adjust, calibrate and balance as applicable all components including controls and field wiring. Provide these services for such period and for as many visits as necessary to achieve complete working order in the subject Work.

3.2 FIELD INSPECTION

.1 Provide field engineer for inspection and certification of equipment during installation, testing and commissioning as required.

3.3 MOUNTING HEIGHTS

.1 Mounting heights of equipment is from finished floor to centre line of equipment unless noted otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding.

.3 Install electrical equipment at following heights unless indicated otherwise.

.1	Wall receptacles:	450 mm.
.2	Receptacles above top of counters or backsplash:	175 mm.
.3	Telecommunications outlets:	450 mm.
.4	Wall mounted telephone and interphone outlets:	1200 mm.
.5	Wall mounted Fire alarm speaker and strobes:	2100 mm.

3.4 ACCESS DOORS

.1 Supply access doors for installation by other trades in walls or ceilings where accessibility is required for the accessibility to electrical components.

3.5 PAINTING

.1 Touch up finishes on electrical equipment found to be marred on completion of the Work using same colour and type of finish as originally used.

.2 Prime paint field fabricated metalwork.

3.6 PRICING

.1 Provide for the purposes of monthly draw recognition only the electrical price broken down into the following components.

.1 Mobilization

.2 Selective Demolition

.3 Power and Systems Equipment and Installation

.4 Telecommunications Equipment and Raceway and Installation

.5 Wire and Conduit

.6 Commissioning

.7 Project Closeout

3.7 **CORE DRILLING**

.1 Refer to Section 01 73 29 Cutting and Patching for requirements of Drilling or Coring into existing structure.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Related Requirements:

.1 Comply with Conditions of the Contract and Division 01 - General Requirements.

1.2 RELATED SECTIONS

.1 Section 26 05 01: Common Work Results for Electrical.

1.3 REFERENCES

.1 Conform to latest issues, amendments and supplements of following standards:

.1 CAN3-C21.1-M - Control Cable - 600V

.2 CAN3-C21.2-M - Control Cable for Low Energy Circuits 150V and 300V

.3 CAN/CSA C22.2 No. 18 - Outlet Boxes, Conduit Boxes, and Fittings

.4 CAN/C22.2 No. 26 - Wireways, Auxiliary Gutters and Associated Fittings

.5 CSA C22.2 No. 38-M - Thermoset Insulated Wires and Cables

.6 CSA C22.2 No. 40-M - Cutout, Junction and Pull Boxes

.7 CSA C22.2 No. 42-M - General Use Receptacles, Attachment Plugs and Similar Wiring Devices

.8 CSA C22.2 No. 45-M - Rigid Metal Conduit

.9 CSA C22.2 No. 49 - Flexible Cords and Cables

.10 CAN/CSA C22.2 No. 51-M - Armoured Cables

.11 CSA C22.2 No. 56 - Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit

.12 CSA C22.2 No. 65 - Wire Connectors

.13 CSA C22.2 No. 75-M - Thermoplastic Insulated Wires and Cables

.14 CSA C22.2 No. 76-M - Splitters

.15 CSA C22.2 No. 83-M - Electrical Metallic Tubing

.16 CAN/CSA-C22.2 No. 85-M - Rigid PVC Boxes and Fittings

.17 CSA C22.2 No. 127 - Equipment Wires

.18 CAN/CSA-C22.2 No. 131-M - Type Teck 90 Cable

.19 CSA C22.2 No. 208-M - Fire Alarm and Signal Cable

.20 CSA C22.2 No. 211.2-M - Rigid PVC (Unplasticized) Conduit

.21 CSA C22.2 No. 214-M - Communications Cables

.22 CSA C22.2 No. 227.1 - Electrical Nonmetallic Tubing

.23 CSA C22.2 No. 227.2 - Flexible Liquid-Tight Nonmetallic Conduit

.24 CSA C22.2 No. 227.3-M - Flexible Nonmetallic Tubing

.25 CSA C22.2 No. 230-M - Tray Cables

.26 CSA C22.2 No. 232-M - Optical Fiber Cables

.27 SSPC - Steel Structures Painting Council “Steel Structures Painting Manual, Vol. 2"

1.4 **SUBMITTALS**

.1 Consultant reserves the right to require Contractor to submit samples of any materials to be used in this project.

.2 Cable pull and tension calculations for all cables under vertical tension.

PART - 2 PRODUCTS

2.1 **WIRE - LOW VOLTAGE UP TO 1000V SERVICE**

.1 Conductors

.1 ASTM Class B, soft drawn, electrolytic copper

.2 Stranded

.2 Insulation

.1 CSA type RW90 XLPE (-40°C)

.1 Heat and moisture resistant

.2 Low temperature, chemically cross-linked thermosetting polyethylene material

.3 600V rated

.4 For maximum 90°C conductor temperature

.5 For installation at minimum -40°C temperature

.6 To CSA C22.2 No. 38

.2 CSA type T90 NYLON (-10°C):

.1 Heat resistant

.2 Flame retardant

.3 Thermoplastic PVC material with extruded nylon cover

.4 600V rated

.5 For maximum 90°C conductor temperature dry and 75°C in wet locations

.6 For installation at minimum -10°C

.7 To CSA C22.2 No. 75-M

.3 Acceptable Manufacturers

.1 Alcan Cable

.2 Alcatel Canada Wire

.3 Pirelli Cables

2.2 CABLE - LOW VOLTAGE UP TO 1000V SERVICE

.1 CSA Type AC90 XLPE (-40°C)

.1 Conductors

.1 ASTM Class B, soft drawn, electrolytic copper

.2 Solid for sizes #10 AWG and smaller

.3 Stranded for sizes #8 AWG and larger

.2 Insulation

.1 Heat and moisture resistant

.2 Low temperature, chemically cross-linked thermosetting polyethylene material

.3 600V rated for sizes #10 AWG and smaller

.4 600V rated for sizes #8 AWG and larger

.5 For maximum 90°C conductor temperature

.6 For installation at minimum -40°C temperature

.7 To CSA C22.2 No. 38

.3 Construction

.1 2, 3 or 4 insulated conductors

.2 Bare ground conductor

.3 Overall interlocking aluminum armour

.4 To CSA C22.2 No. 51

.4 Acceptable Manufacturers

.1 Alcan Cable

.2 Alcatel Canada Wire

.3 Pirelli Cables

.2 CSA Type TC, Tray Cable (-40°C)

.1 Conductors

.1 ASTM Class B, soft drawn, electrolytic copper

.2 Stranded

.2 Insulation

.1 Heat and moisture resistant

.2 Low temperature, chemically cross-linked thermosetting polyethylene material

.3 600V rated

.4 For maximum 90°C conductor temperature

.5 For installation at minimum -40°C temperature

.6 CSA type RW90 XLPE to CSA C22.2 No. 38

.3 Construction

.1 2 or more insulated conductors

.2 Bare, stranded, copper ground conductor

.3 Fillers with binder tape to produce a circular cross-section

.4 Jacket

.1 PVC

.2 FT4 flame test rated

.3 Low acid gas rated to CSA C22.2 No. 0.3

.4 Black colour

.5 To CSA C22.2 No. 230

.4 Acceptable Manufacturers

.1 Alcatel Canada Wire

.2 BICC Phillips

.3 Pirelli Cables

2.3 CABLE CONNECTORS

.1 Connectors for Type AC90 Cable

.1 Steel or malleable iron

.2 Insulated throat

.3 Acceptable manufacturers

.1 Efcor 1000B series

.2 Elliott 65200 series

.3 Thomas & Betts 3110 series

2.4 WIRE AND CABLE CONNECTORS

.1 Copper compression type wire and cable terminations for #8 AWG and larger conductors, colour keyed, sized to suit. Long barrel NEMA 2 hole lugs for sizes #1/0 AWG and larger.

.1 Acceptable Manufacturers

.1 Thomas & Betts series 54000

.2 Ideal Powr-Connect

.3 Burndy Hylug

.2 Twist type splicing connectors, copper, sized to suit, with nylon or plastic shroud for tee connections in #10 AWG and smaller conductors.

.1 Acceptable Manufacturers

.1 Thomas & Betts spring type

.2 Ideal Twister

.3 Marr Marrette

.3 Conductor compression splice for #10 AWG or smaller.

.1 Acceptable Manufacturers

.1 Thomas & Betts STA-Kon series

.2 Ideal Splices

.3 Burndy

2.5 CONDUIT AND FITTINGS

.1 Rigid Steel Conduit

.1 To CSA C22.2 No. 45-M

.2 Rigid thickwall galvanized steel threaded conduit

.2 Flexible Steel Conduit

.1 To CSA 22.2 No. 56

.2 Liquid-tight flexible steel conduit with PVC cover

.3 Rigid Steel Conduit Fittings

.1 To CAN/CSA C22.2 No. 18

.2 Galvanized or polymer coated cast steel fittings

.3 Expansion fittings, watertight with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions

.4 Sealing condulets for hazardous areas

.5 Corrosive resistant coated cast steel fittings for corrosive resistant conduit

.4 Liquid Tight Flexible Steel Conduit Fittings

.1 Watertight connectors with nylon insulated throat

.1 Acceptable Manufacturers:

.1 T & B Series 5331 with Sealing O-ring Series 5262

.2 Commander/Iberville Series 6300-IT with nitrile O-ring

2.6 EMT AND FITTINGS

.1 EMT

.1 To CSA C22.2 No. 83-M

.2 EMT galvanized cold rolled steel tubing

.2 EMT Fittings

.1 Compression type, steel

.1 Gland compression connectors with insulated throats

.2 Compression couplings

.3 Acceptable manufacturers:

.1 T & B Series 5123 & 5120

.2 O-Z/Gedney type ZTC series

.3 Commander/Iberville Series 5600-IT and 5700

.2 Set screw type, steel, concrete-tight

.1 Connectors with insulated throats

.2 Couplings

.3 Acceptable manufacturers

.1 Commander/Iberville Series 5400 and 5500

2.7 FASTENINGS, SUPPORTS AND SLEEVES

.1 Fastenings

.1 Galvanized steel straps, beam clamps and threaded rods

.2 Sleeves

.1 Schedule 40 steel pipe, minimum I.D. 13 mm larger than O.D. of conduit or cable passing through.

.3 Strut

.1 Continuous slotted channel

.2 12 gauge pre-galvanized steel

.3 41.2 mm x 41.2 mm minimum

.4 Acceptable manufacturers:

.1 B-Line

.2 Pilgrim

.3 Pursley

.4 Unistrut

2.8 JUNCTION BOXES

.1 Galvanized steel EEMAC Type 4 size as required by code for number and size of conduits, conductors and devices, complete with covers, corrosion resistant screws, terminal blocks and mounting rails.

.2 Screw-on sheet steel covers to match enclosure for surface mounting boxes.

.3 Covers with 25 mm minimum extension around for flush-mounted junction boxes.

.4 Galvanized steel barriers as required.

2.9 PULL BOXES

.1 Galvanized sheet steel welded construction, EEMAC Type 4

.2 Screw-on galvanized sheet steel covers for surface mounting boxes.

.3 Covers with 25 mm minimum extension around, for flush mounted pull boxes.

.4 Galvanized steel barriers as required.

2.10 **CONDUIT BOXES - GENERAL**

.1 Boxes for EMT

.1 Galvanized pressed steel

.2 Boxes for Rigid Steel Conduit

.1 Galvanized cast iron alloy FS boxes with mounting feet for surface mounted switches and receptacles

.2 Gasketted cover plate for exterior location

.3 For corrosive resistant coated conduit: cast boxes with same finish as conduit

.3 Boxes for Rigid PVC Conduit

.1 PVC boxes

2.11 **OUTLET BOXES - SHEET STEEL**

.1 Pressed steel single and multi-gang flush device boxes, minimum size 100 mm x 50 mm x 38 mm. 100 mm square outlet boxes where more than 1 conduit enters 1 side, with extension rings as required.

.2 100 mm square or octagonal outlet boxes.

.3 119 mm square outlet boxes with extension and plaster rings as necessary for flush mounting devices in gypsum board, plaster or panelled walls.

2.12 **MASONRY BOXES**

.1 Pressed steel masonry single and multi-gang boxes for devices flush mounted in exposed masonry walls with extension and plaster rings as required.

2.13 **OUTLET BOXES - FITTINGS**

.1 Bushings and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of foreign materials.

.3 Double locknuts and insulated bushings for sheet steel metal boxes.

2.14 **WIRING DEVICES - RECEPTACLES FOR GENERAL SERVICE**

.1 Receptacles: specification grade suitable for back and side wiring, complete with grounding terminal, colour as required for type of area for straight blade devices and black colour for twistlock devices.

.2 Receptacles of one manufacturer.

.3 Acceptable Manufacturers:

.1 20A, 125V, (5-15R) Single Straight Blade

.1 Arrow Hart 5262

.2 Leviton 5262

.3 Hubbell 5262

.4 Pass & Seymour 5262

.2 20A, 125V, (5-15R) Duplex Straight Blade

.1 Arrow Hart 5262

.2 Leviton 5262

.3 Hubbell 5262

.4 Pass & Seymour 5262

.3 20A, 125V, (5-15R) Single Straight Blade

.1 Arrow Hart 5362

.2 Leviton 5362

.3 Hubbell 6332

.4 Pass & Seymour 5362

.4 20A, 125V, (5-20R) Duplex Straight Blade

.1 Arrow Hart 5392

.2 Leviton 5362

.3 Hubbell 5392

.4 Pass & Seymour 5362

.5 20A, 125V, (5-15R) Duplex GFCI, Straight Blade

.1 Arrow Hart GF5242AH

.2 Leviton 6599-W

.3 Hubbell GF-5252

.4 Pass & Seymour 1591

.6 15A, 125V, (5-15R) Duplex Isolated Ground Straight Blade

.1 Arrow Hart IG5262AH

.2 Leviton 5262-IG

.3 Hubbell IG-5262

.4 Pass & Seymour IG6200

.7 20A, 125V (5-15R) Quad straight blade, 2 pole, 3 wire grounding

.1 Bryant 1254

.2 Hubbell 415 series

.3 Pass & Seymour 1254

.8 20A, 125V, (5-15R) Duplex straight blade

.1 Arrow Hart 26262

.2 Leviton Decora Plus

.3 Hubbell 2152 series

.4 Pass & Seymour 885

2.15 **WIRING DEVICES - COVER PLATES**

.1 Stainless steel Type 302 alloy, vertically brushed, 0.8 mm thick cover plates.

.2 Nylon, smooth, high impact strength.

.3 Pressed steel, galvanized.

.4 Cast covers for cast boxes with gaskets.

.5 Cover plates of same manufacture as devices.

PART - 3 EXECUTION

3.1 **WIRE AND CABLE**

.1 Install wiring in raceways unless noted otherwise.

.2 Minimum wire sizes:

.1 Power and lighting No. 12 AWG

.2 Control No. 14 AWG

.3 Fire alarm No. 18 AWG

.3 Wire and cable application and type:

Application	Type
Lighting branch circuit where connection to luminaire is AC90 cable	T90 nylon
Receptacle branch circuit	T90 nylon
Ceiling boxes to luminaires in suspended ceiling	T90 nylon or AC90 cable
Wiring under raised floor used as plenum	AC90 cable or wire in flexible metal conduit
Wiring inside high temperature equipment	TEW or SEW-2
Branch circuits other than those covered above	RW90
Equipment feeders, circuits	RW90
Underground and under slab raceways, duct banks, direct burial	RWU90

.4 Type AC90 cable length limitations:

.1 Ceiling box to luminaire:

.1 1.2 m maximum in non-accessible ceilings;

.2 1.8 m in accessible ceilings

.2 Junction box to outlet:

.1 3.6 m maximum

.5 Load current limitations:

.1 Conductors rated for more than 90°C:

.1 90°C code ampacity rating

.2 Motor connection:

.1 75°C code ampacity rating

3.2 **TECK CABLES**

.1 Store cables in a clean, dry environment

.2 Install per manufacturer's written instructions, taking care to not exceed pulling tension nor bend radius.

.3 Install cable in tray unless noted otherwise on the drawings.

.4 Do not use cable splices.

.5 Where TECK cable is not installed in tray, provide support at a minimum of 600 mm intervals.

.6 Use cable reels and sheaves at bends.

.7 Submit cable pulling tension calculations for all cables under vertical tension. For horizontal installations, submit calculations when requested by the Engineer.

.8 Perform insulation resistance (megger test) on each TECK low voltage (<1001V) cable.

3.3 **CONNECTORS**

.1 Install compression terminations and splices in accordance with manufacturer's written instructions.

.2 Make splices in junction boxes.

.3 Make connections in lighting circuits with twist type splicing connectors.

.4 Terminate and splice conductors No. 8 and larger at terminal blocks in junction boxes.

.5 Seal terminations and splices exposed to moisture, corrosive conditions or mechanical abrasions with heavy wall heat shrinkable insulation.

.6 Install fixture type connectors and tighten. Replace insulating cap.

3.4 **CONDUIT AND EMT - GENERAL**

.1 Run parallel or perpendicular to building lines.

.2 Group raceways wherever possible. Support on channels.

.3 Install expansion joints as required.

.4 Run raceways in web portion of structural steel columns and beams.

.5 Do not drill structural members to pass through.

.6 Locate raceways behind infrared or unit heaters with 1500 mm clearance.

.7 Locate raceways not less than 125 mm clear where parallel to steam or hot water lines with a minimum of 75 mm at crossovers.

.8 Do not install horizontal runs in masonry walls.

.9 Use metallic raceway where temperatures exceed 75°C or where enclosed in thermal insulation.

.10 EMT and non-metallic conduits to contain insulated green ground wire.

.11 Install 6 mm diameter nylon pull cord in empty raceways.

3.5 **CONDUIT AND FITTINGS**

.1 Minimum conduit sizes:

.1 Surface installation: ¾ (21) trade size conduit

.2 Embedded in concrete: (27) trade size conduit

.3 Directly buried: 2 (53) trade size conduit

.2 Conduit application and type:

Application	Type
Corrosive areas	rigid steel corrosion resistant coated
Hazardous areas	rigid steel
Outdoor areas	rigid steel
Embedded in concrete, other than grade slab	rigid steel (PVC)
In or below grade slab	PVC
Exposed in unfinished areas up to 3 m above finished floor. Use EMT above 3m	rigid steel
Connection to motors and equipment subject to vibration	liquid tight flexible steel conduit
Final connection to dry type transformer	flexible steel conduit
Whip connection to modular furniture	non-metallic extra flexible PVC

.3 Use field threads on rigid conduit of sufficient length to draw conduits up tight.

.4 Do not bend coated steel conduit. Use elbows for deflections.

.5 Use factory "ells" where 90° bends are required for 1(27) trade size and larger conduits.

.6 Bend conduit offsets cold. Do not install crushed or deformed conduits and avoid trapped runs in damp or wet locations. Prevent the entrance of water and lodging of concrete, plaster, dirt, or trash in conduit, boxes, fittings, and equipment during course of construction.

.7 Where conduit joints occur in damp or wet locations, make joints watertight by applying an approved compound on the entire thread area before assembling. Draw up all conduit joints as tightly as possible.

.8 Cap exposed empty conduits which do not terminate in outlets, panels, cabinets, etc., with standard galvanized plumber's pipe caps.

.9 Plug empty conduits which terminate flush with floors or walls with flush coupling and brass plug.

.10 Install conduit sleeves for all exposed conduits and cables passing through walls, ceilings, or floors, and fill void between sleeve and conduit with caulking. If fire-rated caulking is required by code, use same class as walls, ceilings or floors.

.11 Terminate conduit stubbed up through concrete floor for connection to free standing equipment with a coupling flush with finish floor, and extend rigid conduit to equipment, except where required, use flexible conduit from a point 150 mm above floor.

.12 Install double locknuts and bushings on all rigid conduit terminations into threadless openings. Increase length of conduit threads at terminations sufficiently to permit bushing to be fully seated against end of conduit.

.13 Mechanically bend steel conduit.

.14 Install sealing condulets in conduits at hazardous area boundaries.

.15 Conduits in Poured Concrete

.1 Locate to suit reinforcing steel. Secure firmly to prevent movement during pour.

.2 Clear each conduit with mandrel and brush before concrete sets.

.3 Protect conduits from damage where they stub out of concrete.

.4 Install sleeves where conduits pass through slab or wall.

.5 Provide oversized sleeve before membrane is installed where conduits pass through waterproof membrane. Use cold mastic between sleeve and conduit.

.6 Encase conduits completely in concrete; provide 50 mm minimum concrete cover.

.7 Replace with exposed conduit, any conduit run found to be obstructed after concrete sets.

3.6 EMT AND FITTINGS

.1 Minimum EMT size: ¾ (21) trade size conduit.

.2 EMT Application

.1 Exposed in unfinished areas, above truss level and for drops in column web to 3 m above finished floor. Use rigid steel conduit below 3 m .

.2 In block walls and stud partitions.

3.7 WIREWAYS

.1 Install per manufacturer's recommendations.

.2 Keep number of elbows, offsets and connections to a minimum.

.3 Install barriers where required by Code.

.4 Install gutters to full length of equipment.

3.8 **FASTENINGS AND SUPPORTS**

.1 Provide supports and fastenings for the Work of this Division. Do not use supports or equipment provided by other Trades.

.2 Equipment fastenings and supports shall conform to manufacturers recommendations.

.3 Do not attach to, or suspend any electrical product or service from the roof deck, mechanical ductwork or piping.

.4 Do not use wire lashing or perforated strap to support or secure raceways or cable.

.5 Support rods for any suspended item must not be attached to or extended through steel pan type roofs or through concrete slab roofs.

.6 For surface mounting of two or more raceways or cables use channels.

.7 Where there is no wall support for raceways and cables dropped vertically to equipment, provide channel properly secured to floor and structure.

.8 Hang supports from structural members. Where location does not permit direct support from structure provide necessary brackets, frames, channels secured to structural members.

.9 Fasten exposed conduit and cables to building construction or support systems using straps. Use beam clamps on exposed steelwork.

.10 Masonry, tile and plaster surfaces: use lead anchors.

.11 Poured concrete: use expandable inserts. Low velocity powder activated fastenings may be used only in poured concrete.

.12 Steel structures: use clips, spring loaded bolts, cable clamps, designed as accessories to basic channel members.

.13 Do not use powder activated fasteners in, tile, precast concrete or steel structure.

.14 Do not install conduits or cables on the bottom chord of joists or trusses.

.15 Use beam clamps of the 2-bolt design and of such type that the rod load is transmitted only concentrically to the beam web centreline. The use of "C" and "I" beam side clamps will not be allowed.

.16 Where the roof or floor framing consists of open web or long span steel joists and/or trusses, ensure that hangers are located at or within 150 mm of the joist or truss top or bottom chord panel points, otherwise provide additional structural steel as required where hanger spacing does not coincide with joist or truss spacing. Design suspension assembly such that the hanger load is transmitted only concentrically to the supporting joist or truss. The use of "C" and "I" beam clamps, brackets, etc., will not be allowed.

.17 Locate secondary structural steel members between joists or trusses at or within 150 mm of top or bottom chord panel points. Where the secondary structural steel member cannot be located at or near a joist or truss panel point, provide additional diagonal structural steel web member/members designed for the applicable load to the nearest panel point in the opposite chord member. Diagonal hangers which will induce lateral stresses in the chord members of the joist will not be permitted. Submit shop drawings of the suspension assembly indicating the location of suspension or support points, the maximum load at

each suspension point, location and size of hangers, brackets and intermediate framing members when required, and also details of connection to building structure.

3.9 **JUNCTION BOXES**

.1 Install junction boxes in inconspicuous but accessible locations. Secure to structure.

.2 Install terminal blocks on mounting rails, for termination of each wire and cable regardless of size.

.3 Only one voltage source is permitted in a junction box.

.4 Install barriers to separate different auxiliary systems.

3.10 **PULL BOXES**

.1 Install pull boxes in inconspicuous but accessible locations. Secure to structure.

.2 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

.3 Only one voltage source is permitted in a pull box.

.4 Install barriers to separate different auxiliary systems.

3.11 **OUTLET AND CONDUIT BOXES**

.1 Install conduit outlet boxes for conduit up to 32 mm and pull boxes for larger conduits.

.2 Support boxes independently of connecting conduits.

.3 Seal boxes during construction to prevent entry of debris, dust and dirt.

.4 For flush installations mount plaster rings to box, flush with wall surface to permit wall finish to come within 6 mm of opening.

.5 Provide correct size of openings in boxes for conduit, armoured cable connections. Reducing washers will not be acceptable.

.6 Install switches and other controls close to door lock or latch jambs and other openings, maintaining a minimum of 100 mm from trims of doors (except where installed in door frames of metal partitions) check door swings.

.7 Install 100 mm square or octagonal outlet boxes for lighting fixture outlets.

3.12 **MASONRY BOXES**

.1 In block walls use deep boxes to provide clear space around knockout for AC90 cable entry.

3.13 **WIRING DEVICES - RECEPTACLES**

.1 Install receptacles vertically, use gang type outlet box where more than one receptacle is required in a location.

.2 Where split receptacle has a portion switched, mount vertically and switch upper portion.

.3 Coordinate with architectural and interior design drawings for final positioning and mounting heights of power and voice/data receptacles. Where there is disagreement between electrical and architectural drawings, take the architectural drawings as correct.

.4 Maintain clearances between receptacle outlet boxes and millwork as stipulated on the drawings.

.5 Align and evenly space outlet boxes that are mounted as a group.

.6 Install receptacle colours as follows:

Area	Colour
Gypsum board, plaster or panelled	White
Office	White
Factory, service, exterior	White

3.14 **WIRING DEVICES - COVER PLATES**

.1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.2 Install suitable common cover plates where wiring devices are grouped.

.3 Do not use cover plates designed for flush outlet boxes on surface-mounted boxes.

.4 Provide plaster ring where necessary.

.5 Install cover plates as follows:

Area	Cover Plate Type
Gypsum board, plaster or panelled	stainless steel
Factory, service	galvanized steel
Exterior	cast cover

3.15 **CONTROL DEVICES**

.1 Install as indicated.

3.16 **FIELD FABRICATED METAL WORK**

.1 Clean and prime paint field fabricated metal work.

.2 After fabrication deburr, scrape, grind smooth, wire brush with power brush and degrease metal work.

.3 Prime paint steel with 1 coat of CISC/CPMA 2.75 oil alkyd primer.

.4 Prime paint aluminum as follows: wash with detergent solution and wipe down with SSPC-SP1 solvent. Apply Glidden #Y-5229 primer to 1.5 mils DFT.

.5 For brass and bronze alloy materials, prepare as for aluminum but apply 1 coat of CAN/CGSB-1.40-M zinc chromate primer.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Modifications, demolition and installation of services within this building require utmost care due to vital operation of systems involved. Removal and installation of systems require constant communication with Consultant.

1.2 CO-ORDINATION BETWEEN NEW AND EXISTING INSTALLATIONS

.1 Provide interfacing components between new and existing systems as necessary for proper performance and operation.

1.3 EXISTING SERVICES

.1 Ensure existing services remain undisturbed and energized except where indicated to be disconnected.

.2 Disconnect and remove abandoned wiring materials and devices.

.3 Cut raceways flush where embedded in structure.

.4 Retain abandoned embedded outlet boxes and close with pressed steel coverplates.

.5 Make safe all circuit wiring left for future use.

1.4 INTERRUPTION OF SERVICES

.1 Obtain Consultant's written approval before interrupting any service. Long outages are not acceptable.

.2 Provide temporary services to maintain continuity in the event that services must be interrupted.

1.5 PREMIUM TIME

.1 Include cost of premium time in tender price for work during nights, weekends or other time outside normal working hours necessary to do the work and maintain electrical services in operation.

PART - 2 PRODUCTS

2.1 USE OF EXISTING MATERIAL AND EQUIPMENT

.1 Unless noted otherwise, existing panels, boxes and wiring materials may be reused if acceptable to Inspection Authority.

.2 Unless noted otherwise, provide additional equipment of same type and manufacture to supplement existing equipment.

.3 Reused Luminaires: Furnish new lamps.

PART - 3 EXECUTION

3.1 EXAMINATION

.1 Visit the site, examine the existing conditions and become familiar with the extent of the necessary removal, relocation, reconnecting, and rerouting of electrical equipment and wiring as necessary for the completion of the project.

.2 Review and confirm with the Consultant's drawings for the complete extent of demolition and alteration.

3.2 EXISTING MATERIAL AND EQUIPMENT

.1 Equipment to be reused or relocated: test for proper operation and repair as necessary.

.2 Repair or replace existing equipment which is damaged in process of relocation.

.3 Reused Luminaires: Install lamps, clean fixtures and touch up damaged finish.

.4 Relocate existing junction, pull or terminal boxes which become inaccessible due to new mechanical ductwork or equipment.

.5 Ensure all electrical, life safety services, and services for existing equipment, in areas outside the areas of this work, that are required to remain in service, shall be kept in service and without interruption.

.6 Relocate any electrical feeders or equipment that are required to remain in service that are secured to existing walls, floors or ceilings to be demolished or that are buried and required to be excavated for new work.

.7 When deleting and/or making safe existing electrical work, ensure that it includes all wiring back to the associated panel boards or control panel.

.8 Disconnect and remove existing light fixtures, devices, outlets, etc., which are not to be reused. Such items shall be cartoned and turn over to the Owner at a place designated by the Owner. Cut back and cap unused raceway and outlets and removed unused wiring back to panel board in approved manner.

3.3 PENETRATIONS IN EXISTING STRUCTURE

.1 Perform cutting, patching and repairing. Before proceeding obtain Consultant's approval.

.2 Where necessary to penetrate existing floors, walls, ceiling, roof or structural members provide sleeve and follow Consultant's instructions.

.3 Restore surfaces to same finish and condition as existed prior to penetration.

3.4 SALVAGE MATERIALS

.1 Remove from site materials in renovated areas that are not to remain or be reused, unless noted as remaining property of Owner.

3.5 DEMOLITION

.1 Make safe and disconnect all power and systems, as and when, and to the extent required to facilitate with the demolition.

.2 Demolish existing work, where indicated, and remove from site.

.3 Execute all demolition work so as to create minimum vibration or dust within and outside the building. Obtain Consultant's approval of methods before proceeding.

.4 Include in demolition work for removal of all communication devices, outlets, and cables etc., which are not be reused. Remove all unnecessary cables and equipment in hub rooms and/or telephone rooms with extreme care to avoid any accidental shutdown to existing services serving other parts of the building.

.5 All existing electrical equipment which is no longer required shall be removed and disposed of, off site.

.6 Be responsible and pay for any damage to the Base Building incurred by work of this Division, or repair to the satisfaction of the Consultant.

.7 Carry out the work with minimum of noise, dust and disturbance.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

1.2 APPROVALS

.1 Identification subject to prior approval of Consultant.

PART - 2 PRODUCTS

2.1 WIRE AND CABLE MARKERS

.1 Wire and Cable Diameter Less Than 13 mm

.1 Acceptable manufacturer

.1 Wieland Z type

.2 Cable Diameter 13 mm and Larger

.1 Acceptable manufacturer

.1 Wieland K type

.3 Non-Circular Wire

.1 Acceptable manufacturer

.1 Raychem Shrinkmark sleeves

PART - 3 EXECUTION

3.1 SYSTEMS IDENTIFICATION

.1 Identify outlet boxes for various systems with distinctive paint colour. Apply a small area of paint to inside of outlet, junction and pull boxes and panels. In suspended ceiling areas, apply paint to inside and outside of junction boxes. System colours:

System	Normal	Emergency	UPS
120/208 volt	black	black/red	black/blue
Fire alarm	red		
Intercom	brown		

3.2 WIRE AND CABLE IDENTIFICATION

.1 Identify power, control, lighting and receptacle wires with continuous colouring as follows:

.1 Phase A red

.2 Phase B black

.3 Phase C blue

.4	Neutral	white
.5	Ground	green
.6	Isolating ground	green and yellow
.7	Control	red
.8	Interlock	yellow
.9	D.C.	blue

.2 For larger wire sizes available only in black, install coloured wire marker tape in accordance with above coding.

3.3 **WIRE AND CABLE IDENTIFICATION**

.1 Cables Bearing Identification Numbers on the Drawings

.1 Install identification markers at each end of cable run.

.2 Control/Indication Conductors

.1 Install conductor identification markers at switchgear, motor control centres and motor starter terminal blocks and at remote devices.

.2 Identification in accordance with the Drawings and reviewed shop drawings.

.3 Lighting and Receptacle Branch Circuits

.1 Install conductor identification markers at panel, outlet box connections to lighting fixtures and device outlet boxes.

.2 Typical identification if fixture or device is connected to panel A, circuit 5: A-5.

.4 Data, Voice and Fibre Optic Cables

.1 Label horizontally distributed cabling at the following locations:

.1 Both ends of cable run

.2 Entrance and exit of cable pathway (i.e. cable trays, zone conduits, etc.)

.2 Label riser/backbone distribution cables at the following locations:

.1 Both ends of cable run

.2 Entrance and exit of cable pathway (ie. cable trays, zone conduits, etc.)

.3 1.5 m above finished floor in communication closets and equipment rooms

.4 At entrance and exit of a sleeve or slot in communication closets and equipment rooms

.3 Use the following colour codes for labels:

Function	Colour
Auxiliary and miscellaneous circuits	Yellow
Common equipment	Purple
Customer side of network interface	Green
First level backbone	White

Horizontal cabling to workstations	Blue
Interbuilding backbone	Brown
Key telephone systems	Red
Network side of network interface	Orange
Second level backbone	Gray

Note: Common equipment refers to PBX equipment, host computer, LANs and multiplexer. Miscellaneous refers to maintenance alarms, security, paging systems, and other system and circuits not an integral part of common equipment. Colour codes to ANSI/TIA/EIA-606.

.5 Fire Alarm and Miscellaneous Systems

.1 Install identification on conductors at panels, remote devices and system connections. Identify in accordance with reviewed shop drawings.

3.4 **PANELBOARD IDENTIFICATION**

.1 Install directory.

3.5 **IDENTIFICATION AFTER FINISH PAINTING**

.1 Behind access doors at shaft plenums: identify busways, feeder cables and feeder conduits.

3.6 **PATCH PANEL AND FACEPLATE IDENTIFICATION**

.1 Identify each jack at each wall or furniture outlet with a label supplied by the faceplate manufacturer. Each jack identification designation to match the respective cable identification designation.

.2 Identify each jack at each patch panel jack with labels, front and back, supplied by the patch panel manufacturer. Each jack identification designation to match the respective cable identification designation.

.3 In addition to an alphanumeric label use manufacturer's matching colour coded icons, which conform to ANSI/TIA/EIA-606, to identify individual jacks on faceplate and patch panels.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of Division 27.

1.2 RELATED SECTIONS

.1 Work to be done in adherence to the requirements of Section 26 05 01, Common Work Results for Electrical.

1.3 DIMENSIONS AND QUANTITIES

.1 Dimensions shown on Drawings are approximate. Verify dimensions by reference to shop drawings and field measurement.

.2 Quantities or lengths indicated in any of the Contract Documents are approximate only and are not to gauge or limit the Work.

.3 Make necessary changes to routing of cables and the like to accommodate structural, mechanical, electrical and architectural conditions. Coordinate with other trades and make allowance for conditions that will arise from work in progress under separate contract.

1.4 WORKING DRAWINGS AND DOCUMENTS

.1 Where the word "HOLD" appears on Drawings and other Contract Documents, the Work is included in the Contract. Execute such Work only after verification of dimensions and materials and obtaining Consultant's written permission to proceed.

1.5 OPERATING AND MAINTENANCE MANUALS

.1 Submit Operating and Maintenance Manuals.

1.6 "AS BUILT" RECORD DRAWINGS

.1 Where wiring is underground or underfloor, furnish field dimension with respect to building column lines and inverts with respect to finished floor levels or grades.

.2 Record deviations from cable numbers shown on the Contract Drawings.

.3 Prepare records of interconnecting and cross-connecting wiring between items of equipment including equipment supplied by Owner and under other Specification Sections.

.4 Prepare drawings clearly identifying routes taken by cable where the cable is not supported along its length by either conduit or raceway.

.5 Include all test reports as part of the "As-built" submittals.

.6 Provide all test data and numeric as-built information in both a hardcopy and electronic format.

1.7 MANUFACTURER'S ATTENDANCE

.1 Provide manufacturer's representatives to verify installation practices for each part of the Work as may be relevant to all components including wiring and terminations.

1.8 **FIELD INSPECTION**

.1 Provide field engineer for inspection and certification of equipment during installation, testing and commissioning as required.

1.9 **QUALITY ASSURANCE**

.1 These Specifications supplement the Electrical and Electronic Manufacturers Association of Canada, Canadian Standards Association Standards, Electronic Industries Association, Telecommunications Industries Association standards and recommendations. Conditions of the EEMAC, CSA, EIA, TIA and ISO/IEC standards and recommendations apply unless superseded or modified by this Specification.

.2 Where requirements of the specifications exceed referenced standards, the specifications apply. Where standards differ between authorities, the most rigid applies.

.3 Requirements of the specifications that are substandard to referenced standards should be brought to the attention of Consultant during bidding period in sufficient time to allow suitable action to be taken and addenda issued as necessary.

.4 Equipment must be acceptable to electrical inspection authorities.

.5 Where any part of the Work fails tests, repair the fault in a manner to prevent recurrence and re-test.

.6 Where any part of the Work fails tests and that Work is to be built without physical discontinuity, remove the offending material and install new without increase in cost to the Contract.

PART - 2 PRODUCTS

2.1 **LABELS**

.1 All cables to be labelled using self-adhesive, self-laminating material.

.2 All faceplate and icons labels to suit selected faceplate.

.3 All grounding conductors to be labelled with materials in compliance with CSA-T528 or ANSI/TIA/EIA-606 specification.

.4 All patch panels and termination strips to be labelled with materials to suit selected patch panel or termination strip.

2.2 **CABLE SUPPORT HARDWARE**

.1 Cable supports of open hook construction with curved cable bearing surface. Do not exceed minimum bending radius restriction.

.2 Flexible corrugated non-metallic conduit to be available in colours:

.1 Orange

.3 Flexible corrugated non-metallic conduit to be available in the following nominal sizes:

.1 25 mm inside diameter

.2 32 mm inside diameter

.4 Flexible corrugated non-metallic conduit to be available in the following fire ratings:

.1 FT4

.2 FT6 - plenum rated

2.3 **PATCH-CORDS AND CROSS-CONNECT JUMPERS**

.1 Supply all cross-connect cables, interconnect cables, and patch-cords.

.2 Supply all work-area cables.

.3 Cross-connect cable to be 24 AWG solid copper twisted and to perform per ANSI/EIA/TIA 568A specification for Category 6A cables as far as it may apply.

.4 Patch cords, equipment cables and work area cables to be 24 AWG stranded conductors and perform per ANSI/EIA/TIA 568A specification for Category 6A cables.

.5 Patch-cords to be factory assembled and tested, and not site prepared.

.6 Patch-cords to be of the snagless type using either a molded connector or rubber housing for connector pin.

.7 Patch-cord to be by same manufacturer as other signal carrying components.

.8 Patch-cords to be available in the following colours:

.1 Grey

.2 Yellow

.3 Orange

.4 Blue

.5 Green

.6 Red

.9 Patch cord length to be as follows unless stated otherwise.

.1 3 m in telecommunications closet

PART - 3 EXECUTION

3.1 **GENERAL**

.1 All cables and cable pathways to run parallel or perpendicular to building lines.

.2 Proposed installation drawings to be submitted to the Consultant prior to installation.

3.2 **LABELLING**

.1 Clearly identify all cables according to the administration system shown on the Contract Drawings.

.2 Use only approved cable marking materials.

.3 Clearly identify all outlets, patch-panels, patch-cords, cables, racks, enclosures, spaces, closets, conduit, and raceways according to the administration system shown on the contract drawings.

.4 Use only machine printed labelling for outlets.

.5 Use only engraved plastic plates for the labelling of enclosures and racks.

3.3 **GROUNDING**

.1 All grounding bonding to comply with CSA C22.1 standard or after applicable codes.

.2 Support grounding cables in the non-metallic conduits or cable trays provided.

3.4 **WARRANTY**

.1 Test complete structural cabling system to meet manufacturer's best warranty.

.2 Submit all necessary test results, drawings, and any other documents required to receive manufacturer's warranty certificate to manufacturer's representative.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

1.2 SHOP (VENDOR) DRAWINGS AND PARTS LISTS

.1 Submit for review, manufacturer's or vendor's drawings and specifications for all products being furnished. Include rating, performance, specification sheets, descriptive literature, schematic and wiring diagrams, dimensional layouts and weights of components as well as complete assemblies.

1.3 AREA CLASSIFICATION

.1 No area in the Work is classified as Hazardous.

PART - 2 PRODUCTS

2.1 MANUFACTURERS

.1 Labels

.1 All cables to be labelled using self-adhesive, self-laminating material.

.2 All faceplate and icons labels to suit selected faceplate.

.3 All grounding conductors to be labelled with materials in compliance with CSA-T528 or ANSI/TIA/EIA-606 specification.

.4 All patch panels and termination strips to be labelled with materials to suit selected patch panel or termination strip.

PART - 3 EXECUTION

3.1 LABELLING

.1 Clearly identify all cables according to the administration system shown on the Contract Drawings.

.2 Use only approved cable marking materials.

.3 Clearly identify all outlets, patch-panels, patch-cords, cables, racks, enclosures, spaces, closets, conduit, and raceways according to the administration system shown on the contract drawings.

.4 Use only machine printed labelling for outlets.

.5 Use only engraved plastic plates for the labelling of enclosures and racks.

.6 All cables to be labeled as follows:

.1 At each end of the cable, 50mm from each end of the cable termination.

.2 On the corresponding faceplate.

.3 On the associated patch panel.

.7 All communication conduits to be labeled along the exterior of the conduit at each end..

.8 For conduits that stub into an associated Communication Room, label the end of the conduit with the source room number or location.

.9 All communication junction boxes to be labeled.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

.2 Include all test reports as part of the "As-built" submittals.

.3 Applicable Standards:

.1 ANSI/TIA-1152A, Requirements for Field Test Instruments and Measurements for Balanced Twisted-Pair Cabling

.2 ANSI/TIA-568.0-E, Generic Telecommunications Cabling for Customer Premises.

.3 ANSI/TIA-568.1-E, Commercial Building Telecommunications Cabling Standard

.4 ANSI/TIA 568.2-D, Balanced Twisted-Pair Telecommunications Cabling and Components Standards.

.5 ANSI/TIA-606-D, Administration Standard for Commercial Telecommunications Infrastructure, including the requirements specified by the customer, unless the customer specifies their own labeling requirements.

1.2 TEST REPORTS

.1 For each check and test performed prepare and submit a Test Report, signed by the Test engineer, and where witnessed, by the Consultant.

.2 Test Reports to include a record of all tests performed, methods of calculation, date and time of test, ambient conditions, names of testing company, test engineer, witnesses, also calibration record of all test instruments used together with manufacturers name, serial number and model number. Report to be itemized by cable identification number.

.3 Calibration record to include percentage error and applicable correction factors.

.4 Tests performed with instruments that have not been calibrated or certified as Fit For Purpose within 12 months preceding the date of use will not be accepted.

.5 Submit a Certified Test Report from each manufacturer, signed by the certifying inspector, confirming correct installation and operation of each product and part of Work. Include name of certifying inspector, date and times of inspection, ambient conditions.

.6 Submit evidence from each third party warranting performance guarantees of any part of the cabling system of their agreement that testing and site inspection procedures are fit for the purpose of upholding the warranty.

.7 Undertake either full or sample testing daily and have reports available for inspection by the Consultant or the consultant's designate as an assurance that standards of working practices are being maintained.

.8 Complete test records and certification of such records prior to project cutover.

1.3 **MANUFACTURER'S ATTENDANCE**

.1 Provide manufacturer's representatives to verify installation practices for each part of the Work as may be relevant to all components including wiring and terminations.

1.4 **FIELD INSPECTION**

.1 Provide field engineer for inspection and certification of equipment during installation, testing and commissioning as required.

1.5 **QUALITY ASSURANCE**

.1 These Specifications supplement the Electrical and Electronic Manufacturers Association of Canada, Canadian Standards Association Standards, Electronic Industries Association, Telecommunications Industries Association standards and recommendations. Conditions of the EEMAC, CSA, EIA, TIA and ISO/IEC standards and recommendations apply unless superseded or modified by this Specification.

.2 Where requirements of the specifications exceed referenced standards, the specifications apply. Where standards differ between authorities, the most rigid applies.

.3 Requirements of the specifications that are substandard to referenced standards should be brought to the attention of Consultant during bidding period in sufficient time to allow suitable action to be taken and addenda issued as necessary.

.4 Equipment must be acceptable to electrical inspection authorities.

.5 Where any part of the Work fails tests, repair the fault in a manner to prevent recurrence and re-test.

.6 Where any part of the Work fails tests and that Work is to be built without physical discontinuity, remove the offending material and install new without increase in cost to the Contract.

PART - 2 PRODUCTS

2.1 **MANUFACTURERS**

.1 Use a Fluke DSX2-8000-NW Cable Analyzer, including Versiv Mainframe and Remote, LinkWare PC Software, CAT 6A/Class EA Permanent Link Adaptors , CAT 6A/Class EA Channel Adapters, Headset for Talk, Handstrap, Shoulder Strap (2), AC Chargers (2), carrying case, USB interface cable (Mini-B), Universal Couplers (2), Versiv Open Source Software.

.2 Provide a Statement of Calibration demonstrating the device has been calibrated within the past 3 months.

.3 This tester shall be used during testing of this project. Included features shall include the ability to integrate with labeling and cable management software, which yields downloadable 606-B cable IDs, ensuring data accuracy.

PART - 3 EXECUTION

3.1 TESTING AND REPAIRING

.1 Horizontal cables to be completed according to the following test criteria.

.1 Unless otherwise specified by the Owner or the Owners representative, each cabling link shall be in tested for:

.1 Graphical/numerical data. Both graphical data plots and numerical data are required for the following test parameters:

.1 NEXT

.2 PS NEXT

.3 ELFEXT

.4 PS ELFEXT

.5 Attenuation

.6 Return loss

.2 Numerical data. Numerical data only is required for the following test parameters:

.1 Propagation delay

.2 Delay skew

.3 Resistance

.3 The Category 6A Horizontal Cable Certification reports shall have complete testing of Permanent Link at frequency increments up to 500 MHz as indicated in TIA-568-D and shall include the following:

.1 Cable/Faceplate Number - matching faceplate numbers on patch panels

.2 Test Date

.3 Cable Length

.4 Wire-Map

.5 Network Tests for 100BASE-TX and 1000BASE-T

.6 Attenuation

.7 Near End Crosstalk (NEXT)

.8 Power-sum NEXT (PS-NEXT)

.9 Attenuation to Cross Talk Ratio (ACR)

.10 Power-sum Attenuation to Crosstalk Ratio (PS-ACR)

.11 Equal Level Far End Crosstalk (ELFEXT)

.12 Power-sum Equal Level Far End Crosstalk (PS-ELFEXT)

.13 Return Loss

.14 Propagation Delay

.15 Delay Skew

.16 Signal to Noise Ratio

.2 Test every fibre of each cable with an Optical Time Domain Reflectometer for length and attenuation. Include a hard copy chart recording with the test documentation.

.3 Test fibre of each cable with a Power Meter/Light source combination operating at wavelengths of 850 nm and 1300 nm for multimode fibres in both directions and 1310 nm and 1550 nm for singlemode fibres in both directions. Tabulate and include test results with the test documentation.

.2 Correct all cable faults. Splicing of any cable will not be permitted, for any reason, unless prior authorization is received in writing by the Consultant.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

1.2 MANUFACTURER'S ATTENDANCE

.1 Provide manufacturer's representatives to verify installation practices for each part of the Work as may be relevant to all components including wiring and terminations.

1.3 FIELD INSPECTION

.1 Provide field engineer for inspection and certification of equipment during installation, testing and commissioning as required.

1.4 QUALITY ASSURANCE

.1 Where any part of the Work fails tests, repair the fault in a manner to prevent recurrence and re-test.

.2 Where any part of the Work fails tests and that Work is to be built without physical discontinuity, remove the offending material and install new without increase in cost to the Contract.

PART - 2 PRODUCTS

2.1 MODULAR OUTLET JACKS - 8 POSITION

.1 The modular telecommunications outlet receptacles (Jacks) to be used in the flush- and surface-mount telecommunications outlets shall also be suitable for use in utility poles and modular furniture using faceplates or adapters manufactured for this purpose where required.

.2 Jacks to be blue

.3 The 8-position modular telecommunications outlet receptacles are to be of the RJ45 type as described in ANSI/EIA/TIA 568C specification.

.4 Suitable for 6a cable as required.

.5 The receptacle outlet is to be white unless noted otherwise on the drawings

.6 Faceplates to be available in duplex or quadplex configuration in a single gang box.

.7 Faceplates to be white unless noted otherwise on the drawings.

.8 Conductors of the UTP cable to be connected to the outlet receptacle by use of insulation displacement contacts.

.9 All UTP cable conductors to be terminated.

2.2 **UTP CABLE TERMINATION PATCH PANELS**

.1 Termination jacks to support Category 6A cables.

.2 Patch panels to be suitable for rack mounting in EIA standard 19" wide racks and equipment enclosures.

.3 Patch panels to have angled “quick-connect” type mounting frame suitable for RJ-45 jack.

.4 All 8-position UTP termination patch panels to meet performance specifications described in ANSI/EIA/TIA 568B.

.5 All 8-position UTP termination patch panels to be wired as per EIA-568B wiring convention.

.6 Patch panels for UTP cables to be available in 24 position, 48 position and 96 position forms.

.7 UTP patch panels to be supplied complete with the equivalent of one cable management panel occupying IU space for each 24 UTP outlet positions.

2.3 **UTP CABLE TERMINATION BLOCKS**

.1 Cables so indicated on the Contract Drawings are to be terminated on UTP Cable termination blocks.

.2 Cable termination blocks to be back board mounted except where otherwise indicated on the Contract drawings.

.3 Cable termination blocks to be Insulation Displacement Connectors (IDC).

.4 Cable termination block types to include: symmetrical, for use in crossconnect arrangements using crossconnect wire; and asymmetrical, for use in interconnect arrangements using RJ45 terminated patch cord.

.5 Termination blocks to be supplied complete with cable management components.

.6 Termination blocks to have following minimum characteristics:

.1 Category 6A performance as per ANSI/EIA/TIA 568A.

.2 Dielectric Strength (DC): No breakdowns with 1.5 kV DC of 1 minute duration pair to pair and conductors to ground.

PART - 3 EXECUTION (NOT USED)

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

1.2 SHOP (VENDOR) DRAWINGS AND PARTS LISTS

.1 Submit for review, manufacturer's or vendor's drawings and specifications for all products being furnished. Include rating, performance, specification sheets, descriptive literature, schematic and wiring diagrams, dimensional layouts and weights of components as well as complete assemblies.

1.3 APPLICABLE STANDARDS

.1 ANSI/TIA 568-C.0 – General Telecommunications Cabling for Customer Premise

.2 ANSI/TIA/EIA 568-C.1 – Commercial Buildings Telecommunications Cabling Standard.

.3 ANSI/TIA/EIA 569 – Commercial Building Standard for Telecommunications Pathways and Spaces.

.4 ANSI/TIA/EIA 606-A – Administrative Standard for the Telecommunications Infrastructure of Commercial Building; TR-42.6 – Labelling.

.5 ANSI/TIA/EIA 607A – Commercial Building Grounding and Bonding Requirements for Telecommunications.

.6 ANSI/TIA – TSB 95 – Testing Standards

.7 ANSI/TIA-568-B.2-ad10 – Augmented Category 6

.8 ANSI/TIA 942 – Data Center Cabling Standard

.9 BICSI TDMM – Telecommunications Distribution Methods Manual

.10 Government of Ontario Information Technology Standard – Wiring Topology for Government Buildings – Voice and data telecommunications GO-ITS 80.0.

PART - 2 PRODUCTS

2.1 HORIZONTAL (DISTRIBUTION) UTP CABLES – CATEGORY 6A

.1 Horizontal UTP cables to be of characteristic impedance 500 MHz and comply with ANSI/EIA/TIA 568-B.2 specification.

.2 Horizontal UTP cable to be 4 pair 24 AWG solid conductor.

.3 Cable to be FT6 Plenum rating (CMP).

.4 Cable to withstand a bend radius of 25 mm at a temperature of -20°C without jacket or insulation cracking.

.5 Minimum Breaking Strength 400N.

.6 Cable jacket to be imprinted with manufacturers name and type information, rating and descending distance markers.

PART - 3 EXECUTION

3.1 GENERAL

.1 All cables and cable pathways to run parallel or perpendicular to building lines.

.2 The following minimum clearances from electrical and heat sources are to be maintained when routing cables.

.1 Unit substations 10 m

.2 Power transformers (greater than 30KVA) 10 m

.3 Transformers 1.2 m

.4 Motors 1.2 m

.5 Switch gear (greater than 600V) 10 m

.6 Feeder cables (600V and above) 1 m

.7 Distribution cables (less than 600V) 750 mm

.8 Conduit (Enclosing 30A branch circuits) 300 mm

.9 Conduit (Enclosing 20A branch circuits) 75 mm

.10 Conduit (Enclosing 15A branch circuits) 65 mm

.11 Fluorescent luminaires 120 mm

.12 Pipes (gas, oil, water, etc.) 300 mm

.13 HVAC (equipment, ducts, etc.) 150 mm

.3 Avoid scraping, denting, crushing, twisting, kinking or otherwise damaging cables, before, during or after installation. Damaged cables to be replaced by the Contractor without additional compensation.

.4 Patch-panels and cable management panels to be mounted with clearance between equipment enclosure doors and patch cables.

.5 Proposed installation drawings to be submitted to the Engineer or Consultant prior to installation.

3.2 CABLING - GENERAL

.1 Pull all UTP cables in a continuous run. Cable splices will not be permitted.

.2 Each cable to be terminated unless noted otherwise on the drawings.

.3 Install all cables in accordance with manufacturer's specifications ensuring that proper installation techniques are observed and that the cable maximum pull-force and minimum bend radius specifications are adhered to.

.4 Utilize all indicated and available cable pathways such as slots, sleeves, conduits, cable trays, ducts, raceways and furniture system channels except where otherwise noted to route cable vertically and horizontally through the building. Exercise caution when pulling

cables in such pathways to avoid damage to any existing cables and follow manufacturer's maximum pull-force and minimum bend radii.

.5 Where cables are exposed to risk of being damaged by sharp edges of furniture, cabletray, raceway etc. protect cables by feeding them through a length of flexible plastic conduit.

.6 Where cables exit the cable tray and are exposed to sharp bends, reduce the bending stress by covering the cable tray with protective flexible plastic conduit.

.7 Neatly bundle and secure cables with Velcro or Milli-Ties. Zip-ties are not acceptable. Ensure cable ties do not deform the cable jacket.

.8 Where cables are terminated on a patch panel, bundle and dress cables in groups of 12 or 24, each group consisting of cables from a single 12 or 24 port patch panel.

.9 Where cables are terminated on a cross-connect field, bundle and dress cables in groups of 12 or 24, each group consisting of cables from a single cross-connect panel.

.10 Where voice and data cables are separately identified on the Contract Drawings, separate voice and data cable into distinct bundles.

.11 Do not maintain bundles for distances greater than 1m in cable trays.

.12 For cables being terminated on a backboard mounted cross-connect field, pass all cables behind backboard in bundles and pass them through holes positioned in the center of the termination mount.

.13 When bundling cable bundles, comply with manufacturer's recommended bundling practices for installations. Ensure that no cable bundling puts excess pressure on the cable at any point which may result in compression or deformation of the cable jacket and internal pair/conductor geometry.

.14 When terminating UTP cables to IDC blocks or outlet connections, observe the manufacturer's recommendations on stripping back insulation and the extent that pairs may be untwisted. Do not untwisted pairs for more than 13 mm.

.15 Follow proper installation and termination practices for UTP cabling. Do not kink or exceed manufacturer's restrictions on the UTP cable minimum bend radius.

.16 For UTP cables, maintain a minimum bending radius of 10 times cable diameter or 30 mm whichever is larger.

.17 When terminating UTP cables follow manufacturer's installation instructions. Unless directed by the manufacturer's instructions otherwise, remove cable jacket only enough to perform termination and untwist pairs no more than 13 mm of cable.

.18 Secure UTP distribution cables at rear of patch panels. Ensure cable approach to the patch panel is normal to the panel and stress is not transmitted to the termination.

.19 Ground all metallic strength members integral to cables and components to manufacturer's specifications and standard practices

.20 Do not strap cables to, or lay cables on, any length of conduit, pipe, ventilation duct or other building element not expressly installed for the purpose of cable support.

.21 When determining a cable routing pathway, give priority to air handling ducts, fire sprinkler pipes and electrical conduits.

.22 Except for spare cables, terminate all pairs of UTP cable and all strands of fibre optic cable at both ends.

.23 Terminate all pairs of spare UTP cable in telecommunication closet and store workstation end in ceiling space by coiling neatly and suspending. Do not rest cables on ceilings or air handling ducts.

.24 Spare cables to be of sufficient length to permit reaching any point in the room to which they apply.

3.3 **HORIZONTAL DISTRIBUTION**

.1 Where practicable and where the maximum allowable cable length is not exceeded, provide 3 m of slack UTP cable at the workstation end of each distribution cable to permit outlet relocation after installation. Neatly coil slack in ceiling space and store suspended.

.2 Secure and support cables every 1.2 m when running in free space. Bundle and tie-wrap all suspended cables so that droop between supports is minimized.

.3 Attach cable supports only to the building structure or to support wires installed expressly for cable suspension. Do not attach cable supports to ceiling support wires.

.4 Where the telecommunications outlet is mounted on a wall box or floor box or system furniture, provide working slack allowance for UTP cable of 300 mm. Coil neatly and secure.

.5 Where the telecommunications outlet is mounted on furniture, do not crimp or trap the cable between the outlet receptacle and furniture structure.

.6 Select least obstructed pathway through modular or system furniture. Where available, use eye-level pathways in preference to base-level pathways.

.7 Install blank filler plates for all unused modular jack positions on faceplates.

.8 Install blank cover plates for all unused or abandoned outlet boxes.

.9 Inform Consultant immediately of any horizontal cable runs exceeding 90 m in length.

END OF SECTION

PART - 1 GENERAL

1.1 SUMMARY

.1 Section includes:

.1 Labour, products, equipment and services necessary to complete the work of this Section.

PART - 2 PRODUCTS

2.1 MANUFACTURERS

.1 Patch-Cords and Cross-Connect Jumpers

.1 Supply all cross-connect cables, interconnect cables, and patch-cords.

.2 Supply all work-area cables.

.3 Cross-connect cable to be 24 AWG solid copper twisted and to perform per ANSI/EIA/TIA 568A specification for Category 6A cables as far as it may apply.

.4 Patch cords, equipment cables and work area cables to be 24 AWG stranded conductors and perform per ANSI/EIA/TIA 568A specification for Category 6A cables.

.5 Patch-cords to be factory assembled and tested, and not site prepared.

.6 Patch-cords to be of the snagless type using either a molded connector or rubber housing for connector pin.

.7 Patch-cord to be by same manufacturer as other signal carrying components.

.8 Patch-cords to be available in the following colours:

.1 Grey

.2 Yellow

.3 Orange

.4 Blue

.5 Green

.6 Red

.9 Patch cord length to be as follows unless stated otherwise.

.1 3 m at workstation

.2 3 m in telecommunications closet

.10 Workstation patch-cord to be colour grey.

PART - 3 EXECUTION (NOT USED)

END OF SECTION

Jacobs

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December 5, 2025

Attn: Fabiola Bereta
Environmental Manager
Infrastructure Ontario
1 Dundas Street West Suite 2000

Project name: Phase 3 of Courthouse Justice Video Strategy (CJVS) MAG Sites Designated Substance and Hazardous Materials Assessment – Perth, Ontario
IO Project No.: 230601
Jacobs Project No.: IOJVSM25

Subject: Review of Designated Substance and Hazardous Materials Assessment, Perth, Ontario prepared by Safetech Environmental Ltd.

Dear Ms. Bereta,

This letter summarizes the key finding and Jacobs Consultancy Canada (Jacobs) review of designated substance and hazardous materials (DSHM) assessment report prepared by Safetech for the following location:

- 43 Drummond Street East, Perth, Ontario

The DSHM assessment supports the Courthouse Justice Video Strategy (CJVS) program for the installation of video equipment at identified Ministry of the Attorney General (MAG) courthouses across Ontario.

It is important to review the details of the assessment report to understand the context of when the DSHM identified could represent a risk to building occupants (i.e. during activities that disturb the DMHS or during construction, renovation or demolition).

One permanent building (Perth Courthouse) was assessed.

Designated Substance or Hazardous Material	Location
Asbestos & Asbestos containing material (ACM)	1- Second Floor Courtroom 1 – Smooth plaster – beige joint compound – is ACM (0.5% chrysotile present). a. Estimated quantity was approximately 1800 square feet. Plaster is in good condition, considered to be friable Asbestos is suspected present in the following materials: 1'x1' fissure and pinhole pattern ceiling tiles were identified within Courtroom 1 (P2). The tiles could not be sampled at the time of assessment due to height limitations (i.e. above 20 feet), however, they are not expected to be impacted by planned CJVS work. The

	tiles and associated ceiling mastic (if present) are suspected to contain asbestos, and should be sampled to confirm or refute asbestos content prior to potential disturbance.
Lead	1- Off white paint on plaster walls in Courtroom 1 is lead- based paint 2- White paint on wood frame in RTR Room is lead-based paint 3- Purple paint on concrete floor in IT Room is lead-based paint Additional suspect lead-containing materials visually identified within the investigated areas that may require disturbance as part of the project include: • Possible lead-containing batteries in the form of emergency lighting. • Solder in pipe fittings and electrical equipment; and, • Lead packing at bell and spigot connection gaskets of cast iron drain pipes (P5).
Mercury	Deemed present in sealed fluorescent tubes (mercury vapour) where used in the building.
Silica	deemed present in all concrete (walls, columns, decking) grout and associated mortar finishes. Drywall and associated drywall joint compounds, plaster finishes (walls and ceilings), spray applied fireproofing, ceiling tiles, mastics and caulking

Acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride were not included in our assessment as these substances are not expected to be a significant component of building materials or present in a form that would represent an exposure concern.

PCBs (in light fixtures) were not identified and are unlikely to be present on site given the type of fixtures installed.

Ozone depleting and global warming substances (ODS/GWS) containing equipment (fixed equipment) was not observed in the assessed areas.

Generally, the following guidance should be considered:

Asbestos-Containing Materials (ACM) should be abated/managed prior to starting any work. The removal or disturbance of ACM must follow the measures and procedures indicated in Ontario Regulation 278/05. Work should be carried out by workers who completed the proper training by a “competent person” in the hazards of asbestos exposure, personal hygiene and work practices, and the use and care of respirators and protective clothing.

Any disturbance of lead materials and/or lead-based and lead-containing paints should be conducted in accordance with the procedures outlined in guidance referenced in the DSHM reports. The extent of procedures required depends on the type of work to be conducted.

The DSHM report noted that lead may be present as a minor component of solder in pipe fittings, spigot connection gaskets of cast iron drain pipes and batteries in electrical equipment, but is not expected to be a worker or waste hazard due to the small quantity presumed present. Future testing of these items and specific handling or disposal requirements are to be utilized if these materials are to be disturbed.

The DSHM report indicated that fluorescent lamps and/or wall mounted thermostats that require removal should be handled with care and kept intact to avoid potential exposure to mercury. Any mercury containing lamps or equipment that is to be removed is recommended to be handled and disposed of in accordance with the regulation referenced in the DSHM report. It is also noted that while no mercury was visibly identified in other equipment, dismantling of equipment was not conducted. Any thermometers, barometers, and other measuring devices, thermostats and a variety of other electrical switches should be assumed to contain mercury until proven otherwise and precautions should be taken if they are to be disturbed or taken out of service in the future.

Activities involving the disturbance of silica-containing materials should follow the procedures referenced in the DSHM report(s) and provincial guidance. Engineering controls, work practices, hygiene practices, personal protective measures and training to carry out activities safely are provided in the referenced guideline(s).

Any PCB-containing equipment taken out of service should be properly handled and disposed of at an authorized disposal facility. At the time of decommissioning, any suspect PCB-containing equipment should be verified by referring to the Environment Canada document entitled "Handbook on PCB's in Electrical Equipment".

For planned renovation or demolition-level work, where ODS/GWS are affected (e.g. that is removed from an HVAC or air-conditioning unit) all provincial regulations and guidelines should be considered and followed, including waste management requirements.

Entities that rely on the Safetech DHSM assessment report prepared for 43 Drummond Street East, Perth, Ontario, should review and consider the report's limitations section.

This DSHM report and any related communications are provided exclusively to Client and solely for informational purposes. They do not constitute a guarantee, warranty, or certification regarding the presence or absence of hazardous materials on the inspected premises. The inspection is based on the conditions observed at the time of the visit by Safetech and made available to Consultant for inspection; subsequent changes or disturbances to the property may alter the asbestos risk. The provider of this hazardous materials inspection makes no representations or warranties, express or implied, regarding the completeness or accuracy of the inspection findings. All such warranties are expressly disclaimed. This disclaimer applies to any and all aspects of the inspection, including but not limited to, the detection of asbestos, potential health risks, or the condition of materials. Unless otherwise agreed upon in writing by Client and Consultant, this inspection report should not be used as the sole basis for decision-making regarding property safety, renovation, sale, transfer, or demolition.

Kind regards,

Prepared by:
Jacobs
Project Manager

Krista Duchaine, BSc.

Reviewed by:
Jacobs
Senior Technical Consultant

James Sprenger, BSc., QPRA, C.Chem, EP

December 2, 2025

Jacobs
165 King Street West, Suite 201
Kitchener, Ontario N2G 1A7

Attention: **Krista Duchaine,**
Project Manager
Krista.Duchaine@jacobs.com

Re: Designated Substance and Hazardous Materials Assessment (DSHM)
Appendix E of the DSHM Cover Report – Specific to CJVS Project Areas
Perth Courthouse – B20016 | N02556
43 Drummond Street East, Perth, Ontario

1.0 INTRODUCTION

Background and Objectives

Safetech Environmental Limited (Safetech) was retained by Jacobs to provide specialized sub-consulting services direct to Jacobs on behalf of Ontario Infrastructure and Lands Corporation (IO). Services provided by Safetech included conducting a Designated Substance and Hazardous Materials (DSHM) assessment within the planned Phase 3 Courthouse Justice Video Strategy Program (CJVS) installation areas of The Ministry of the Attorney General (MAG) Perth Courthouse located at 43 Drummond Street East, Perth, Ontario (B20016 | N02556).

The scope of our services provide support of 'Phase 3' of the Ministry of the Attorney General's (MAG) Criminal Justice Video Strategy (CJVS) project to install JVN equipment at various courthouse locations throughout the province of Ontario. This project is 'Phase 3' of a three (3) phase project and includes the review and assessment of seventeen (17) courthouses. This report is specific to the assessment of CJVS work areas within the Perth Courthouse and shall be read in conjunction with the complete DSHM report submission. Assessment and sampling methodology, general recommendations, and limitations of our survey are included in the cover report.

This specific report, in conjunction with the cover report, satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statues of Ontario 1990, as amended for the specific areas of assessment included in the scope of work. Section 30(1) requires a building owner to determine if there are any designated substances present at a project site prior to construction or demolition activity.

Sections 30(2), (3) and (4) require the Owner and constructors for a project to provide the findings in this report as part of the tendering information for any tendered project or to prospective contractors (and subcontractors) of a project before entering into a binding contract.

Findings of our on-site inspection that was conducted within the proposed CJVS work areas on August 27, 2025, is documented in this report. Specific conclusions and recommendations based on our findings and knowledge of the planned CJVS Installation Program project are also included.

Description of Assessment Areas

Our assessment included all of the CJVS project work areas included in the Norr document set entitled "*MAG P3_Perth IFT*". Areas included specific courtrooms, adjacent spaces, corridors and areas where conduit and equipment will be installed. Refer to Figures AS-B20016-01 – AS-B20016-03 provided in Attachment 1-B20016 which defines all areas included into the assessment.

The Ontario Court of Justice located at 43 Drummond Street East, Perth, Ontario is a two-storey limestone structure originally constructed in 1842, encompassing an area of 11,663 square feet. It should be noted that the building holds heritage status as a Provincial Heritage Property of Provincial Significance (PHPPS).

The building is constructed with a stone foundation, wood framing, and consists of various interior finishes including plaster, drywall, carpet and ceiling tile. Specific areas included in the assessment include Courtrooms 1 and 2, surrounding corridors and offices on the second floor, main floor IT room and cable routing corridors, and the basement electrical room. All exterior building materials and finishes, including the roof, were excluded from the scope of this assessment. Therefore, we cannot provide any independent presumptions of material types, conditions or applications in areas not assessed.

Past Environmental Reports

Where past environmental reports were provided, Safetech reviewed these reports to assist in our assessment and understanding of the ongoing environmental management of the subject building. For building B20016, no environmental reports were provided to Safetech at the time of assessment.

However, following our assessment and subsequent DSHM report release, the following environmental reports were shared with Safetech on December 1, 2025:

- *"CBRE Asbestos Abatement Close-Out Report, Property Number: N02556: Justice Facility, 43 Drummond Street, Perth, Ontario"* prepared by ECOH, dated March 13, 2016; and,
- *"Asbestos Building Materials Reassessment Survey Report, East Region, Installation # N02556, Perth, Ontario"* prepared by ECOH, dated November 28, 2024.

Based on our post assessment review of the environmental reports noted above, the following building materials within B20016 are noted to be "presumed asbestos-containing". No other asbestos-containing materials were identified by bulk sample analysis in past environmental reporting.

- Exterior door caulking; and,
- Roofing materials.

It should be noted that the presumed asbestos-containing building finishes noted above are not present within the proposed CJVS project work areas included in the Norr document set entitled "*MAG P3_Perth IFT*". Therefore, no asbestos-containing materials were previously identified within the project work areas included within this scope of work. Safetech cannot validate the presence of these presumed asbestos-containing materials as they were outside of our scope of assessment.

2.0 RESULTS

Results of our visual assessment and bulk sample analytical findings are summarized in the sections below. Refer to the Limitations section of the cover report for additional details.

2.1 Designated Substances

2.1.1 Asbestos

Results of additional bulk sample analysis for the determination of asbestos content are summarized below in Table 1-B20016. Materials have been classified as "ACM" or "Non-ACM" based on analytical results. Yellow highlighted materials noted in the table are confirmed to be ACM. Bulk sample locations are identified on the figures provided in Attachment 1-B20016 along with locations of major asbestos-containing materials and other hazardous materials with a potential impact to the CJVS project work. Laboratory Certificates of Analysis are included in Attachment 2-B20016.

TABLE 1-B20016
Bulk Sample Analytical Results for Determination of Asbestos Content
Perth Courthouse – 43 Drummond Street East, Perth, Ontario
Sample Collection Date: August 27, 2025

Sample No.	Material Description	Sample Location	Asbestos Content	Material Classification
B20016-S01A	**Smooth Plaster – Second Floor Courtroom 1** **4 Phases:** **a) Off white joint compound** **b) Grey plaster** **c) Beige joint compound** **d) White plaster**	**Courtroom 1**	a) None Detected b) None Detected **c) 0.5% Chrysotile** d) None Detected	**ACM**
B20016-S01B			a) None Detected b) None Detected *c) Not Analyzed* d) None Detected	
B20016-S01C				
B20016-S02A	2'x4' Small and Medium Pinhole Ceiling Tiles	Second Floor RTR Room	None Detected	Non-ACM
B20016-S02B				
B20016-S02C				
B20016-S03A	Drywall Joint Compound – Second Floor	Second Floor RTR Room	None Detected	Non-ACM
B20016-S03B		Second Floor Privacy Booth		
B20016-S03C		Second Floor Lobby at Courtroom 1		
B20016-S04A	2'x4' Textured Pinhole Ceiling Tiles 2 Phases: a) White texture coat b) Grey ceiling tile	Second Floor Privacy Booth	a) None Detected b) None Detected	Non-ACM
B20016-S04B				
B20016-S04C				
B20016-S05A	2'x2' Random Fleck and Pinhole Ceiling Tiles	Second Floor Elevator Lobby	None Detected	Non-ACM
B20016-S05B				
B20016-S05C				

Sample No.	Material Description	Sample Location	Asbestos Content	Material Classification
B20016-S06A	Yellow Mastic under Carpet	Second Floor Elevator Lobby	None Detected	Non-ACM
B20016-S06B				
B20016-S06C				
B20016-S07A	Paper under Carpet Flooring	Courtroom 1	None Detected	Non-ACM
B20016-S07B				
B20016-S07C				
B20016-S08A	Painted Skim Coat on Stone Foundation 2 Phases: a) Off white primer b) Grey cementitious material	Basement Electrical Room	a) None Detected b) None Detected	Non-ACM
B20016-S08B				
B20016-S08C				
B20016-S09A	Smooth Plaster – Main Floor 2 Phases: a) White plaster b) Grey plaster	Main Floor IT Room	a) None Detected b) None Detected	Non-ACM
B20016-S09B				
B20016-S09C				
B20016-S10A	2'x4' Random Fleck and Pinhole Ceiling Tiles	Main Floor – Manager of Court Operations	None Detected	Non-ACM
B20016-S10B				
B20016-S10C				
B20016-S11A	Drywall Joint Compound – Main Floor	Main Floor – Manager of Court Operations	None Detected	Non-ACM
B20016-S11B		Main Floor Central Hallway		
B20016-S11C		Main Floor Security Office		

Table Note:

1) As per O. Reg. 278/05, ACM contains ≥0.5% asbestos by dry weight.

Materials assessed for asbestos content are summarized in Table 2-B20016 based on the type/use of the material. The condition and friability of materials confirmed or suspected to be asbestos-containing (based on our visual assessment and the results of bulk sample analysis) is provided. Condition (Cond.) ratings are provided as Good (G), Fair (F) or Poor (P) based on our methodized Assessment Criteria (found in section 2.3 of the cover report). Estimates of quantity have only been provided for confirmed or suspected asbestos-containing materials that were deemed to have a potential to be disturbed as part of the CJVS Installation Program work. Any quantities provided should be considered rough estimates only and should not be relied upon for bidding purposes. It is the responsibility of the selected Contractor to obtain actual quantities.

Photographs of asbestos-containing materials and other representative designated substances and/or hazardous building materials identified are referenced in the appropriate section where applicable (as P#) and are included in Section 4.0.

TABLE 2-B20016
Results of Assessment for Asbestos-Containing Materials
Phase 3 Courthouse Justice Video Strategy Program Work Areas
Lindsay Courthouse - 43 Drummond Street East, Perth, Ontario

Sprayed and Loose Fill Insulating Materials	Location/Description	Cond.	Est. Quantity	Friability
Sprayed Fireproofing	None identified in project-specific assessment areas.	N/A	N/A	N/A
Sprayed Insulation	None identified in project-specific assessment areas.	N/A	N/A	N/A
Loose Fill / Vermiculite Insulation	None identified in project-specific assessment areas. Interior portions of concrete block walls could not be assessed.	N/A	N/A	N/A
Thermal System Insulation	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Mechanical Pipe Insulation – Straights	Mechanical pipe straights throughout the areas assessed were observed to be either non-asbestos fiberglass and covered with a paper service jacket and/or PVC, or uninsulated.	N/A	N/A	N/A
Mechanical Pipe Insulation – Fittings (elbows, valves, tees, hangars, etc.)	Mechanical Pipe fittings, hangers, valves, etc. within the assessment areas are either insulated with fiberglass or uninsulated and not suspected to be asbestos-containing.	N/A	N/A	N/A
HVAC Duct Insulation	HVAC supply and return ducts were observed to be uninsulated.	N/A	N/A	N/A

Tank Insulation	None identified in project-specific assessment areas.	N/A	N/A	N/A
Breeching / Exhaust Insulation	None identified in project-specific assessment areas.	N/A	N/A	N/A
Boiler Insulation	None identified in project-specific assessment areas.	N/A	N/A	N/A
Other Mechanical Equipment Insulation	Remaining mechanical equipment was either uninsulated or insulated with fiberglass insulation.	N/A	N/A	N/A
Architectural Finishes & Finishing Materials	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Sprayed Texture / Stucco Finishes	None identified in project-specific assessment areas.	N/A	N/A	N/A
Plaster Finishes	Plaster wall and ceiling finishes were identified throughout Courtroom 1 and within the adjacent RTR room on the second floor. The material was sampled and determined to contain Chrysotile asbestos (refer to sample set B20016-S01 in Table 1-B20016 and Photograph **P1**).	**Good**	**~ 1,800 ft^2**	**Friable**
	Smooth plaster wall and ceiling finishes were identified within the main floor IT room. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S09 in Table 1-B20016).	N/A	N/A	N/A
Drywall Joint Compound	Drywall finishes were observed throughout the second floor assessment areas. The associated joint compound was sampled and determined to not contain asbestos (refer to sample set B20016-S03 in Table 1A-B10991 and Table 1-B20016).	N/A	N/A	N/A
	Drywall finishes were observed throughout the main floor assessment areas. The associated joint compound was sampled and determined to not contain asbestos (refer to sample set B20016-S11 in Table 1-B20016).	N/A	N/A	N/A
Skim Coat	Painted skim coat finish was identified on the stone foundation walls of the basement electrical room. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S08 in Table 1-B20016).	N/A	N/A	N/A

Ceiling Tiles	Location/Description	Cond.	Est. Quantity	Friability
Lay-in Acoustic Ceiling Tiles	2'x4' small and medium pinhole pattern ceiling tiles were identified within the second floor RTR room. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S02 in Table 1-B20016).	N/A	N/A	N/A
	2'x4' textured pinhole ceiling tiles were identified in the second floor privacy booth, the second floor legal aid offices and hallways on the main floor. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S04 in Table 1-B20016).	N/A	N/A	N/A
	2'x2' random fleck and pinhole pattern ceiling tiles were identified in Courtroom 2, and the second floor and main floor elevator lobbies. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S05 in Table 1-B20016).	N/A	N/A	N/A
	2'x4' random fleck and pinhole ceiling tiles were identified within the main floor offices. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S10 in Table 1-B20016).	N/A	N/A	N/A
Glued-on Acoustic Ceiling Tiles	1'x1' fissure and pinhole pattern ceiling tiles were identified within Courtroom 1 (**P2**). The tiles could not be sampled at the time of assessment due to height limitations (i.e. above 20 feet), however, they are not expected to be impacted by planned CJVS work. The tiles and associated ceiling mastic (if present) are suspected to contain asbestos, and should be sampled to confirm or refute asbestos content prior to potential disturbance.	Good	~ 500 ft^2	Non-Friable
Transite Ceiling Panels	None identified in project-specific assessment areas.	N/A	N/A	N/A
Flooring	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Vinyl Floor Tiles	None identified in project-specific assessment areas.	N/A	N/A	N/A
Vinyl Sheet Flooring	None identified in project-specific assessment areas.	N/A	N/A	N/A
Other Floor Materials	Yellow mastic was identified beneath carpet flooring. The material was sampled and determined to not contain asbestos (refer to sample set B20016-S076 in Table 1-B20016).	N/A	N/A	N/A
	Paper was identified beneath carpet flooring within Courtroom 1. The material was sampled and determined to not contain asbestos (refer to sample et B20016-S07 in Table 1-B20016).	N/A	N/A	N/A

Asbestos Cement Products	Location/Description	Cond.	Est. Quantity	Friability
Piping	None identified in project-specific assessment areas.	N/A	N/A	N/A
Roofing, Siding, Wallboard	None identified in project-specific assessment areas.	N/A	N/A	N/A
Other Cement Products	None identified in project-specific assessment areas.	N/A	N/A	N/A
Misc. Materials	**Location/Description**	**Cond.**	**Est. Quantity**	**Friability**
Other Materials	No other asbestos-containing materials were identified. Materials outside of our assessment area (which may be impacted by work) should be assessed and sampled prior to tendering the work.	N/D	N/D	N/D

Table Note:
1) N/A=Not Applicable; N/D=Not Determined

2.1.2 Lead

Laboratory analytical results for paints tested to determine lead content are summarized below in Table 3-B20016. Locations where bulk samples were retrieved for analysis are indicated on the figure provided in Attachment 1-B20016. The Laboratory Certificate of Analysis is included in Attachment 2-B20016.

TABLE 3-B20016
Results of Paint Condition and Lead Content Assessment
Phase 3 Courthouse Justice Video Strategy Program Work Areas
Perth Courthouse - 43 Drummond Street East, Perth, Ontario
Sample Collection Date: August 27, 2025

Sample No.	Location	Surface	Paint Colour	Condition	Lead Conc. (µg/g)	EACC Classification
B20016-LP01	**Courtroom 1**	**Plaster Wall**	**Off White**	**Good**	**14,600**	**Lead-Based**
B20016-LP02	RTR Room	Drywall Wall	Beige	Good	12	'de minimis' level of lead
B20016-LP03	**RTR Room**	**Wood Frame**	**White**	**Good**	**72,800**	**Lead-Based**
B20016-LP04	Basement Electrical	Wood Framing	Silver	Good	196	'de minimis' level of lead
B20016-LP05	**IT Room**	**Concrete Floor**	**Purple**	**Good**	**18,300**	**Lead-Based**
B20016-LP06	Main Floor Hallway	Drywall Wall	Light Brown	Good	<5	'de minimis' level of lead

Three (3) paint samples collected were determined to contain greater than 5,000 µg/g, and are considered to be lead-based in accordance with the October 2014 Environmental Abatement Council of Canada (EACC) *Lead Guideline for Construction, Renovation, Maintenance or Repair.* Materials coated with lead-based paints require special procedures when performing work that may disturb them or their coatings. The type of procedure required depends on the work being conducted. Off white paint on plaster walls throughout Courtroom 1 (**P3**), white paint on wood doors and original window frames (**P4**), and purple paint on the floor of the IT room (**P5**), were determined to be lead-based.

All other paint samples collected were determined to contain less than 1,000 µg/g and are considered to have a '*de minimis*' level of lead in paint (virtually safe) as per the October 2014 EACC *Lead Guideline for Construction, Renovation, Maintenance or Repair.*

Additional suspect lead-containing materials visually identified within the investigated areas that may require disturbance as part of the project include:

- Possible lead-containing batteries in the form of emergency lighting; and,
- Solder in pipe fittings and electrical equipment.

2.1.3 Mercury

Mercury is present within the areas assessed in the form of vapour within fluorescent lamp tubes. No other mercury-containing equipment was identified or is suspected to be present within the areas assessed.

2.1.4 Silica

A number of building materials were identified within the surveyed areas that are suspected to contain crystalline silica. This includes the following materials:

- All concrete (walls, columns, decking), grout, and associated mortar finishes;
- Drywall and associated drywall joint compounds;
- Plaster walls and ceilings;
- Ceiling tiles; and,
- Mastics and caulking.

2.1.5 Other Designated Substances

Acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride were not included in our assessment as these substances are not expected to be a significant component of building materials or present in a form that would represent an exposure concern. Additionally, no specific information regarding their use was provided to us.

2.2 Other Hazardous Materials

2.2.1 Chemical Hazards

No visible evidence of UFFI installation (i.e. injection openings) or overspray of foam insulation at wall/ceiling joints was identified. In addition, due to the age of construction and use of the building the presence of UFFI insulation is not suspected. No other hazardous materials were identified.

2.2.2 Biological Hazards

Mould Contamination

Water staining and minor water damage was observed on lay-in acoustic ceiling tiles and drywall ceiling finishes on the second floor of the assessment area. However, this condition is typical and there was no visible evidence of obvious mould growth at the time of our assessment.

2.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

Fluorescent light fixtures were identified throughout the CJVS Installation Program areas. These were noted to be four-foot, two lamp, and four-foot, four-lamp fixtures, containing T8 lamp tubes. Fluorescent light fixtures containing T8 lamps are not suspected to contain PCB ballasts, as they are incompatible for operation. Assessment of ballasts was not possible at the time of assessment as the lighting system was not deenergized, and there was no safe access to remove the fixtures.

Ozone Depleting and Global Warming Substances

No fixed equipment suspected to contain ODS/GWS were observed in the areas assessed.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Designated Substances

3.1.1 Asbestos

Results of our assessment indicated that the following asbestos-containing materials are present within the Phase 3 Courthouse Justice Video Strategy Program work areas:

- Friable Asbestos-Containing Materials:
    - Smooth plaster walls and ceiling finishes within Courtroom 1 and the adjacent RTR room on the second floor.

Other materials identified within the assessment area that are suspected to contain asbestos, but were not sampled due to inaccessibility include:

- Non-friable 1'x1' fissure and pinhole patterned ceiling tiles and associated mastic adhesive (if present) within Courtroom 1 on the second floor.

All suspect materials shall be assumed to be asbestos-containing until proven otherwise by bulk sample analysis (i.e. prior to disturbance as part of the CJVS Installation project). Alternatively, treat all suspect materials as asbestos-containing and remove/dispose of them prior to disturbance.

Additional asbestos-containing materials may be present outside of the Phase 3 Courthouse Justice Video Strategy Program work areas but were not included into our scope of assessment. Conduct further assessment and sampling if work is planned to occur outside of the assessment areas identified on the figures provided in Attachment 1-B20016.

As per O. Reg. 278/05, removal or disturbance of less than 1 square meter of friable ACM, such as plaster finishes, is classified as a Type 2 operation provided the removal is performed using non-powered hand tools only. Removal of greater than 1 square meter of friable ACM shall be conducted as a Type 3 operation.

The removal or disturbance of ACM must follow the measures and procedures indicated in O.Reg. 278/05. This work should be conducted by workers who have received proper training by a "competent person" in the hazards of asbestos exposure, personal hygiene and work practices, and the use and care of respirators and protective clothing. Any worker/supervisor who works in a Type 3 operation must successfully complete the Asbestos Abatement Worker or Supervisor Training Program approved by the Ministry of Training, Colleges and Universities.

It is recommended that all work involving the removal or disturbance of ACM be subject to inspection and testing to document conformance with O.Reg. 278/05 requirements. The degree of inspection and testing is dependent on site-specific conditions such as the type, duration, size and location of the work. In most circumstances Type 3 operations require a visual inspection and clearance air testing to be conducted by a competent worker on completion of the work. The inspection should be conducted to ensure that the enclosure and the work area inside the enclosure are free from visible dust, debris or residue that may contain asbestos. Clearance air testing for Type 3 operations requires a minimum number of air samples to be taken (depending on the size of the work area) following specific sampling and analytical procedures and all samples taken must meet the clearance criteria set out in O.Reg. 278/05.

3.1.2 Lead

Results of paint chip analysis for the determination of lead content determined that off white paint on plaster finishes, white paint on original doors and windows, and purple paint on the concrete floor are lead-based in accordance with the 2014 EACC Lead Guideline. Materials coated with lead-based paints require special procedures when performing work that may disturb them or their coatings. Any disturbance of lead-based paints should be conducted in accordance with the EACC Lead Guideline (October 2014) and the Ministry of Labour, Immigration, Training and Skills Development (MLITSD) *"Lead on Construction Projects"* guideline (April 2011). The extent of procedures (or Type of operation) necessary depends on the type of work to be conducted.

Remaining paints sampled were determined to contain a 'de minimis' level of lead (virtually safe). Provided these materials are disturbed in a non-aggressive manner and the work is performed using normal dust control procedures, worker protection from the inhalation of lead is not required. General health and safety precautions must still be implemented.

At this time the method of disturbance, if any, of lead-containing paints is unknown. It is recommended that any contractor whose work requires lead-containing paints to be disturbed consult the MLITSD guideline prior to the start of work to determine the Type of operation(s) and the corresponding control measures (engineering controls, work/hygiene practices, protective clothing and equipment and worker training) necessary to conduct the work in a manner that will prevent worker overexposure to lead.

Additional suspect lead-containing products not anticipated to be disturbed as part of the Phase 3 Courthouse Justice Video Strategy Program work include solder on pipe fittings and electrical components and lead-acid batteries within emergency lighting. Future testing of these materials and specific handling/disposal requirements may be necessary if/when these materials are to be disturbed.

If practicable, all bulk lead waste materials should be separated from other wastes and sent to a recycling facility. If not practicable, lead-containing waste should be handled and disposed of according to R.R.O. 1990 Regulation 347 (Reg. 347), *"General – Waste Management"*, as amended, made under the Environmental Protection Act.

3.1.3 Mercury

Fluorescent lamps that require removal should be handled with care and kept intact to avoid potential exposure to mercury vapour present within the lamps. Any mercury-containing lamps or equipment that is to be removed is recommended to be recycled rather than disposed of in landfill. Waste should be handled and disposed of under Reg. 347, *"General – Waste Management"*, made under the Environmental Protection Act.

Although no mercury was visibly identified in other equipment, dismantling of equipment was not conducted to verify the presence/absence of mercury. It is cautioned that thermometers, barometers and other measuring devices (pressure gauges/sensors, vacuum gauges, manometers, etc.), thermostats and a variety of other electrical switches (temperature sensitive, tilt switches, float switches, etc.) may contain mercury that may not be visible without dismantling the equipment. Such devices should be assumed to contain mercury until proven otherwise and similar precautions to those outlined above should be taken if any of these items are to be disturbed or taken out of service in the future.

3.1.4 Silica

Suspect silica-containing materials were identified to be present within the project-specific work area. In their current state, building materials containing silica do not represent a risk to building occupants or construction workers. Risks associated with exposure to silica arise during demolition activities that cause silica dust to be created (particularly grinding, drilling or cutting operations and during major demolition), resulting in a crystalline silica inhalation hazard.

If any materials suspected to contain silica are to be removed or otherwise disturbed as a result of work activities it is recommended that procedures be put in place to control the generation of dust (such as routine water misting) and thus reduce the potential for worker exposure. Workers that have the potential to be exposed to airborne silica should also wear appropriate protective clothing and respiratory protection.

Any work involving the disturbance of silica-containing materials should follow the procedures outlined in the MLITSD *"Silica on Construction Projects"* guideline (April 2011). The appropriate engineering controls, work practices, hygiene practices, personal protective measures and training necessary to conduct the work in a safe manner are provided in this guideline. The general measures and procedures (or Type of operation) necessary depends on the type of work to be conducted.

3.1.5 Other Designated Substances

No other designated substances are expected to be a component of building materials within the surveyed areas in a form that would represent an exposure concern. Therefore, no protective measures or procedures specific to acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride are considered necessary.

3.2 Other Hazardous Materials

3.2.1 Chemical Hazards

As no UFFI was identified or is suspected to be present within the surveyed areas no further action is required.

3.2.2 Biological Hazards

Mould Contamination

As no mould contamination was identified or is suspected to be present within the assessment areas no further action is required.

3.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

The federal government has set strict regulations for the handling, storage and disposal of PCBs. The *PCB Regulations* (SOR/2008-273) came into effect on September 5th, 2008 and consolidates and replaces the *Chlorobiphenyls Regulations* (SOR/91-152) and the *Storage of PCB Material Regulations* (SOR/92-507). The purpose of the PCB Regulations is to improve the protection of Canada's environment and the health of Canadians by minimizing the risks posed by the use, storage and release of PCBs by accelerating the elimination of these substances.

As of December 31, 2009 all current PCB storage sites are to have been eliminated and there should no longer be any electrical capacitors, electrical transformers, electromagnets, heat transfer equipment or any other equipment in service that contains PCBs at a concentration greater than 500 mg/kg (500 ppm). As of this time, all of this equipment should have been removed from service and sent for destruction. Furthermore, the PCB Regulations restricts the use of equipment containing PCBs (other than light ballasts or pole-top electrical transformers) at concentrations exceeding 50 mg/kg (50 ppm) in sensitive areas (such as drinking water treatment plants, schools, hospitals and senior citizen care facilities) by the same date. All other locations have until December 31, 2025 to decommission equipment containing 50 ppm to 500 ppm PCBs.

Based on our inspection results, light fixtures inspected throughout the subject area did not contain PCBs. We expect that a lighting retrofit has taken place and do not suspect any PCB ballasts remain within the subject area. However; when light fixtures are to be decommissioned, any PCB-containing ballasts that are found should be removed and separated from other waste and disposed of as PCB waste at an authorized destruction facility. The PCB content of “assumed PCB-containing” fluorescent light ballasts should be verified at this time by determining the date of manufacture and other pertinent information by referring to the Environment Canada document entitled *“Identification of Lamp Ballasts Containing PCBs” (Report EPS 2/CC/2 (revised) August 1991)* to aid in identification.

Ozone Depleting and Global Warming Substances

No ozone depleting or global warming substances are expected to be disturbed as part of the Phase 3 Courthouse Justice Video Strategy Program work. However, should the scope expand, the following standards are in place regarding the removal or disturbance of ozone depleting and global warming substances.

Ontario Regulation 463/10, “Ozone Depleting Substances and Other Halocarbons” (O. Reg. 463/10, made under the Environmental Protection Act) controls the use, discharge, sale, transfer, transport, storage and disposal of ozone depleting substances and halocarbons in Ontario. This regulation enhances the control and management of ODS and other halocarbons to prevent or minimize emissions, which serves a dual environmental benefit of lowering emissions of substances that deplete the ozone layer and contribute to global warming.

O. Reg. 463/10 restricts the discharge of a class 1 and class 2 ozone depleting substance or a halocarbon into the natural environment or within a building. Servicing and testing of refrigeration equipment should be conducted in accordance with Environment Canada’s “*Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems”*.

This work must be conducted by a certified person who holds a valid Ozone Depletion Prevention (ODP) Certificate. Refrigeration equipment and containers that are to be dismantled and disposed of need to be properly purged of remaining refrigerant by a certified person and a notice must be affixed to the equipment or container that indicates it no longer contains a refrigerant (in addition to other information required by the regulation).

Any refrigerant that is removed from an air-conditioning unit, heat pump, refrigeration or freezer unit (that is not mobile) is defined as a Stationary Refrigerant Waste under Reg 347 and must be collected, handled, transported and recycled or disposed of in accordance with the requirements set forth in Sections 30 to 35 of this regulation.

4.0 SITE PHOTOGRAPHS

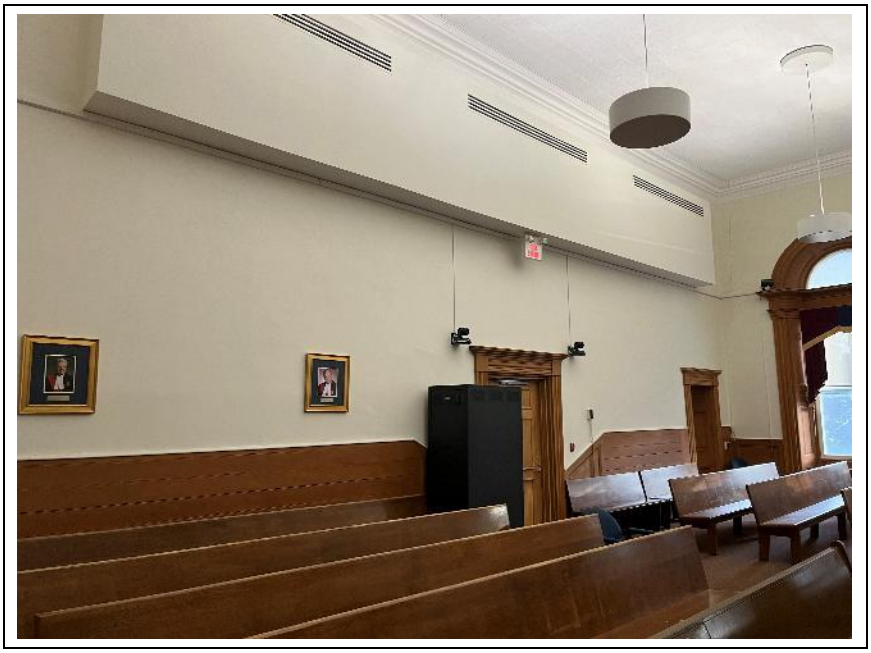
Photographs of site conditions and any hazardous materials or designated substances identified within the Phase 3 Courthouse Justice Video Strategy Program work areas are referenced below as P# with a description of the material type and an approximate location.

P1 – Courtroom 1 – Asbestos-Containing Plaster Walls

Photograph of asbestos-containing plaster walls present throughout Courtroom 1, and identified within the adjacent RTR room on the second floor.

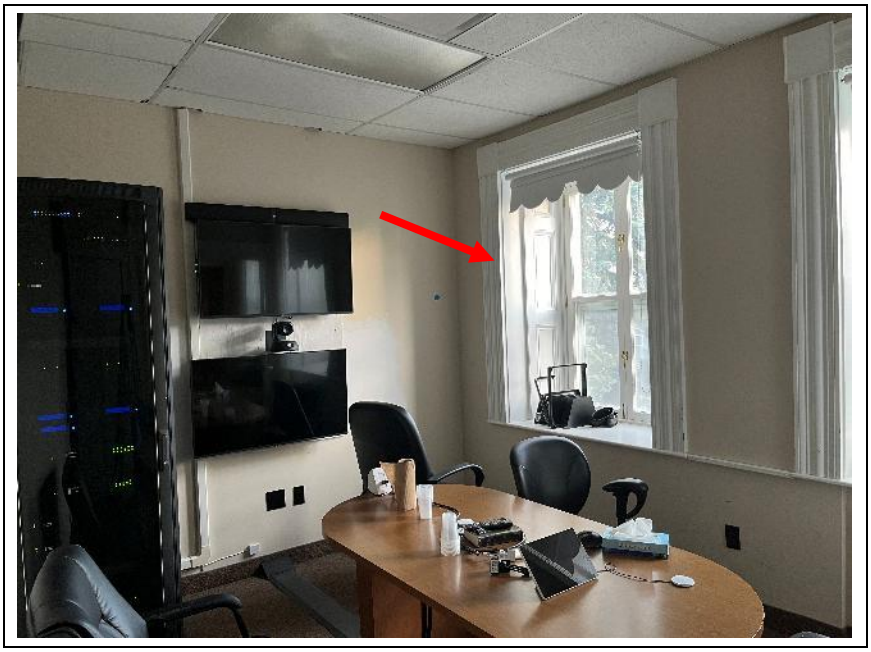
P2 – Courtroom 1 – Ceiling Tiles

Photograph of 1'x1' ceiling tiles that could not be sampled at the time of assessment and are suspected of containing asbestos. If CJVS work has the potential to impact these ceiling tiles, sampling shall be conducted prior to disturbance or removal.



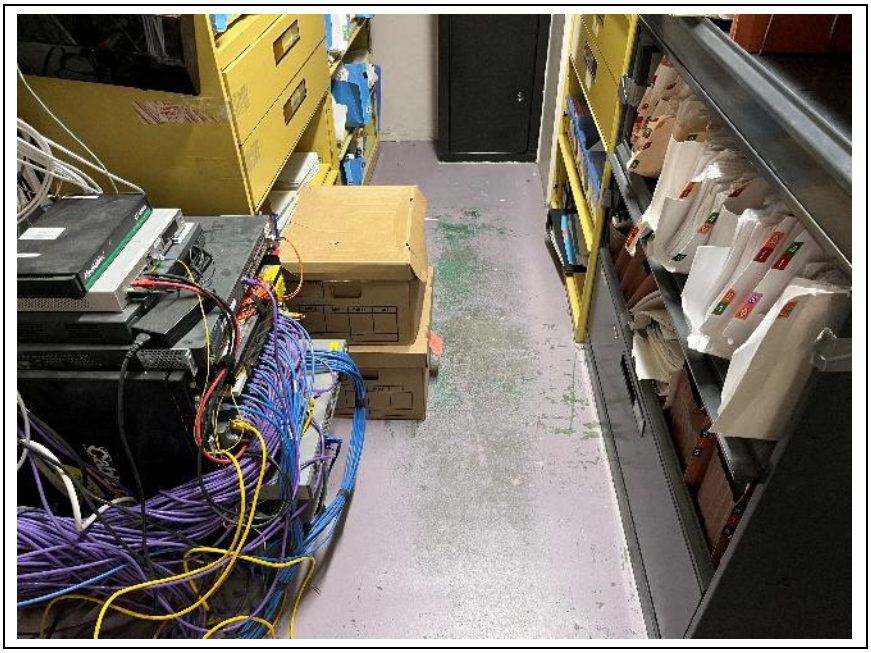
P3 – Courtroom 1 – Lead-Based Paint

Photograph of lead-based off-white paint present on plaster finishes within Courtroom 1.



P4 – RTR Room – Lead-Based Paint

Photograph of lead-based white paint (red arrow) identified on original wood windows and doors throughout the assessment areas.



P5 – IT Room – Lead-Based Paint

Photograph of lead-based purple paint identified on the concrete floor within the first floor IT room.

Attachment 1-B20016

Figures AS-B20016-01, AS-B20016-02 and AS-B20016-03
Sample Locations and Location of Major ACM and other DSHM

NOTES:

1.Refer to report entitled “Designated Substance and Hazardous Materials Assessment (DSHM) Appendix E of the DSHM Cover Report – Specific to CJVS Project Areas, Perth Courthouse – B20016 | N02556, 43 Drummond Street East, Perth, Ontario” for complete details regarding designated substances and hazardous materials identified, deemed and suspected within CJVS project work areas.

2.All known, deemed, or suspected designated substances may not be depicted on the figure(s). Refer to the report for a complete list of identified and suspected asbestos-containing materials within the scope of the assessment area.

3.All figures to be referenced with the report.

4.All figures are not to scale.

5.All base plans provided by Infrastructure Ontario.

6.Grey hatched areas and any detail call-outs on the Figure are part of the base plan provided by Infrastructure Ontario.

7.Figures are colour dependent; photocopies may alter interpretations of the figure. Refer to original figure(s) and report.

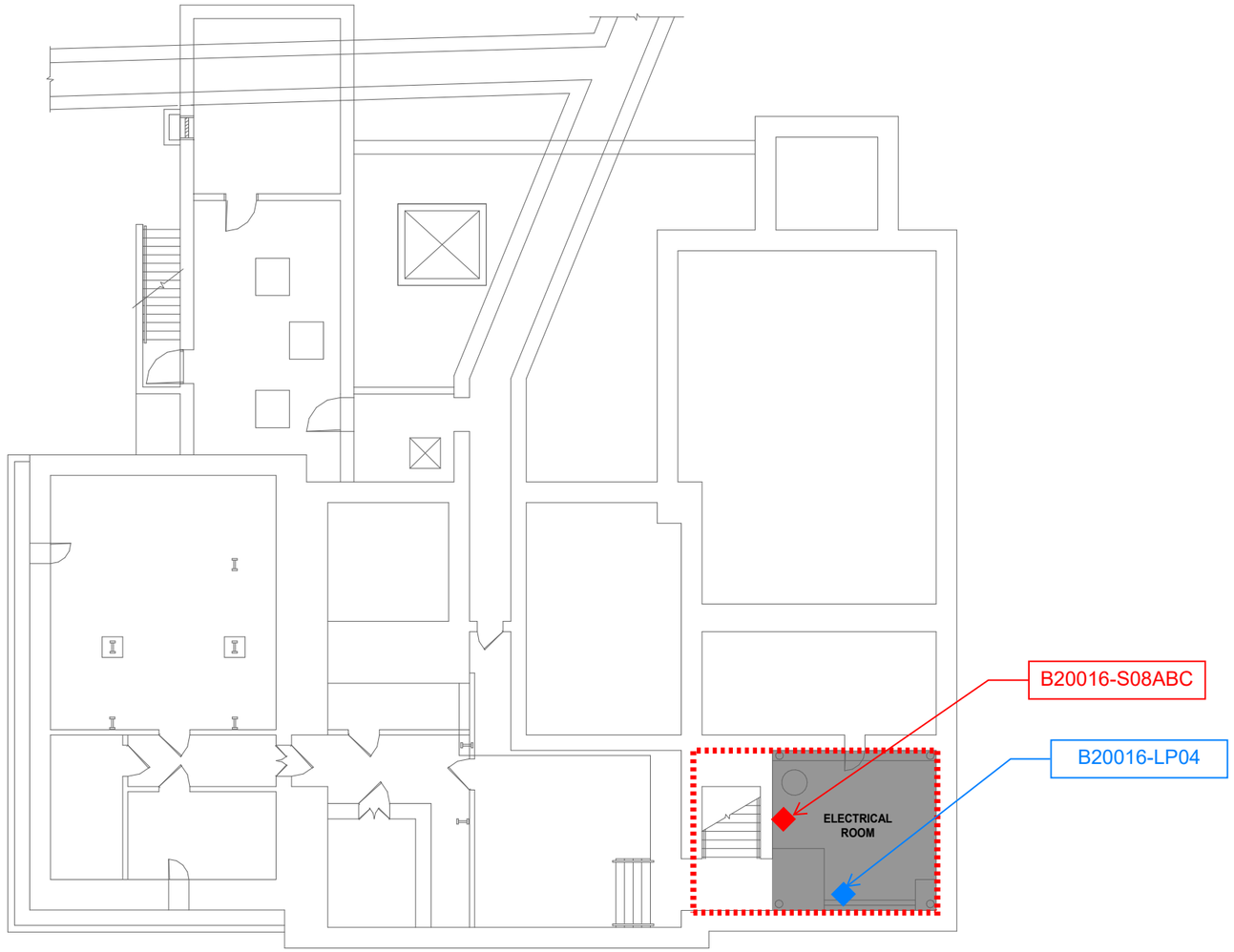
8.Locations and quantities of asbestos-containing materials and sample locations are approximate (where presented).

9.The assessment was strictly limited to the CJVS project-specific assessment area, as identified by Infrastructure Ontario. Conduct further assessment and sampling if work is planned to occur outside of the assessment areas identified on the Figure.

10. Asbestos-containing plaster wall and ceiling finishes are present throughout Courtroom 1 and within the adjacent RTR room on the second floor.

11. 1'x1' ceiling tiles within Courtroom 1 are suspected of containing asbestos until sampling can be conducted to confirm or refute asbestos content.

12. Off white paint on plaster walls throughout Courtroom 1, white paint on wood doors and original window frames, and purple paint on the floor of the IT room are lead-containing.



SAMPLE LOCATION AND SURVEY LEGEND:

◆	B20016-S01A	Asbestos Bulk Sample and Sample Identification Number
◆	B20016-LP01	Lead Bulk Sample and Sample Identification Number
●	Pre-1-B20016	Background Total Fibre Air Sample and Sample Identification Number
●	Post-1-B20016	Clearance Total Fibre Air Sample and Sample Identification Number
▭		Extent of Assessment Area

ASBESTOS –CONTAINING MATERIALS AND OTHER HAZARDOUS MATERIALS LEGEND:

- Vinyl Floor Tile
- Vinyl Sheet Flooring
- Ceiling Tiles
- Ceiling Texture Coat
- Spray Applied Fireproofing
- 2 Parged Pipe Fitting Insulation and Quantity
- Pipe Insulation (Horizontal)
- Pipe insulation (Vertical)
- Duct or Mechanical Equipment Insulation
- Flexible Duct Coupling
- Asbestos Cement (Transite) Pipe (Horizontal)
- Asbestos Cement (Transite) Pipe (Vertical)
- 2 Mercury-Containing Thermostat Switch and Quantity

BASEMENT

PROJECT:
Infrastructure Ontario
Justice Video Technology Program
The Ministry of the Attorney General
Perth Courthouse

Building Number:	B20016	**Safetech Project Number:**	2-3250046
Building Address:	43 Drummond Street East, Perth, Ontario		

DRAWING NAME:
Designated Substances and Hazardous Materials Sample and Asbestos-Containing Material Locations for 43 Drummond Street East, Perth, Ontario

SURVEY DATE:	August 27, 2025
DRAWING BY:	SD
DRAWING #:	AS-B20016-01
APPROVED BY:	JJG

Prepared for:

Infrastructure Ontario

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Prepared by:

safetech ENVIRONMENTAL LTD.

Safetech Environmental Limited
100 Hanson Avenue,
Unit 2, Kitchener, ON
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NOTES:

1.Refer to report entitled “Designated Substance and Hazardous Materials Assessment (DSHM) Appendix E of the DSHM Cover Report – Specific to CJVS Project Areas, Perth Courthouse – B20016 | N02556, 43 Drummond Street East, Perth, Ontario” for complete details regarding designated substances and hazardous materials identified, deemed and suspected within CJVS project work areas.

2.All known, deemed, or suspected designated substances may not be depicted on the figure(s). Refer to the report for a complete list of identified and suspected asbestos-containing materials within the scope of the assessment area.

3.All figures to be referenced with the report.

4.All figures are not to scale.

5.All base plans provided by Infrastructure Ontario.

6.Grey hatched areas and any detail call-outs on the Figure are part of the base plan provided by Infrastructure Ontario.

7.Figures are colour dependent; photocopies may alter interpretations of the figure. Refer to original figure(s) and report.

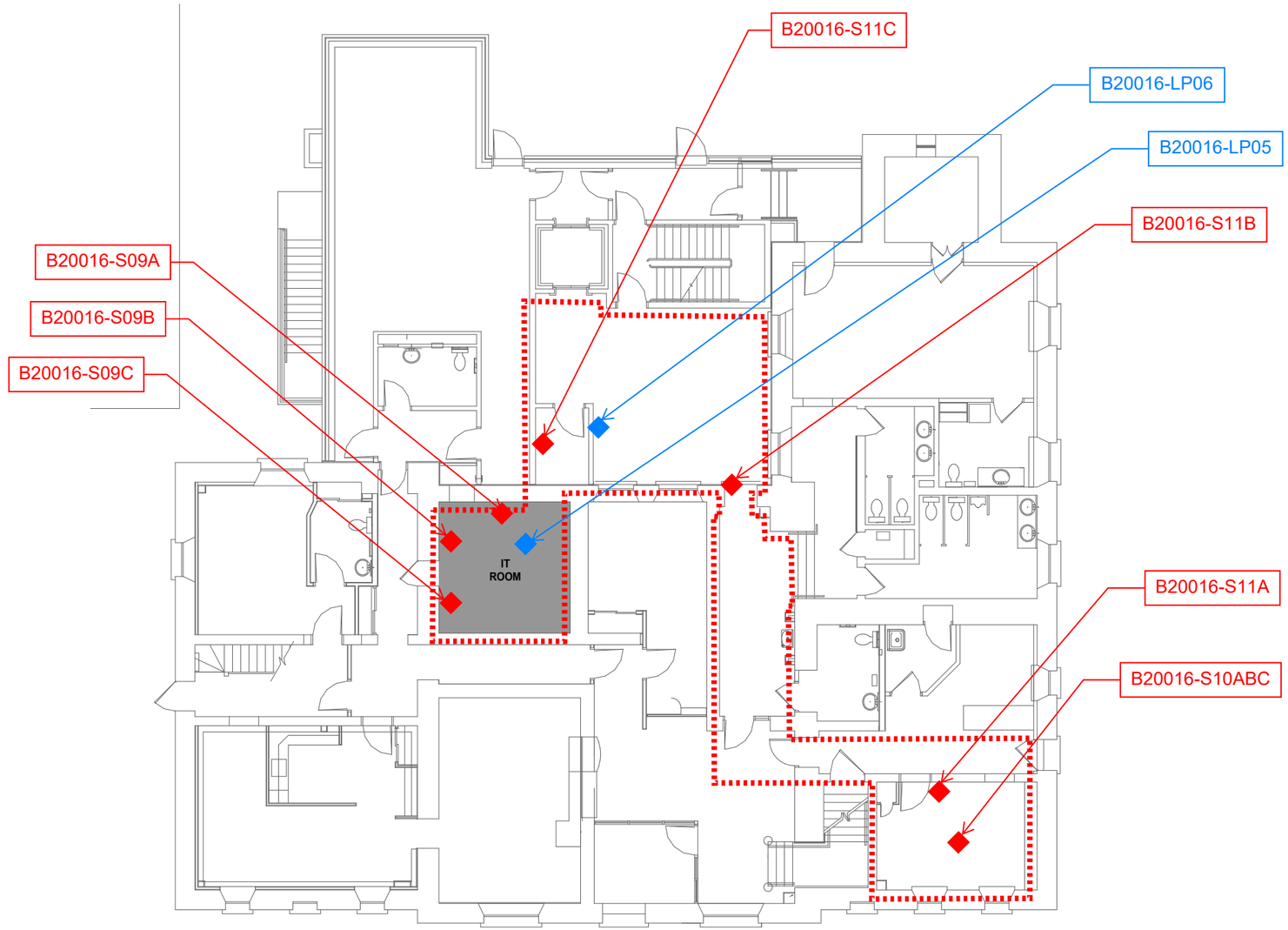
8.Locations and quantities of asbestos-containing materials and sample locations are approximate (where presented).

9.The assessment was strictly limited to the CJVS project-specific assessment area, as identified by Infrastructure Ontario. Conduct further assessment and sampling if work is planned to occur outside of the assessment areas identified on the Figure.

10. Asbestos-containing plaster wall and ceiling finishes are present throughout Courtroom 1 and within the adjacent RTR room on the second floor.

11. 1'x1' ceiling tiles within Courtroom 1 are suspected of containing asbestos until sampling can be conducted to confirm or refute asbestos content.

12. Off white paint on plaster walls throughout Courtroom 1, white paint on wood doors and original window frames, and purple paint on the floor of the IT room are lead-containing.



SAMPLE LOCATION AND SURVEY LEGEND:

◆	B20016-S01A	Asbestos Bulk Sample and Sample Identification Number
◆	B20016-LP01	Lead Bulk Sample and Sample Identification Number
●	Pre-1-B20016	Background Total Fibre Air Sample and Sample Identification Number
●	Post-1-B20016	Clearance Total Fibre Air Sample and Sample Identification Number
▭		Extent of Assessment Area

ASBESTOS –CONTAINING MATERIALS AND OTHER HAZARDOUS MATERIALS LEGEND:

- Vinyl Floor Tile
- Vinyl Sheet Flooring
- Ceiling Tiles
- Ceiling Texture Coat
- Spray Applied Fireproofing
- 2 Parged Pipe Fitting Insulation and Quantity
- Pipe Insulation (Horizontal)
- Pipe insulation (Vertical)
- Duct or Mechanical Equipment Insulation
- Flexible Duct Coupling
- Asbestos Cement (Transite) Pipe (Horizontal)
- Asbestos Cement (Transite) Pipe (Vertical)
- 2 Mercury-Containing Thermostat Switch and Quantity

MAIN FLOOR

PROJECT:
Infrastructure Ontario
Justice Video Technology Program
The Ministry of the Attorney General
Perth Courthouse

Building Number:	B20016	**Safetech Project Number:**	2-3250046
Building Address:	43 Drummond Street East, Perth, Ontario		

DRAWING NAME:
Designated Substances and Hazardous Materials Sample and Asbestos-Containing Material Locations for 43 Drummond Street East, Perth, Ontario

SURVEY DATE:	August 27, 2025
DRAWING BY:	SD
DRAWING #:	AS-B20016-02
APPROVED BY:	JJG

Prepared for:

Infrastructure Ontario

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Prepared by:

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Safetech Environmental Limited
100 Hanson Avenue,
Unit 2, Kitchener, ON
N2C 2E2

NOTES:

1.Refer to report entitled “Designated Substance and Hazardous Materials Assessment (DSHM) Appendix E of the DSHM Cover Report – Specific to CJVS Project Areas, Perth Courthouse – B20016 | N02556, 43 Drummond Street East, Perth, Ontario” for complete details regarding designated substances and hazardous materials identified, deemed and suspected within CJVS project work areas.

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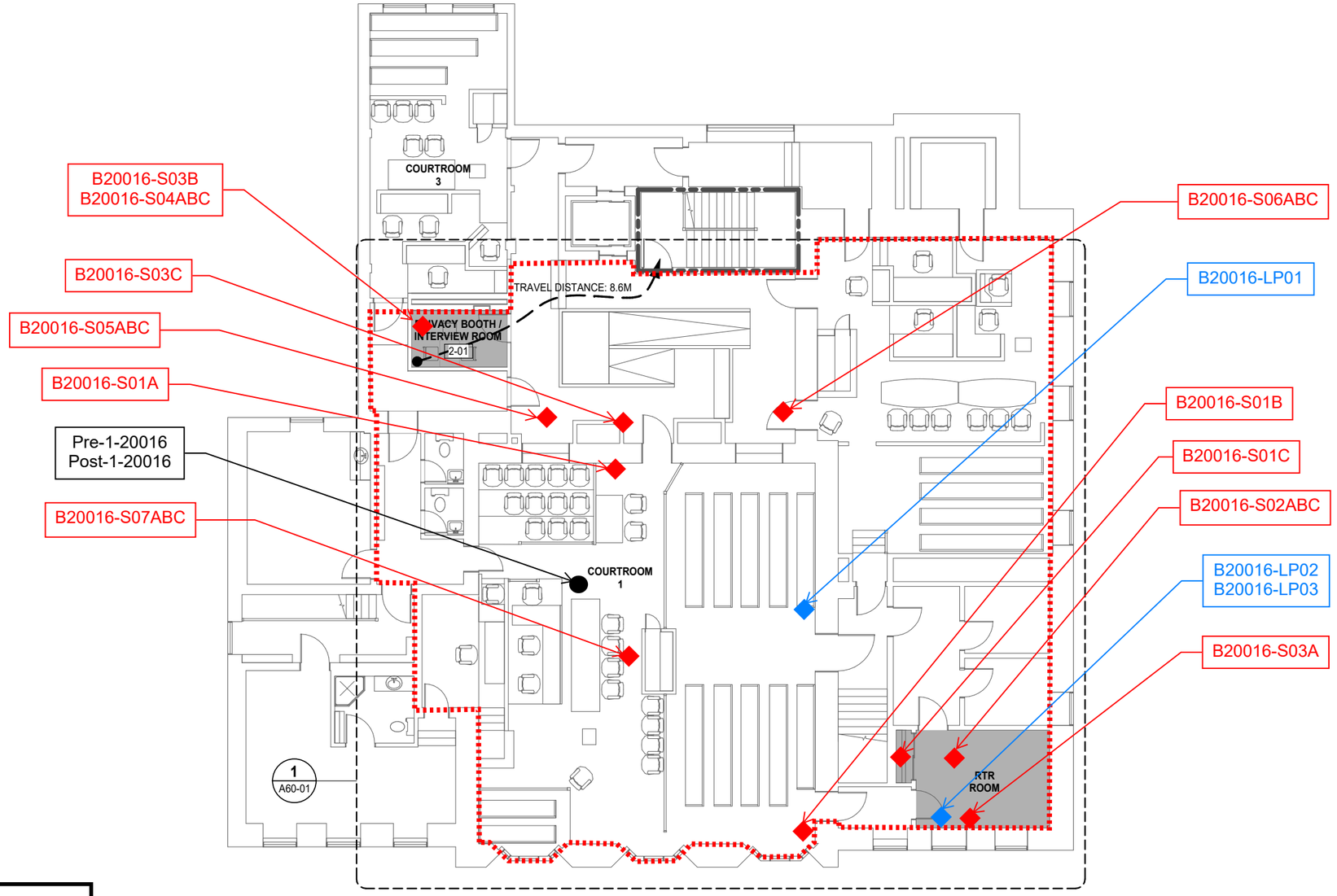
8.Locations and quantities of asbestos-containing materials and sample locations are approximate (where presented).

9.The assessment was strictly limited to the CJVS project-specific assessment area, as identified by Infrastructure Ontario. Conduct further assessment and sampling if work is planned to occur outside of the assessment areas identified on the Figure.

10. Asbestos-containing plaster wall and ceiling finishes are present throughout Courtroom 1 and within the adjacent RTR room on the second floor.

11. 1'x1' ceiling tiles within Courtroom 1 are suspected of containing asbestos until sampling can be conducted to confirm or refute asbestos content.

12. Off white paint on plaster walls throughout Courtroom 1, white paint on wood doors and original window frames, and purple paint on the floor of the IT room are lead-containing.



SECOND FLOOR

SAMPLE LOCATION AND SURVEY LEGEND:

◆	B20016-S01A	Asbestos Bulk Sample and Sample Identification Number
◆	B20016-LP01	Lead Bulk Sample and Sample Identification Number
●	Pre-1-B20016	Background Total Fibre Air Sample and Sample Identification Number
●	Post-1-B20016	Clearance Total Fibre Air Sample and Sample Identification Number
▭		Extent of Assessment Area

ASBESTOS –CONTAINING MATERIALS AND OTHER HAZARDOUS MATERIALS LEGEND:

- Vinyl Floor Tile
- Vinyl Sheet Flooring
- Ceiling Tiles
- Ceiling Texture Coat
- Spray Applied Fireproofing
- 2 Parged Pipe Fitting Insulation and Quantity
- Pipe Insulation (Horizontal)
- Pipe insulation (Vertical)
- Duct or Mechanical Equipment Insulation
- Flexible Duct Coupling
- Asbestos Cement (Transite) Pipe (Horizontal)
- Asbestos Cement (Transite) Pipe (Vertical)
- 2 Mercury-Containing Thermostat Switch and Quantity

PROJECT:
Infrastructure Ontario
Justice Video Technology Program
The Ministry of the Attorney General
Perth Courthouse

Building Number:	B20016	**Safetech Project Number:**	2-3250046
Building Address:	43 Drummond Street East, Perth, Ontario		

DRAWING NAME:
Designated Substances and Hazardous Materials Sample and Asbestos-Containing Material Locations for 43 Drummond Street East, Perth, Ontario

SURVEY DATE:	August 27, 2025
DRAWING BY:	SD
DRAWING #:	AS-B20016-03
APPROVED BY:	JJG

Prepared for:

Infrastructure Ontario

Infrastructure Ontario
1 Dundas Street West
Suite 2000
Toronto, Ontario
M5G 1Z3

Prepared by:

safetech ENVIRONMENTAL LTD.

Safetech Environmental Limited
100 Hanson Avenue,
Unit 2, Kitchener, ON
N2C 2E2

Attachment 2-B20016

Laboratory Certificates of Analysis (Asbestos and Lead)

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INCORPORATED

Laboratory Analysis Report

To:

Shannon Deline
Safetech Environmental Ltd.
100 Hanson Avenue, Unit 2
Kitchener, Ontario
N2C 2E2

EMC LAB REPORT NUMBER: A124548
Job/Project Name: 43 Drummond Street East, Perth
Analysis Method: Polarized Light Microscopy – EPA 600
Date Received: Sep 2/25 **Date Analyzed:** Sep 8 & 9/25
Analyst: Chengming Li
Reviewed By: Malgorzata Sybydlo

No. of Phases Analyzed: 51
Job No: 2-3250046
Number of Samples: 33
Date Reported: Sep 9/25

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
B20016-S01A	A124548-1[5]	Smooth plaster – courtroom 1	4 Phases:				
			a) Off white, joint compound	**ND**			100
			b) Grey, plaster	**ND**			100
			c) Beige, joint compound	**Chrysotile**	**0.5**		99.5
			d) White, plaster	**ND**			100
B20016-S01B	A124548-2	Smooth plaster – courtroom 1	4 Phases:				
			a) Off white, joint compound	**ND**			100
			b) Grey, plaster	**ND**			100
			c) NA	**NA**			
			d) White, plaster	**ND**			100
B20016-S01C	A124548-3	Smooth plaster – courtroom 1	4 Phases:				
			a) Off white, joint compound	**ND**			100
			b) Grey, plaster	**ND**			100
			c) NA	**NA**			
			d) White, plaster	**ND**			100
B20016-S02A	A124548-4	2'x4' small and medium pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S02B	A124548-5	2'x4' small and medium pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S02C	A124548-6	2'x4' small and medium pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S03A	A124548-7	Drywall joint compound – second floor	Off white, joint compound	**ND**			100

EMC LAB REPORT NUMBER: A124548
Client's Job/Project Name/No.: 2-3250046
Analyst: Chengming Li

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
B20016-S03B	A124548-8	Drywall joint compound – second floor	Off white, joint compound	**ND**			100
B20016-S03C	A124548-9	Drywall joint compound – second floor	Off white, joint compound	**ND**			100
B20016-S04A	A124548-10	2'x4' textured pinhole ceiling tiles	2 Phases: a) White, texture coat b) Grey, ceiling tile	 **ND** **ND**		 75	 100 25
B20016-S04B	A124548-11	2'x4' textured pinhole ceiling tiles	2 Phases: a) White, texture coat b) Grey, ceiling tile	 **ND** **ND**		 75	 100 25
B20016-S04C	A124548-12[6]	2'x4' textured pinhole ceiling tiles	2 Phases: a) White, texture coat b) Grey, ceiling tile	 **ND** **ND**		 75	 100 25
B20016-S05A	A124548-13	2'x2' random fleck and pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S05B	A124548-14	2'x2' random fleck and pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S05C	A124548-15	2'x2' random fleck and pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S06A	A124548-16	Carpet mastic	Brown, mastic	**ND**			100
B20016-S06B	A124548-17	Carpet mastic	Brown, mastic	**ND**			100
B20016-S06C	A124548-18	Carpet mastic	Brown, mastic	**ND**			100
B20016-	A124548-19	Paper under carpet	Brown, paper	**ND**		90	10

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Laboratory Analysis Report

EMC LAB REPORT NUMBER: A124548
Client's Job/Project Name/No.: 2-3250046
Analyst: Chengming Li

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
S07A							
B20016-S07B	A124548-20	Paper under carpet	Brown, paper	**ND**		90	10
B20016-S07C	A124548-21	Paper under carpet	Brown, paper	**ND**		90	10
B20016-S08A	A124548-22	Painted skim finish on stone foundation	2 Phases: a) Off white, primer b) Grey, cementitious material	 **ND** **ND**			 100 100
B20016-S08B	A124548-23	Painted skim finish on stone foundation	2 Phases: a) Off white, primer b) Grey, cementitious material	 **ND** **ND**			 100 100
B20016-S08C	A124548-24	Painted skim finish on stone foundation	2 Phases: a) Off white, primer b) Grey, cementitious material	 **ND** **ND**			 100 100
B20016-S09A	A124548-25	Smooth plaster – main floor IT room	2 Phases: a) White, plaster b) Grey, plaster	 **ND** **ND**			 100 100
B20016-S09B	A124548-26	Smooth plaster – main floor IT room	3 Phases: a) White, plaster b) Grey, plaster c) Red, cementitious material	 **ND** **ND** **ND**			 100 100 100
B20016-S09C	A124548-27	Smooth plaster – main floor IT room	2 Phases: a) White, plaster b) Grey, plaster	 **ND** **ND**			 100 100
B20016-S10A	A124548-28	2'x4' random fleck and pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25

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Laboratory Analysis Report

EMC LAB REPORT NUMBER: A124548
Client's Job/Project Name/No.: 2-3250046
Analyst: Chengming Li

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
B20016-S10B	A124548-29	2'x4' random fleck and pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S10C	A124548-30	2'x4' random fleck and pinhole ceiling tiles	Grey, ceiling tile	**ND**		75	25
B20016-S11A	A124548-31	Drywall joint compound – main floor	White, joint compound	**ND**			100
B20016-S11B	A124548-32	Drywall joint compound – main floor	2 Phases: a) White, joint compound b) Off white, joint compound	 **ND** **ND**			 100 100
B20016-S11C	A124548-33	Drywall joint compound – main floor	White, joint compound	**ND**			100

Note:
1. Bulk samples are analyzed using Polarized Light Microscopy (PLM) and dispersion staining techniques. The analytical procedures are in accordance with EPA 600/R-93/116 method.
2. The results are only related to the samples analyzed. **ND** = None Detected (no asbestos fibres were observed), **NA** = Not Analyzed (analysis stopped due to a previous positive result)
3. This report may not be reproduced, except in full without the written approval of EMC Scientific Inc. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.
4. The Ontario Regulatory Threshold for asbestos is 0.5%. The limit of quantification (LOQ) is 0.5%.
5. Phase c) is small in size.
6. Phase a) is small in size.

CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured. Proudly Canadian.

CERTIFICATE OF ANALYSIS

Final Report

C.O.C.: -

REPORT No: 25-026744 - Rev. 0

Report To:
EMC Scientific Inc.
5800 Ambler Dr. #100
Mississauga, ON L4W 4J4

CADUCEON Environmental Laboratories
2378 Holly Lane
Ottawa, ON K1V 7P1

Attention: Alister Haddad

DATE RECEIVED: 2025-Sep-03
DATE REPORTED: 2025-Sep-05
SAMPLE MATRIX: Paint Chips

CUSTOMER PROJECT: 43 Drummond Street East. Perth
P.O. NUMBER: 2-3250046

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
ICP/OES (Solid)	6	OTTAWA	SGORMAN	2025-Sep-05	D-ICP-02	EPA 6010

R.L. = Reporting Limit
NC = Not Calculated
Test methods may be modified from specified reference method unless indicated by an *

		Parameter	Lead
		Units	µg/g
		R.L.	5
Client I.D.	Sample I.D.	Date Collected	-
B20016-LP01 Off white on plaster	25-026744-1	2025-Aug-27	14600
B20016-LP02 Beige on drywall	25-026744-2	2025-Aug-27	12
B20016-LP03 White on window frame	25-026744-3	2025-Aug-27	72800
B20016-LP04 Silver on wood	25-026744-4	2025-Aug-27	196
B20016-LP05 Purple on concrete	25-026744-5	2025-Aug-27	18300
B20016-LP06 Light brown on drywall	25-026744-6	2025-Aug-27	<5

M. Dubien

Michelle Dubien
Data Specialist